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# The World's First Commercial SAR and Optical 16-Satellite Constellation

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## ABSTRACT

UrtheCast plans to build, launch and operate the world's first fully-integrated, multispectral Optical and Synthetic Aperture Radar (SAR) commercial constellation of Earth observation satellites. These will be deployed over multiple launches in 2019 and 2020. Known as the Constellation, it will comprise of 8 Optical and 8 SAR satellites flying in two orbital planes, with each plane consisting of four satellite pairs. Each pair of satellites will consist of a dual-mode, high resolution Optical satellite (video and pushbroom) and a dual-band high resolution SAR satellite (X-band and L-band) flying in tandem.

The Constellation will provide an unmatched space-imaging capability, including high collection capacity, Optical and SAR data fusion, weather-independent high resolution imaging using the SAR, target revisit, and imaging latency. By flying the satellites in tightly-paired SAR and Optical tandem formations, the Constellation is expected to offer a number of innovative capabilities, including on-board real-time processing, cross-cueing between the satellites, and real-time cloud imaging on the leading SAR satellites that enables cloud avoidance in the trailing Optical satellites. By employing two orbital planes, the Constellation will allow for maximum revisit rates in the mid-latitudes, while providing global coverage extending to the poles.

This paper will describe how the envisaged constellation will create new opportunities for both businesses and government with an altogether new and responsive way to addressing applications.

Surrey Satellite Technology Ltd. (SSTL) is the strategic implementation partner for the satellite design and build and will use its considerable experience in designing spacecraft constellations to tackle this new challenge. This paper will provide some insight into the mission engineering approach that goes into a constellation of this complexity and performance. It will also provide an overview of the benefits of this strategic partnership between UrtheCast and SSTL.

**KEYWORDS: UrtheCast; SSTL; Constellation; SAR; Optical; Earth Observation; Tandem; Cross-Cueing; Cloud-Free;**

## INTRODUCTION

UrtheCast, although a relatively new name in the industry, has already emerged as a key player in the downstream space industry. The company's novel vision to democratise Earth observation has, in part, been achieved by establishing several sovereign space capabilities in a relatively short period. This includes the Generation 1 cameras that were docked onto the ISS in 2013 that has been producing ultra high definition videos (via the Iris instrument) and medium resolution imagery (via the Theia instrument). Without the usual power, mass and thermal constraints of a standalone spacecraft, the use of the ISS dramatically changes the economics of Earth observation from space. In addition to this, the newly acquired Deimos Imaging by the company comes with the added benefit of the use of the fully operational medium resolution Deimos-1 and high resolution Deimos-2 satellites. The final piece of the company's grand vision is the recently announced Constellation mission; a 16-satellite state-of-the-art constellation of SAR and Optical satellites, built and tested in partnership with SSTL, UK. The combination of SAR and Optical satellites forms a constellation whose performance and functionality is unparalleled in the Earth observation domain.


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SSTL has been building satellites for Earth observation since 1985. The Disaster Monitoring Constellation (DMC) satellites proved that it is possible to acquire humanitarian, political and technological value from Earth imaging using cost effective small satellites and, since then, SSTL has continued to push the boundaries of low cost satellite capability by pioneering and advancing the small satellite design approach. The UrtheCast Constellation mission is proof of this, with challenging requirements designed to provide novel applications amidst the 'New Space' era in the ever-growing Earth observation industry. As such, SSTL's experience and approach perfectly places them to be the strategic implementation partner of the UrtheCast Constellation.

## THE CONSTELLATION

### *Constellation Design*

A few of the many unique features of the Constellation is the satellites it is comprised of and the orbits they will be flying in. For typical LEO altitudes (600-800 km), the laws of physics dictate that the image resolution achievable through a relatively small aperture is in the mid-to-low resolution region. However, very high resolution data can be collected from a relatively small aperture at very low altitudes – a region typically unused by commercial operators.

The Constellation is formed of 8 Optical satellites and 8 SAR satellites at an altitude of 450 km split across two orbital planes: a sun synchronous plane and a medium inclination plane. The satellites are equally distributed in each plane, with the SAR satellite leading the Optical satellite by a few minutes to enable effective cross-cueing operations, as shown in Figure 1.

The combination of both planes enables an optimum revisit in the mid-latitude regions to be achieved, while providing global coverage that extends to the poles.

The revisit, combined with the tandem formation of the satellites enables a fusion of different datasets with very low latency, creating and enhancing various applications.

