

THEORETICAL AND PRACTICAL ASPECTS REGARDING AVIATION ARMY MANAGEMENT

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Abstract: *Open architecture of multi-purpose aircraft to provide the possibility of further upgrading, flying qualities and maneuvering. The realization of the modular avionics architecture enables them to be replaced (block, module, equipment) with some of the technical-tactical superiority.*

The design of the aircraft takes into account the realization of standardized connectors, which allow only some systems to be modernized without replacing the whole assembly.

Installing software on the onboard computer, which may be replaced by some more performance over time, improves the quality of the aircraft.

Also, the multiple points of excellence allow a very complex fire management management with the continuous upgradeability. In the following paper we present an overview of the importance of military aviation in the way of thinking about the arming variants and their effectiveness.

Keywords: *decision, power of fire, air supremacy, maximum effectiveness*

1. INTRODUCTION

Taking into account the conditions of the modern struggle: high speed, very short decision-making time in the air battle, the pilot being required to perform all the operations necessary to ensure the flight and the mission (navigator, pilot, shooter) - the pilot is highly requested in the fight it is necessary to create such a weapon that the pilot's preoccupation for using it during the air strike is minimal - thus, the efficiency and automation of the on-board weaponry.

Due to the very high velocity of hunting planes, the clearance distance from the target must be high and the opening distance of the fire even greater, so that the precision of the sighting device must be good and at great distances.

Also, the effectiveness of the weapon is appropriate to the firing distance.

Air combat is a form of aerial operations between hunting, hunting-bombing, isolated or formative airplanes for mutual destruction. Success in air combat is accomplished by skillfully combining maneuver with fire.

Air combat consists of a series of judiciously organized maneuvers and precise and effective fire on the attacking aircraft with on-board means of calculation, which directly leads to the destruction of the enemy [1].

2. THE THEORETICAL ASPECTS OF THE AVIATION ARMAMENT

Artillery weapons are complemented by reactive weapons. These two armament categories complement one another.

If reactive armaments have advantages such as: high fire power, high firing distance, high precision (the guided one), etc.

It also has the disadvantage of reduced fire autonomy, which only artillery weapons can compensate for. Initial projectile speed (additional missile speed) must ensure the firing efficiency at the maximum distance for which the sights ensure the necessary corrections.

The ammunition reserve must be calculated according to the number of possible attacks. The mission of the hunting plane is:

The hunting-bombing aircraft can give 3-4 attacks requiring a 10 second fire autonomy;

- The hunting-intercept aircraft operates over its own territory and can return relatively quickly to the aerodrome by requiring a 4-5 second (for 2-3 attacks);

- The accompanying hunting jet operates on the enemy territory, requiring a fire autonomy of about 20 seconds;

Fire control must be mechanized, electrified and even automated.

To provide the required fire power, the weapon is distributed about 6-12% of the aircraft's weight (less ammunition or missiles).

Its location is good at optimized points in order to reduce the effect of kickback on flight dynamics and to ensure the required fire precision.

Role fighter-bomber aviation is an important one associated character executed missions and objectives assigned importance, with the following properties:

- can search, identify and hit small and mobile objects;
- can strike, with little force, objectives of great operational-tactical importance;
- Airplane technical and tactical features allow the breakthrough of enemy air defense and surprise intrusion into hit targets;
- High speeds make it possible to execute a "hit" or blow-up of missions and hit targets other than those originally planned;
- The features of on-board weaponry (precision, low scatter and high power of destruction) allow large targets to be disposed of by striking vital points;
- can act successfully on support missions across the entire depth of the opponent's devices [1,2,3].

3. POTENTIAL VARIATIONS AND POSSIBLE MISSIONS FOR F-16 BLOCK 15 MLU

The aircraft F-16 Block 15 MLU can access among other weapons:

- Air-to-air missiles (AAM):
 - AIM-9 L/I Sidewinder;
 - AIM-120 AMRAAM.
- Air-ground rockets (AGM):
 - AGM-65 Maverick;
- Unreacted reactive weaponry:
 - CRV7 2,75.
- Unruly Bombs:
 - MK 82 & 84;
 - MK 82 "SNAKEYE";
 - BDU 33.
- Bombs directed:
 - GBU-12 Paveway II;
 - GBU-31 Joint Direct Attack Munition (JDAM);

- GBU-49 Dual Mode Laser/GPS.
- Electronic Warfare Pod:
 - MJU-11 CHAFF/FLARE Magazine;
 - MJU-12 FLARE Magazine.
- 20mm ammunition:
 - 20mm (TP) training munitions;
 - 20 mm incendiary ammunition (HEI).
- Additional fuel tanks.

F-16 Block 15 MLU is the variant with major changes to variants earlier, incorporating color screens, a new electronic warfare package, advanced avionics and advanced weapons [3,4,5].

