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Space Resources, the Enabler of the Earth-Moon Econosphere (5)

Author: Prof. andrea sommariva
SEE Lab - SDA Bocconi School of Management, Italy

Mr. Mattia Pianorsi
SEE Lab - SDA Bocconi School of Management, Italy
Mr. Edoardo Vittori
Politecnico di Milano, Italy

ECONOMICS OF MOON MINING

Abstract

In a paper published by Acta Astronautica, we addressed the following questions: (i) Moon resource utilization - in particular a resource exploration campaign focused on ice deposits on the Moon that leads to industrial scale production of propellant - is sustainable by solely private companies and (ii) if not, what types of public-private partnership are appropriate to enable the development of private sector activities. The analysis rejects the private model as it produces a negative Net Present Value (NPV). From a financial standpoint, the reasons behind this result are twofold. First, the company takes on the uncertainties derived from the entire exploration phase. Second, the exploration period also extends the span of time without revenues, in turn reduced due to the value time of money. Instead, the private-public partnership model produces a positive NPV, provided a successful completion of a prospecting mission by government. Once lunar propellant production is established, the commercial launch companies become the dominant market for lunar derived propellant. Thus, this paper investigates the market structure of industrial transportation system involved in the shipment of the fuel to LEO and cislunar customers. By making the price of Moon propellant endogenous, this paper complete the economic analysis of the entire value-chain (producer, carrier and customer) of lunar propellant.