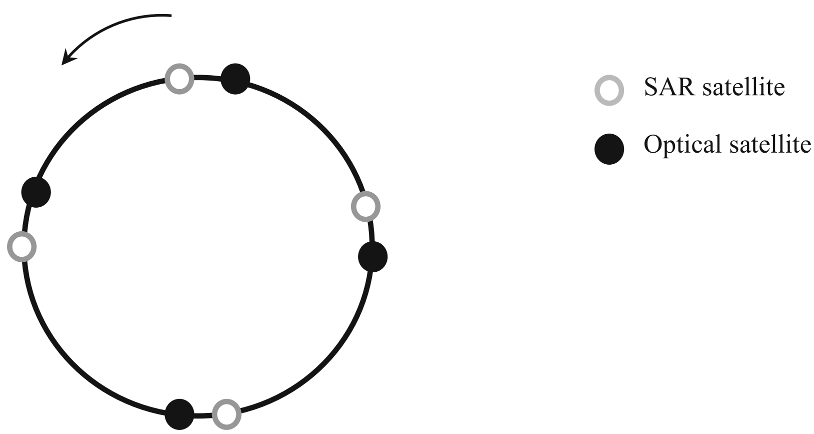


**Figure 1. Constellation Design.**

### *This Isn't Just Another Constellation!*

The 'New Space' phase has been at an all-time high. The past few years has seen a significant rise in announcements of "game changing" constellations in the Earth observation, science and telecommunications domain. So is this mission truly unique or is it just another cool idea? The UrtheCast Constellation is the world's first combined SAR and Optical commercial constellation. The goal of the mission is to collect data that can be processed into very high resolution, 0.5 m-class still and video Optical imagery, and high resolution L-Band and X-Band SAR products. The SAR sensor incorporates a patented technology that gives it the ability to image simultaneously in quad-polarisation L-band and single-polarisation X-band from the same sensor. This is a feat never achieved before.

These products will serve a variety of end users and markets such as traditional Earth observation commercial and civil applications, data analytics and 'big data' applications, and the nascent social media and consumer applications. The individual performance of each satellite, as described in the coming sections, speaks for itself, however, the other aspect that differentiates this constellation from the rest is its innovative concept of operations. This will also be detailed in the coming sections.

***Dual-Mode Optical Camera***

The Optical satellites within the constellation include of a pair of sensor suites – the dual-mode camera and the meteorological camera. The dual-mode camera can be operated either in pushbroom or video mode.

The pushbroom sensor uses a 64-stage Time Delayed Integration (TDI) architecture, digitised to 14 bits. This sensor yields a nominal 12.29 km swath (at nadir for 450 km altitude) and is comprised of a panchromatic channel giving 0.5 m-class imagery and six multispectral channels giving 2 m-class imagery: blue, green, yellow, red, red-edge and near-infrared (NIR). The video sensor uses a 20 MPixel CMOS detector that yields a nominal 2.5 km by 1.9 km footprint (at nadir for 450 km altitude) at up to 30 FPS, digitised to 12 bits. This detector uses a Bayer filter that provides three spectral channels (red, blue and green) giving 0.5 m-class imagery.

Augmenting the dual-mode Optical camera is a meteorological camera (MetCam), providing additional spectral channels, albeit at a lower resolution, designed to measure the impact of the atmosphere on the imagery and enable its correction during ground image processing. The data from the MetCam is not included in the distributed product though.

***Dual-Band Synthetic Aperture RADAR***

The SAR satellites within the constellation include a range of sensor suites – the dual-band SAR, AIS receivers and the cloud camera. The dual-band, L- and X-band, SAR can be operated in one of three modes: SpotLight, StripMap and ScanSAR.

The SpotLight mode is able to acquire 1 m-class (X-band) and 5 m-class (L-band) imagery with a nominal size of 5 km by 5 km.

The StripMap mode is able to acquire 2 m-class (X-band) and 10 m-class (L-band) imagery with a nominal swath width of 10 km.

The ScanSAR mode is able to acquire 10 m-class (X-band) and 30 m-class (L-band) imagery with a nominal swath width of 25 km when both bands are operated together. When operating L-band alone, the ScanSAR mode is able to acquire 30 m-class imagery with a swath width of up to 100 km.

The L-band SAR supports the full complement of polarisation options, including single, dual, quad, linear-compact and circular compact pole. The X-band SAR supports VV polarisation only.

