



# Picture perfect satellite tasking

*Plans to upgrade EUSI's constellation ground station at the German Aerospace Centre (DLR) near Munich by the end of 2016 will give European customers much better access to 30 cm to 50 cm resolution imagery with at least four multi-spectral bands. Here, Portsmouth is imaged by DigitalGlobe's WorldView 2 satellite. Image: © European Space Imaging*

Penelope Richardson explores the advantages of constellation satellite tasking for large VHR imagery mapping projects

Organisations are increasingly turning to satellite imagery to fulfill their mapping projects, a move that can be attributed to the introduction of Very High-Resolution (VHR) satellites and advances in their technical capability such as the advent of 30 cm resolution imagery.

To extend greater benefit to customers from these developments, satellite operators are beginning to offer what is termed constellation satellite tasking. The intention: to deliver imagery in shorter timeframes and with fewer imaging constraints.

## Supply and demand

Such tasking is particularly important to cope with the growing European demand for the regular and cost-effective satellite monitoring of large land areas or specific zones of interest. The result is increased competition for satellite time.

Currently, direct satellite tasking across the United Kingdom, Europe and North Africa can be accomplished by WorldView-1 and WorldView-2 satellites. These are tasked through a Direct Access Facility (DAF) owned and run by European Space Imaging and located at the German Aerospace Center (DLR) near Munich.

Tight collection planning and operator-managed tasking can improve the number of successful orders on each pass, but there is a

finite limit to the actual collection capacity of a satellite and demand currently outstrips supply.

## Guaranteeing access

To guarantee access to imagery, as and when required, supply companies are currently expanding their offering to European customers. Not least, European Space Imaging (EUSI) is planning to expand its ground station to increase direct access to the Very High Resolution (VHR) satellites in the DigitalGlobe satellite fleet.

"Offering direct up and downlinking in Europe to a constellation of VHR satellites is a priority for us. We want to be able to continue to provide the high level of service European organisations expect from us, while also keeping up with demand", says Adrian Zevenbergen, EUSI's Managing Director.

When the entire DigitalGlobe WorldView satellite fleet is available for direct up- and downlinking through EUSI's expanded and upgraded ground station, revisit times and order processing timescales will improve enormously.

Plans to have the upgraded station operating by the end of 2016 will give European customers much better access to 30 cm to 50 cm resolution imagery with at least four multi-spectral bands (NIR1, R, G, B).



Persistent cloud cover can pose problems for image acquisition. This WorldView 2 image of Flimston Bay in Pembrokeshire, South Wales, shows how the tasking of a constellation of VHR satellites can boost opportunities for successful data collection over short timescales. Image: © European Space Imaging

## High-risk zones

Clouds are the enemy of optical satellites and nowhere more so than over the United Kingdom where regular cloud coverage puts it in the 'high-risk for collection' category.

Having a constellation of VHR satellites available to collect imagery on a sub-daily basis over areas of interest in high-risk regions boosts the number of collection opportunities, and improves the potential of a successful collection in a shorter timeframe. This, together with operator-managed constellation tasking for direct decision-making and selected collection planning, will help customers fulfill their large area mapping projects with greater speed and certainty.

## Operator-managed tasking

Satellites need to be 'tasked' with imagery orders before flying into a reception zone. Tasking can be performed via a fully automated scheduling system or by operator-managed tasking (collection planner) using sophisticated, interactive planning systems. A pass collection plan is uploaded to the satellite sensor to guide it in fulfilling imagery requests.

At first glance, creating tasking plans manually may seem impractical and time-consuming, given the significant amount of hands-on preparation required before a satellite pass. Yet in comparison to a fully automated system, operator-managed, interactive collection planning can yield a much higher success rate by maximising the area covered and the amount of cloud-free imagery collected.

When creating tasking plans for a satellite constellation, tasking experts are much more flexible in evaluating and working on last minute customer requirements and changing priorities. In liaising with customer support and sales teams, trained operators are able to look beyond the immediate circumstances of a single satellite pass and make strategic decisions regarding next collection opportunities, weather patterns and adjusted priorities. Consequently, operator-managed planning often moves away from a purely single-pass optimisation, which is what automatic scheduling systems aim to achieve (usually with mixed results).

The goal of operator-managed tasking is to get the most out of each pass to deliver an overall higher yield of usable images in shorter collection times and with better cloud cover results. This approach can significantly benefit mapping projects requiring large area coverages, not least in high-risk collection zones.

