

Nadeem PTMSS 2011 Talk #1

The Gap – It's Here. Now What Do We Do?

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These are Interesting Times for exploration. 50 years ago an entire manned lunar program went from blank sheet of paper and zero flight heritage to 6 successful human sortie missions in less than 15 years. These days it will have taken us almost as much time to deliver a single MSL rover, and longer to bring a single 2018 Mars rover mission to fruition. The presence of a strong political imperative, clear and simple vision and a basic national technology base was sufficient to achieve something as extraordinary then as a human Mars mission seems now. While today we find ourselves arguably in a better world (nations cooperate, technology is more advanced, planetary destinations have already been visited and environments are better understood etc.) numerous false starts over the last 30 years are sobering indicators of the challenge that lies ahead for meaningful, near-term and sustained space exploration in today's socioeconomic context.

Of course, entire books have been written on this topic reflecting upon how we got into this situation, how it might have been avoided and what should be done to get out of it. For today's discussion, however, only two main certainties need be noted. Firstly, those planning to live, work, study or play in space should steel themselves for experiences of inspiration, ambition, anxiety, elation, excitement, adventure, uncertainty, hope, occasional frustration and sometime outright bewilderment. Furthermore, all these may expected to be administered in roughly equal, rarely convenient, likely cyclical and almost certainly recurring measure. But many of all already know this and, somewhat inexplicably, are still here.

The second and more pressing certainty, however, is that we are all now facing a gap. Or, as it is becomingly universally known, The Gap. It is coming, it cannot be avoided and indeed increasing indications are that it is already here. ISS is completed, space shuttle is retired, and the flagship Mars mission developed over this past decade is about to leave Earth. Going forward, ISS space transportation is transferring to the commercial domain, transportation beyond LEO is back but has regressed to the planning stages, the next flagship Mars mission may well not happen before 2020, while the next proposed steps in human space exploration – be they on the Moon, Mars or an Asteroid - feature launch dates not before the early to mid 2020s. Even in the optimistic case, lead times associated with such multi-billion dollar global initiatives suggest meaningful engagement of national capacities could be as much as five years out, with full program ramp-up stretching out beyond this. The Gap, it would seem, could be anywhere from 3 to 5 years long, or worse if false starts continue and the global economy continues to deteriorate. In any scenario the problem is serious, it is not about to go away and it is facing us all.

The issue of how we address The Gap remains the subject of wide debate, with a number of activities already commenced internationally over the past 1-2 years, varying in dependent scale and nature on the respective budgets and interests of national agencies.

Efforts have included: aggressive programs of transformative technology development to enable a new era of 21st Century space initiatives; orbital testing of critical future exploration technologies; ground-based prototype system testing in operationally representative analogue environments; affordable robotic precursor missions demonstrating subsets of future exploration system capabilities or conducting advance characterization at future exploration destinations.

Each of these represent valid preparations in themselves and indeed in Canada, for example, a significant activity within exploration led by the Canadian Space Agency over the last 2-3 years has been the development and ground-testing of terrestrial exploration prototypes. In doing so the community prepares, engages, organizes, and learns, in a manner involving less resources than a flight initiative. This has given rise to a fascinating debate in the community: for how long should this path be pursued? When is the right time to take the next step in flight development, and what is the right balance?

This presentation reviews some of the notable ground testing activities in the community, and considers some of the unenviable dilemmas facing planners over the next 1-2 years: to stick or to twist? Do we continue with our current, more affordable ground preparations or do we take the next step and conduct spaceflight activity? How viable is the latter in today's climate, do opportunities exist and how can they be realized? Do we have any consensus within the community? Planetary mining, terrestrial mining and space sciences represent distinct stakeholder communities with a spectrum of technical, commercial and scientific interests, priorities, constraints and capabilities. How can these all co-exist? Do the benefits of harmonization ever outweigh the benefits of diversity?

A number of lunar exploration mission concepts that have been studied recently for the Canadian Space Agency are considered, and their relevance discussed in light of the impending Gap, and the questions raised above. Considerations include technology readiness, opportunities for US, Canadian and other international cooperation, political and commercial challenges, and relevance to activities discussed elsewhere by science and ISRU talks this week. Finally, assuming everyone is still speaking, there may just be time to ask, in light of all the above, where we should go from here in the near-term.