The SAR data can also be used to generate interferometric products.

Complementing the SAR payload are the AIS receivers which, when combined with SAR data on-board, provide useful information on potential targets of interest in the maritime regions, for the trailing Optical satellite to then investigate further.

Adding to the SAR payload and AIS receivers is a cloud camera (CloudCam), providing continuous cloud coverage to assist the trailing Optical satellite with its image acquisition campaign. The rationale for this is described in the following section.

***Novel Concept of Operations***

Traditionally, the power hungry nature of SAR sensors combined with their day and night imaging ability have driven SAR satellites to fly in dawn-dusk orbits to maximise power generation and the payload duty cycle. This, however, hasn't been the case for Optical satellites due to the less than optimal ground illumination conditions in such orbits. For the Constellation, the tandem formation of both types of spacecraft drives the local solar time of the sun synchronous plane to that more suited for an Optical satellite. However, it is this combination of SAR and Optical satellites that forms a constellation whose performance and functionality is unparalleled in the Earth observation domain. This is a result of each SAR-Optical satellite pair in the constellation being able to uniquely interact with each other in real-time to optimise and enhance the data acquired by the Constellation.

Studies have shown that approximately 67% of the Earth's surface is typically covered by clouds, with only 30% of land usually cloud-free[1]. With Optical satellites frequently being susceptible to acquiring cloudy images, it is important to manage on-board resources effectively, to maximise the amount of useful imagery acquired and increase revenue potential. As clouds can't be moved and it is both difficult and expensive to provide the satellites with real-time cloud coverage from the ground, why not just avoid them autonomously? As detailed in the previous section, each of the leading SAR satellites will have the ability to take real-time cloud imagery via the CloudCam. A continuous stream of cloud maps will be sent over to the trailing Optical satellites, which will then process the data on-board to determine which cloud-free areas of interest it can image to optimise its image acquisition campaign.

The cross-cueing capability of the Constellation provides another completely unique level of service, where the SAR satellite can operate in a wide-area surveillance mode (using ScanSAR) and be used in combination with the on-board AIS sensors and cloud camera to determine if a target of interest (TOI) appears that can be imaged by the trailing Optical satellite. If so, the SAR satellite can immediately send the position of the TOI to the Optical satellite which can then re-task itself to manoeuvre to take a very high resolution image of the target within minutes of the detection.

These are just a few of the unique concept of operations that illustrates the rationale of this tandem formation and the potential of the mission.

***What You Get From the Constellation***

A combination of the state-of-the-art sensors on-board each satellite in the Constellation and the innovative concept of operations generates unique and useful datasets of which a wide range of information can be extracted from.

