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

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SHIFTING THE THINKING ON RESOURCE DEVELOPMENT IN SPACE

Abstract

The expansion into space depends upon the cost-effective availability of resources for fuel, for infrastructure and for human survivability. Earth–origin resources are the only solution at the present time and in the near term. However, the use of Earth resources beyond the very near term is both non sustainable and ultimately constrains space development.

Despite much theoretical work, activity and discussion on the availability of resources in space and possible methods of accessing and using the resources, there is a surprising lack of understanding of the actual principles, processes and requirements for making those resources reliably available.

Resource development on Earth is very well understood, with the concepts and tools of technical capability, risk management, financial sustainability and a rigorous project development models shown to work time after time.

Examples of resource development projects on Earth show that for many (and particularly large scale or large cost) projects a timeframe of 10 to 20 years is required from discovery of resource to its exploitation. The length of time is due to the technical and financial processes that are followed to ensure the success of the project, and licencing and permitting processes and timelines. Even with these processes, in many cases, projects fail along the development pathway. For space resources, it can be reasonably assumed that the lead times for reliably available resources are likely to be similar or longer than for Earth based situations. Therefore, as with Earth situations, staged development and early-start demonstration projects are necessary.

The authors argue that there needs to be a significant shift in thinking about space resources for there to be any substantial expansion into space in the next few decades. The methodologies used for Earth based resources must be incorporated into the very early stages of thinking about space ventures to ensure availability of resources and that technical and financial risks are minimised.

The main contention of this paper is that substantive work must commence now on resource development and that an entrepreneurial approach, focussing on early operations (such as proof of concept missions), rather than further general research, is likely to produce more sustainable outcomes.

This paper will draw on the authors' extensive and diverse experience in terrestrial resource development to provide examples that show timeframes and the developmental steps to achieve full production.