

SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Launch Services, Missions, Operations, and Facilities (2)

Author: Mr. Abe Bonnema
ISIS - Innovative Solutions In Space B.V., The Netherlands, a.r.bonnema@isispace.nl

LAUNCHING THE SWARM: FROM LAUNCHER TO MOTHERSHIP

Abstract

Small satellites have gone viral, to the extent that it even became the main topic of the symposium on small satellites. The number of entities planning for applications based on small satellite constellations, with either nanosatellites or small microsatellites, has increased enormously, and new players join the next space race still every month. As a result, the number of satellites to be launched in the coming few years also increased enormously to several hundred to even a thousand per year. And while the development of smaller launch vehicles capable of launching a batch of such small satellites into a dedicated orbit several times per month is surely on its way, these developments do not seem to go fast enough. That implies that for the first constellations, and surely for the later larger constellations, the more traditional, mid-size launch vehicles are used. Yet in a completely different manner than what they were originally designed for, as the launch vehicle providers now need to accommodate large numbers of satellites on board instead of just the primary with possibly a few secondaries. Moreover, such clusters or swarms of small payloads can have quite different launch and orbital deployment requirements.

This brings all sort of challenges, in terms of accommodation, interface hardware, deployment direction, times and sequence, limitations in command and telemetry interfaces, ballistics and other aspects such as frequency management. Challenges that launch service providers did not have to deal with yet for launches with sometimes well over 100 satellites on board, where a cluster of small satellites in fact is the 'primary payload'. These challenges need to be overcome, while working towards a new and more efficient way of building and maintaining the constellations under development now.

This paper and presentation the authors will give their view on how to deal with these aspects, based on past experience with placing already tens of satellites on a single launch, and using ongoing missions with more than a 100 satellites on a single launch as a 'prime payload cluster' as an example. The authors will also present about their plans towards innovative solutions for constellation deployment and maintenance for very small satellites, using the launchers' capabilities to be transformed into a constellation deployment mothership for the swarm of satellites.