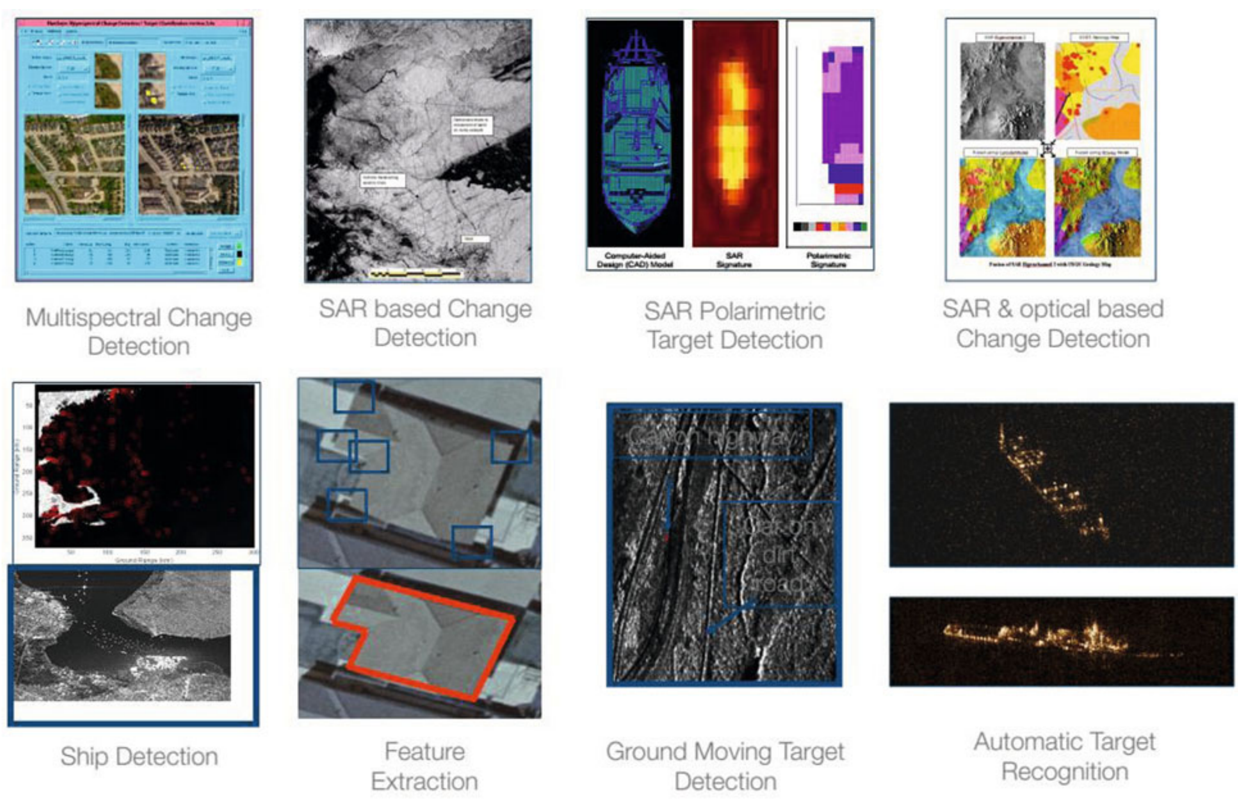


**Figure 2. SAR and Optical Information Product Types.**

The Constellation will generate an industry standard set of Rapid Positioning Capability (RPC) Model and Ortho Model (OM) products and videos. These products will include the imagery (all Optical sensor spectral channels and all SAR sensor polarisations) and the associated metadata for both sensors.

One of the main advantages of the Constellation is the ability to fuse SAR and Optical data. The SAR and Optical data are highly complementary in terms of the information that can be extracted from each source.

The polarisation and dielectric measurement provided by SAR data can support determination of material classification, wetness, structure, texture and roughness information about the scene that the Optical data often cannot. For example, agriculture and forestry applications based on Optical data need to include a correction for soil moisture. And the SAR data can also assist in differentiating plant and tree types based on their polarisation information. The SAR interferometric products can also be used to measure minute variations in the Earth's surface.

The spectral measurement provided by Optical data can support determination of signature classification information about the scene that SAR data often cannot. For example, the spectral signatures of different types of man-made objects, vegetation and geologic features are all well characterised in Optical data, and less so in SAR data.

The addition of a time-series of images acquired by the video sensor over the arc of acquisition geometries yields an even deeper understanding of the scene due to the 3D surface model and motion vector information that it provides.

Consequently, the fusion of Optical imagery, SAR imagery and interferometric information, 3D surface model and motion vector products yields a suite of products where there is significantly more information that can be extracted from any individual data source alone.

With co-incident Optical and SAR imagery, 3D surface model and motion vector information, the accuracy and range of possible applications becomes even more interesting because it eliminates a variety of unaccountable sources of error, typical of most fusion products resulting from the misregistration due to weather conditions, solar illuminations, temporal scene changes, viewing geometries, etc.

For example, in forestry biomass estimation, the X-band SAR sensor is used to locate the tops of the trees and the L-band SAR sensor is used to locate the bottom of the tree, thus yielding an accurate stand height. The pushbroom sensor is used to perform spectral classification to determine tree species and stand density. The video sensor is used to construct a 3D surface model of the scene and correct for any errors in the intermediate results. The data is then fused, in conjunction with the appropriate forestry models, in order to estimate the biomass.

The processing of high resolution SAR data will benefit greatly from being fused with accurate 3D surface models and motion vector information, thus yielding accurately focused imagery. SAR data has been traditionally processed assuming a smooth Earth or a coarse DEM, and therefore tends to be somewhat out of focus and suffer from layover and shadow artefacts. Since SAR data relies on the Doppler phase history, objects that are moving are therefore mis-located.

The cyclic nature of the solar illumination variations from the medium inclined orbit will allow construction of shadow-free 3D image models of cities by fusing both Optical and SAR data acquired over several orbits, giving both colour and structural information for all surfaces.

The following images illustrate a simple example of multi-sensor data fusion, combining X-band SAR, L-band SAR and multispectral Optical imagery, resulting in a very content-rich information product.

