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Author: Mr. Nishith Mishra
High Court of Delhi/Supreme Court of India, India

# 'MAN ALONE' OR 'MAN AND MACHINE'

**Abstract**

The Space Exploration Programs announced by NASA, the European Space Agency, the People's Republic of China and other nations indicate a resurgent interest in large-scale space exploration. The International Space Exploration Coordination Group (ISECG) was established in response to Global Exploration Strategy: The Framework for Coordination". It recognizes that preparing for human space exploration is a stepwise process. The initial steps are directed at attaining basic information. Manned Missions to deep space is the ultimate aim. This paper analyses the importance of Robotic Explorations as precursors to Manned Missions. It becomes particularly relevant in outer space with respect to Exploration of Mars and Near Earth Objects (NEO's) such as 1999 AO10. Robotic Explorations are a part of Mission Risks Reduction Strategy (MRRS). Robotic exploration is considered as an integral part of these programs to ensure that adequate information is obtained before a Manned Mission is undertaken and also to reduce the risks to astronauts. Joint missions between robotic and human missions highlight the NEO approach. For example, NASA's announced programs for the 1999 AO10 includes an automated vehicle to arrive at the asteroid several years prior to the human expedition. Prior to sending a piloted mission to Mars or NEO's, additional characterization of the target is required. High Resolution cameras for surface identification and mapping; LIDAR (topographical mapping and gravitational field survey); small lander (APXS, micrometeorite counter, dust collector, solar wind/particle collector, imager, radiometer, etc.) may form a part of Robotic Missions. The objectives may include an assessment of the nature of surface, hazards to the crew and vehicle, etc. The experience will act as a guide for human mission and will enable man to be better equipped. Surface Assessment done would form a vital database for all future manned missions. Robotic missions would supplement the samples collected during Manned Missions. The NEO's are large in number and each is a small world to explore. The characteristics of one may signifificantly diffffer from others and hence an individual database for each is essential before a manned mission. This paper presents compelling arguments for making Robotic Missions a precursor to Human Missions as part of Space Exploration Programs. It also presents a cost-benefit analysis highlighting the economic gains that can be achieved by doing the same.