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## AIRCRAFT BASED LAUNCH SYSTEM "SYNERGY"

**Abstract**

Currently there is an obvious trend of increasing demands for light class launch vehicles in the world launching service market. A new design for air launch vehicle was developed using criterion of minimal structure mass. All flight dynamics investigations were performed in order to prove this design validity. The new design provides launch carry load mass of 2000kg into circular orbit 200 km altitude. Based on analysis of results it is possible to say that this prototype is quite innovative, however only existing schemes and components for aviation and astronautics were involved in the work. The economical efficiency of the project will allow reducing expenses of launch, thus it will be competitive on a world launching service market. The proposed system bases on the heavy aircraft An-124-100 Ruslan. The aircraft based space launch system Synergy includes three stages launch vehicle with carrying capacity of 2000 kg (to 200 km height of the supporting orbit). The aircraft Ruslan delivers fuelled launch vehicle to 11 km altitude and launch it up in air. The launch vehicle leaves plane due to a parachute and gravitational forces. After horizontal plane stabilization the first stage engine of launch vehicles starts. The launch vehicle includes three stages that are connected via tandem scheme. Separation of the first stage (accelerator) from the launch vehicle takes place according to the hot scheme, while separation of the second scheme – according to the cold one. The first stage provides boost the launch vehicle up to  $M=2$ , after that it separates off and second stage engines starts. The second stage has an analogue of supersonic combustion ramjet (SCRAMJET) engine. This stage works in the air area and it returns to the Earth after a work completion. The third stage provides final injection of payload to the target orbit. The estimated cost of 1 kg of payload orbital injection is around 10000. *We can do following conclusion : according to performed calculations we have the weight of the payload is 5,72 As a result it's possible to conclude that the proposed*