Air combat operations is a form of air between fighter aircraft, fighter-bomber, isolated or in formation with the aim of mutual destruction.

Success in air combat is accomplished by skillfully combining maneuver with fire.

Air combat consists of a series of judiciously organized maneuvers and precise and effective fire on the attacking aircraft with on-board means of calculation, which directly leads to the destruction of the enemy.

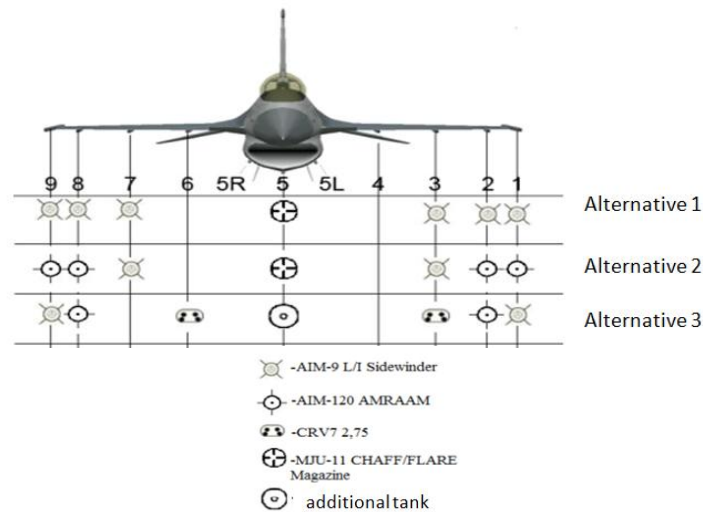


FIG. 1 Arming variants for the Air Force mission [5]

In a combat scenario to maintain air supremacy, I chose to create three different arming variants for the F-16 Block 15 MLU multi-jet airplane in which it carries an isolated aerial combat mission, see Figure 1.

For the second embodiment the arms have chosen to use six air-to-air missile AIM-9L passive infrared guided as its temperature detected by the enemy. It is extremely effective in the near-flight air strike with a short range of action.

As well as missile defense and radar guided enemy infrared I chose to use container MJU-11 electronic warfare. The second arming version consists of 4 missiles AIM-120 AMRAAM and 2 AIM-9L.

AMRAAM is a medium range rocket using its own active radar detector for target detection while Sidewinder is a short-range missile but extremely efficient for near-flight combat.

The countermeasure used is the MJU-11 electronic warhead.

The last armament designed for air combat consists of 4 air-to-air missiles: 2 AIM-9L and 2 AIM-120 along with non-CRV 7 reactive missiles mounted on the SUU-5003.

Although the CRV 7 is designed to hit terrestrial targets, it has also proven to be very useful in air combat in the event the pilot no longer has any directed missile.

For greater flight autonomy I chose to attach a 1135 liters tank [3,4,5].

4. MAXIMUM EFFICACY

The maximum efficacy in the conditions of the modern battlefield (E) is defined as the sum of all the proposed targets ($\sum_{i=1}^n n_i$) to destroy their share of destruction (θ_i), relative to the number

of aircraft exits ($\sum_{j=1}^n i_j$) multiplied by the number of aircrafts on the way out (M).

$$E = \frac{\sum_{i=1}^n n_i + \theta_i}{\sum_{j=1}^n i_j \cdot M} \quad \text{were } \theta_i = \frac{\sum_{k=1}^n p_k}{N} \quad \text{and } \sum_{k=1}^n p_k \text{ is the amount of hit / target to destroy it,}$$

N- the number of targets;

Example:

We have 3 targets (a bridge, a warehouse, a device), 12 planes, programmed in 3 exits of 4 planes.

$$E = \frac{\sum_{i=1}^n n_i + \theta_i}{\sum_{j=1}^n i_j \cdot M} = \frac{7}{12} = 0,58 = 58\% , \quad \theta_i = \frac{3+4+5}{3} = \frac{12}{3} = 4 .$$

Efficiency of 58% is achieved in the condition that in order to destroy the first target it takes 3 hits, to destroy the second target it takes 4 blows and to destroy the third target it takes 5 strokes.

Efficiency is defined as achieving the mission goal using superior sensors and diversified weaponry in the ratio of the minimum number of strokes, with precise strokes to reach the target with zero losses.

5. CONCLUSIONS

- F-16 equipment is performing, diversified, and flexible, with 9 + 2 crack points on which rockets, bombs, specialized containers and additional tanks can be caught.
- Conquering and maintaining air supremacy is the basic mission that provides initiative and freedom of action for all categories of army forces. Air supremacy can be general, zonal, throughout its temporary conflict. The main targets to be hit are: airplanes and aerodromes; deposits that provide aviation resources; aerospace and fuel industry - lubricants; command and control centers and communications.

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