

# Ivar Asteroid Rendezvous Mission System Scenario and Trajectory

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## ABSTRACT

Based on the principle of faster, better, cheaper, this paper has searched and calculated asteroid exploration opportunities whose launch dates are in the interval of 2006 to 2010, Taking 1627 Ivar asteroid as the exploration target, the whole spacecraft and its subsystems project have been designed and analyzed, simultaneously, the transfer trajectory for asteroid rendezvous has been designed using  $\Delta$ VEGA technology , the result acquired satisfied energy requirement of minitype spacecraft.

## INTRODUCTION

As successful launch of all kinds of spacecraft and the commencement of the new century, comet and asteroid exploration has been one of the important parts in deep space exploration fields. Near-Earth Asteroid Rendezvous(NEAR) spacecraft launched in February 1996(one of American "Discovery" plan missions), has performed a flyby of the main-belt asteroid 253 Mathilde on June 27, 1997, and ultimately landed on asteroid, Eros 433. Spacecraft Deep Space-1, launched in October 1998 and rendezvoused with asteroid 1992KD, has been considered as a primary deep space exploration mission, and has experimented more new technologies. Comet spacecraft Stardust, which has been launched in Florida in February 1999, will rendezvous with the comet Wild 2 in January 2004, and will collect dust and return to the earth. Asteroid spacecraft MUSES-C, being developed by Japan, will propose to launch by launch vehicle M-5 in 2002, and it will arrive near-earth asteroid 1998 SF36 in September 2005 , rendezvous with the asteroid and sample. Finally, it will depart from the asteroid in June 2007. ESA ROSETTA plan, which will launch spacecraft by Ariane 5 in January 2003 , and it will arrive comet Wirtanen and land on the comet in 2011 by a Mars gravity-assist flyby and two earth gravity-assist flyby.

In this paper, a plan of Chinese asteroid Ivar 1627 exploration will be presented. First the launch opportunities and arrival time are given. Then the whole spacecraft scheme and the trajectory transfer scheme are designed and analyzed. Finally the transfer trajectory for rendezvous with asteroid Ivar is designed using  $\Delta$ VEGA technology.

## ASTEROID EXPLORATION MISSION OPPORTUNITIES AND CHOICE OF TARGETS

According to principle of the scheme establishment, asteroid exploration mission must have well-focused scientific objectives as well as strict limits on project costs and development time.

For the requirement above, the constraints established are as follows:

- Launch date in the interval 2006 to 2010.