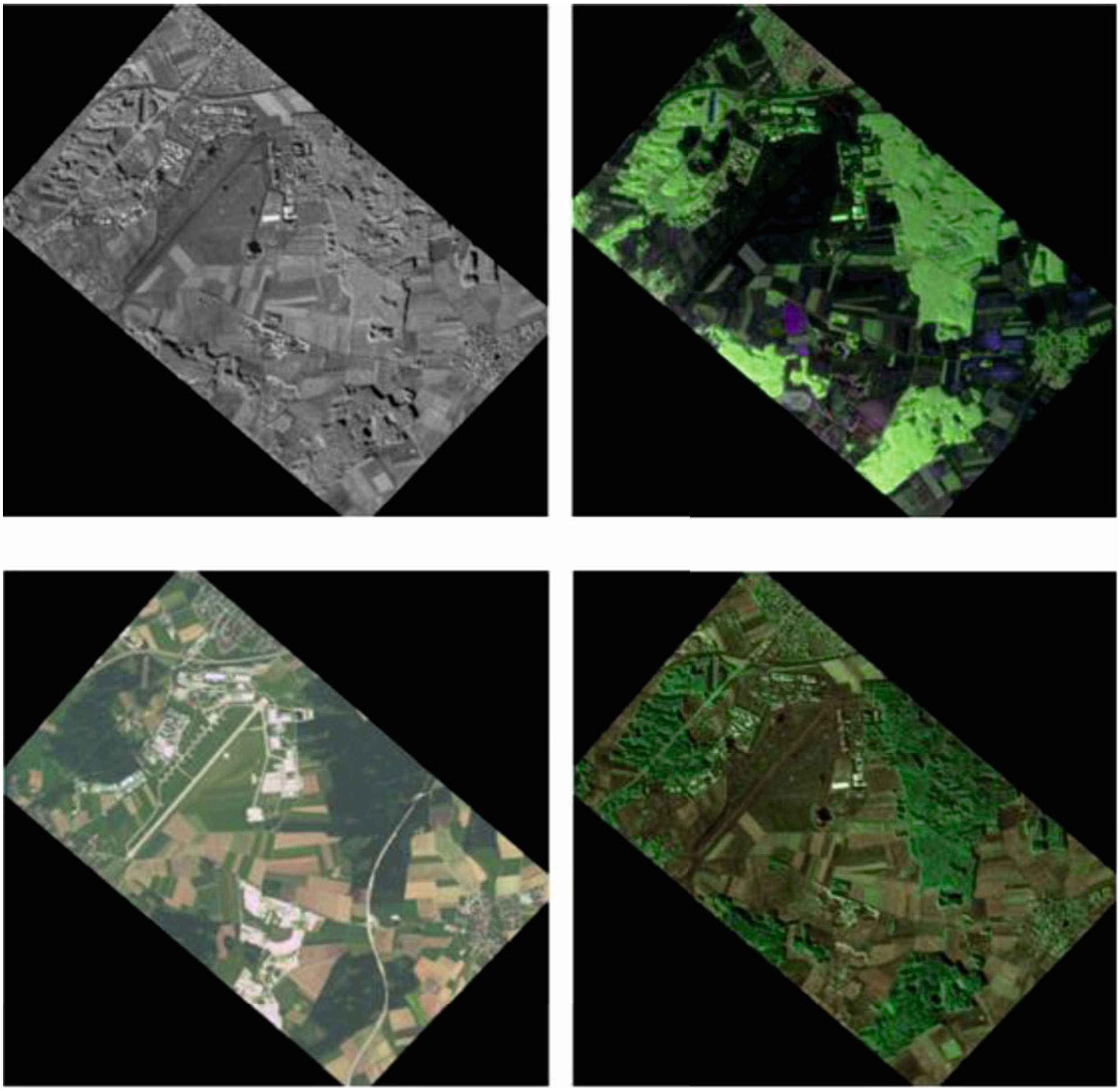

**Figure 3. Samples of X-Band SAR Image (Top Left), L-Band SAR Image (Top Right), Multispectral Optical Image (Bottom Left), Fused Image (Bottom Right).**

***At the End of the Day, it's About the Applications!***

The standard and fusion products discussed earlier will feed into applications and services such as data analytics, site monitoring and wide-area reconnaissance.

