

IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)  
Launch Vehicles in Service or in Development (1)

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THE TRAJECTORY DESIGN AND FLIGHT VERIFICATION OF GRAVITY-1(YL-1) LAUNCH  
VEHICLE**Abstract**

Gravity-1(Yinli-1, YL-1) launch vehicle completed its maiden flight in the Yellow Sea near Haiyang City, Shandong province, on Jan 11, 2024, this mission successfully sent three Yunyao satellites into 500km orbit. The YL-1 has a payload capacity of 4.2t for 500km sun synchronous orbit and 6.5t for low earth orbit. The success of YL-1 has further enriched China's launch vehicle spectrum, and will facilitate the launch of medium and large satellites and satellite constellations. In this paper, the flight ballistic solution and design intention of YL-1 is described. The flight trajectory consists of seven flight segments. The trajectory design comprehensively considers the characteristics and safety requirements of the vehicle to achieve effective utilization of the performance. Through comparative analysis of the flight trajectory and the predicted trajectory, the result demonstrates that the flight trajectory is consistent with the design results, our design methodology is right, and the flight test meet the expected requirements. Subsequently, the vehicle will be employed for commercial application launch service.