The new generation of air ammunition base on distribution and synergy technology

J M Guo*, Y Zh Shan, L F Hu, X D Ma, X G Wang, Z H Zhou and H Y Zhao

Norinco Group Aviation Ammunition Research Institute, Harbin 150030, China
E-mail: 604899127@qq.com

Abstract: In this study, the development of air ammunition was reviewed and the new technologies in weapons were summarized, the applications of distribution and synergy technology are proposed in air ammunition. Two representative types of operation were developed to use in battlefield, and the influences of weapons development in the future was analyzed.

1. Introduction
Air ammunition represented by guided bombs has gradually become the main weapon used for precision air strikes due to its low cost and high combat efficiency ratio. In several local wars since the Gulf War, air ammunition is used heavily and has achieved significant strike effects. It has the advantages of high cost efficiency and small incidental damage [1]. Air ammunition has become the most widely used and most frequently used ground strike weapon at the moment, and it becomes an air weapon that nations are racing to develop [2,3]. Air ammunition has been fully developed driven by the demands of war and emerging technologies.

However, under the conditions of information, network, and intelligence war, it has become an urgent problem to be solved urgently that what capabilities air ammunition should have and how to develop the next generation of air ammunition.

2. Development situation of air ammunition
Air bombs have experienced nearly 100 years of development since 1911, and their development history has gone from high resistance to low resistance, low speed to high speed, unguided to guidance, multi-component to high integration. The development of air bombs is classified as generations I, II, III, and IV based on the landmark technology in the development of air bombs.

The first generation of air bombs were mainly unguided air bombs. The second generation of air bombs is characterized by the comprehensive guidance of air bombs. Its representative products are American "White Eye Star" TV guided bombs, "Gem Road" I / II / III laser guided bombs, Russia's KAB series guided bombs, etc. The third generation of air bombs is characterized by the digitization and integration of navigation bomb control systems. Its representative products include the United
States enhanced "Gem Road" II / III guided bombs, JDAM series guided bombs, SDB I, JSOW series, and French AASM series guided bombs. The fourth generation of air bombs is characterized by the multi-mode guidance, intelligence, information, networking and multi-cooperation. Its representative products include SDB II small diameter guided bomb and low-cost autonomous attack system (LOCAAS).

3. The capabilities and demands of new weapons

The emergence of high-tech weapons and equipment is depends on the development of science and technology, the high-tech weapons and equipment will generate new operational concepts, and the new operational concepts will promote the further development of technologies and weapons again.

With the development and wide application of science and technology, such as computer technology, microelectronic technology, intelligent technology and information technology. The new weapons and equipment are produced with the characteristics of information, intelligence, dexterity and precision. The battlefield will present a large depth and three-dimensional in the new operational concepts. Combat operations will be land, sea, air, and sky integrated, ultra-long-range, all-day, all-weather, fast, flexible, and accurate. The battlefield is becoming more transparent with the highly developed information technologies of acquisition, control, and use. Weapons and equipment with the characteristics of automation, networking and intelligence will become necessary.

4. The concept of a new generation of air ammunition

A new generation of air ammunition with distributed and synergy technology is proposed with the development of science and technology and the traction of war demand. In the new generation of air ammunition, large number of single-function, low-cost ammunition will replace the capabilities of traditional large multifunctional weapons, various ammunitions work together, and complete specific combat missions in a cluster.

The idea of "distributed" is break down the functions of expensive and complex large equipment onto a large number of small platforms, and achieve the same or higher combat capabilities through autonomous and cooperative technologies; The concept of "synergy" is cooperation and cooperation between weapons, , and complete combat missions together using the shared information [4].

5. The typical applications of the new generation of air ammunition

1) Wide area reconnaissance operation

The new generation of air ammunition can be dropped by the aircraft into the designated area. In this area, a new generation of air ammunition will search targets in a wide range, and patrol flights in dangerous operational areas and monitor targets. An air ammunition can only search a small area, which is limited by a narrow field of view. Therefore, an ammunition cluster composed by multiple ammunitions is necessary for searching a large area. Communication will happen between ammunitions, and the key information will be shared in the cluster. The cluster will conduct cooperative operations, and a positive combat effectiveness will be achieved.

2) Air defense system suppression

In a strong confrontation combat environment, the enemy has a perfect integrated air defense system. The new generation of air ammunition will be able to penetrate the enemy's defense area in a
strong confrontation environment in an individual manner. It operates in a clustered cooperative manner, and “saturate” the enemy’s air defense system, make it impossible to cope with all goals. Even if the air defense system defends, it also takes expensive and limited surface-to-air missiles to hit the cheap air ammunition, a significant increase in its defense costs as a result. Air ammunition cluster can also arrange and combine the best combat capabilities in real time according to the enemy situation and the change of its losses, and accomplish missions in a group manner under limited command. Therefore, it has greater operational flexibility.

6. Conclusions and prospects
The new generation of air ammunition based on distributed and synergy is a new type of low-cost, information-based, networked, and intelligent weapon with the ability of reconnaissance, locate, strike, and evaluate.

With the development of a new generation of air ammunition based on distribution and collaboration, it will have a huge impact on future air operations and air weapons. Firstly, the number of equipment in large multi-functional weapons may decrease in the future. Secondly, the key technologies related to low-cost drones, cruise missiles, and missiles will be valued. Thirdly, small air weapons may become the main force of the future air equipment system. Finally, advanced collaboration and artificial intelligence software will be the key to improving air combat capabilities.

References
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