

IAF SPACE OPERATIONS SYMPOSIUM (B6)
New Space Operations Concepts and Advanced Systems (2)

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TOO MANY SATELLITES TO OPERATE? HOW PLANET SUCCESSFULLY OPERATES 100'S OF
SATELLITES USING AGILE AEROSPACE**Abstract**

Historically, space operations teams have used dedicated satellite controllers to monitor spacecraft during every ground contact. In addition, on-call engineering support would need to be used to support anomaly resolution and special on-orbit requests. This approach has worked fine for smaller satellite systems, but now that current and proposed future constellations are upwards of hundreds and thousands of satellites, this concept of operations becomes unmanageable and would require a large team of qualified people in order to support.

Planet has addressed this by building a robust and automated Mission Control system which is constantly improved and scaled with operational experience.

Planet currently builds, tests, launches, and operates the world's largest fleet of imaging satellites, with more than 200 Dove satellites launched to date. Space operations of such a large fleet is carried out by a team of only 8 engineers. This includes a distributed operational team comprised of 5 engineers in Berlin, Germany and 3 in the San Francisco, USA headquarters. The cloud hosted Mission Control system provides the capability to conduct operations from anywhere in the world.

There is a daily check of the fleet's health and status; a process which consumes only a couple of hours. This process evolved as the fleet size increased and is continuously revised in order to more efficiently identify anomalies.

Some key aspects of Planet's agile space operations are:

- Satellites are not monitored individually rather by groups of satellites (called Flocks) are monitored as a whole; since each group has a common baseline, statistics are used to identify out of family satellites.
- Telemetry and logs are not checked individually since this data gets downloaded every pass per satellite, with more than 2000 passes per day.
- Known anomalies are resolved by an automated process that triggers without operator intervention.

This paper will present novel key principles and agile methods that the space operations team has implemented to maintain and operate the large fleet of Doves.