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HISTORY OF THE AIR LAUNCH CONCEPT'S LAUNCH SYSTEM PRACTICAL DEVELOPMENT
IN FORMER SOVIET UNION AND RUSSIA**Abstract**

Certain advantages of launch systems, in which the concept of launching a small launch vehicle from a carrier aircraft in air is using, was drawing an attention of launch system developers beginning from early years of modern astronautics appearance. Numerous projects of these systems were developed in various countries including the former Soviet Union (FSU) and Russia. The paper is dedicated to a brief description of the FSU/Russian experience in this direction's development.

Initially, a definition of the typical ('real') air launch system is done as the system in which a launch vehicle of either winged or ballistic type on basis of common cruise or ballistic missiles/launchers has to be ejected with a following ignition in air from a carrier aircraft that has to be of common type's heavy or speedy aircraft (with certain upgrading). Advantages and shortcomings of this concept are listed and briefly assessed. The especial remark is done that the air launch systems, for which developments of either innovative carrier aircraft (as in the 'Spiral' project), or conceptually new launch vehicle (as in the MAKS project) are beyond the paper's frame since these systems can be considered rather 'advanced' than 'typical' ('real') ones.

It is marked there that experimental aviation systems, in which rocket aircraft were dropped from bombers-carriers, were actual predecessors of the air launch systems and these experimental systems, which were tested in FSU in the early fifties, are briefly described.

Then the projects of 'real' air launch systems, which were developed in the late FSU and in Russia, are described in more details. An especial attention is paid for the 'Rif-MA', 'Diana-Burlak', 'Ishim' and most recent 'Air Launch' projects. The prerequisites for every project development are discovered and the reasons for their cancellations (excluding the 'Air Launch' project) are analyzed.

A comparison of these projects, every of which is typical for one of various versions of the air launch concept, allows to make certain conclusions on possibilities to continue the similar developments in Russia and on the fields of applications for the developed systems. In particular, the conclusion is made that the being currently realized 'Air Launch' system (which is actually a conceptual successor of the early proposed 'Rif-MA' system) would be a most flexible and efficient system among other recently developed systems of the same concept. Besides, certain forecasts on a further development of this concept's system in Russia are presented.