## Controls with remote sensing

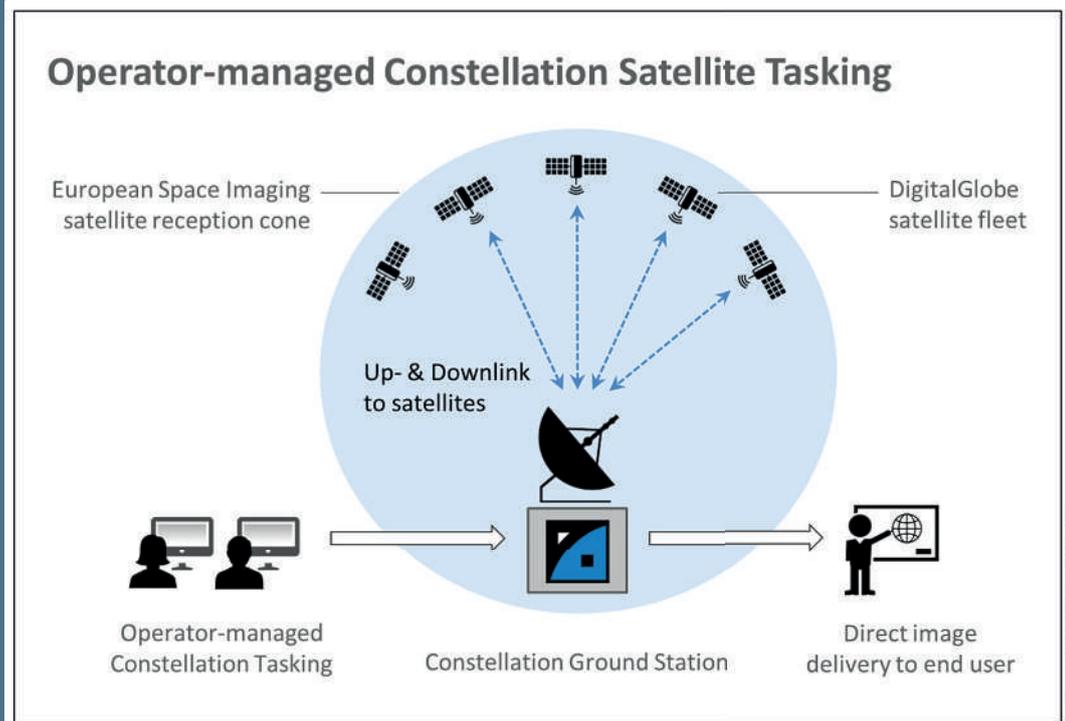
The benefit of using constellation satellite tasking was tested by the European Union's Controls with Remote Sensing (CwRS)

# How a constellation ground station works

A **satellite constellation** is a group of satellites working together to collect image information. These satellites can be coordinated to a ground point or a time and they usually have direct contact to the same ground station. Satellites in a constellation can take images of the same area more regularly.

**Satellite Constellation Tasking** is when more than one satellite fulfills an image order or when any single sensor from the group of satellites fulfills an order to customer specifications.

**Operator-Managed Tasking** is a hands-on, operator-assisted tasking procedure where the operator interacts with sophisticated scheduling software to create an optimal image collection plan. The operator sends this plan to the satellite as it flies into the reception cone of the ground station.



## Constellation tasking for Britain's Rural Payments Agency

The Rural Payments Agency's Control with Remote Sensing campaign requires that it inspects a percentage of customers remotely. Although the agency uses aerial photography as an intelligence source, the currency of this information is insufficient for control checks given that the European Commission requires Member States to use in-year imagery for such checking.

Satellite imagery not only provides the desired spatial resolution for digitising land features; it also enables the agency to derive important spectral information from the raw multispectral data delivered with the satellite imagery. This spectral intelligence is used to

produce the required land classifications.

By using constellation satellite tasking, the agency has the ability to define areas of interest in addition to requesting the desired acquisition windows. This is important to an agency whose work revolves around rural land and crop calendars. It allows it to build a temporal resolution of satellite imagery for all customers. The images below show the same area being inspected by remote sensing. The area has been defined to include certain customer profiles and avoid collecting data on urban areas. Satellite tasking allowed the agency to define collection areas and acquisition windows that follow crop growth.



Crop growth monitored by the Rural Payments Agency in April and July 2016. The image on the left was collected by WorldView 2 in April 2016 (© European Space Imaging/DigitalGlobe™, 2016, distributed by European Space Imaging) while that on the right was collected by WorldView 3 in July 2016 (© DigitalGlobe™, provided by European Space Imaging).

agricultural monitoring programme using European Space Imaging's Direct Access Facility (DAF). Since becoming the unique supplier for VHR data to the program, EUSI has performed imagery collection from multiple VHR sensors.

Using this constellation collection approach the company has proved it can supply the best quality imagery, faster. Combining operator-managed tasking, multiple satellites and the ability to direct uplink and downlink from its ground station means that orders can be fulfilled in almost near real-time. This has major benefits for areas categorised as 'high-risk for collection' such as the UK as, when weather conditions are optimal, all satellites can be brought into play to fulfill an order in record time.

The future looks positive for organisations wanting to use VHR satellite imagery in their projects. The new Direct Access Facility receiving WorldView imagery over Europe will have many benefits for customers, especially those in high-risk areas such as the United Kingdom who have hitherto suffered very low collection opportunities.

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