The unique combination of the multispectral Optical data and the X-band and full quad-pole L-band SAR data provides for many unique applications. As described in the previous section, the L-band SAR data has the unique ability to penetrate through the forest canopy to measure biomass, for example, and detect objects under trees, while the X-band SAR reflect from the top of the canopy to support the biomass estimates and provides higher resolution. When combined with the multispectral Optical data, this provides for information rich fusion products.

As another example, in the rapidly growing area of 'big data' analytics, the dual-band SAR data on its own can provide very high value due to its ability to provide imagery independent of clouds and also at night. When combined with optical data (when it is available on cloud free days), this can provide powerful information that feeds the ‘big data’ analytics engines to create many different types of information products.

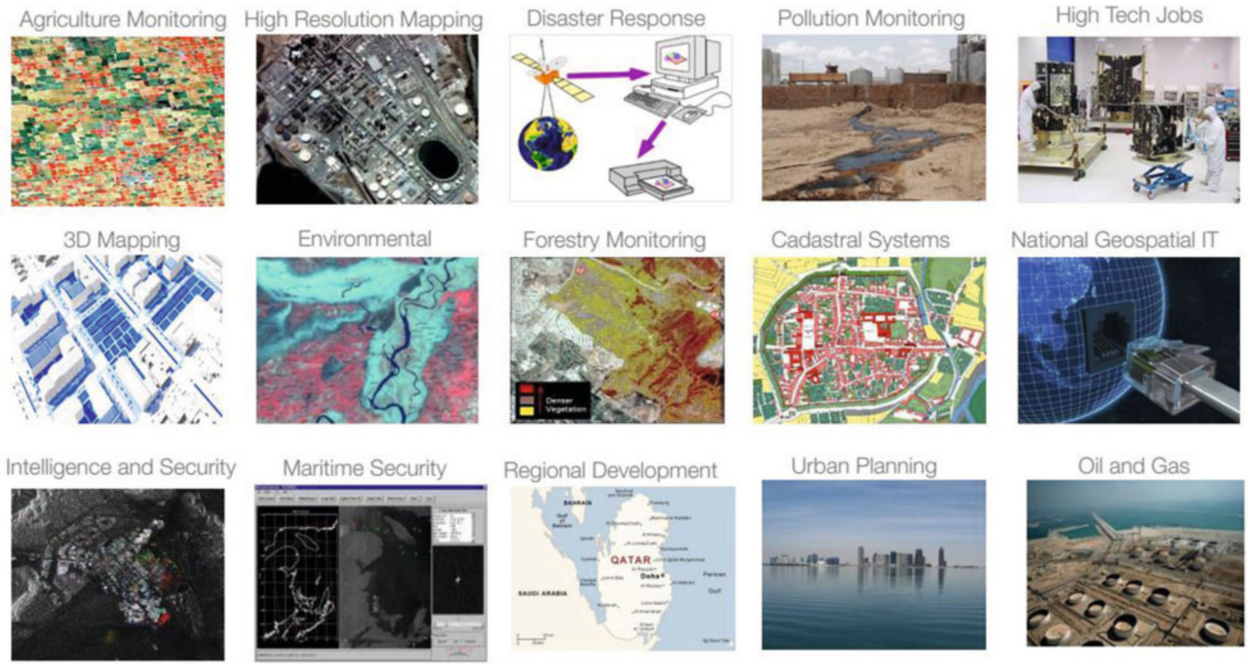


**Figure 4. Applications and Benefits of the Constellation.**

The Constellation will also serve as a platform for advancing the research and development of a host of new applications and services. The combination of on-board processing capability, flexible and highly-configurable Optical and SAR sensor acquisition modes, and rapid data delivery will be used to support experiments involving novel acquisition geometries and imagery exploitation, and reducing latency in the delivery of actionable information to end users.

Just a small subset of the potential application areas that are currently being explored are:

**Maritime Surveillance:** The SAR and Optical sensors could be used in a cross-cueing scenario. The leading SAR sensor would scan the ocean, the on-board processor would perform real-time ship detection and the leading Optical sensor would be commanded to acquire very high resolution images of selected ships for positive identification and detection of any pollution discharges. Only the OTH-Gold (Over-The-Horizon) messages, together with their corresponding image chips from both the SAR and Optical sensor, would then need to be downlinked with no additional ground processing required.

**Oil Spill Tracking:** The X-band SAR provides superior oil-to-sea contrast. The fully polarimetric L-band SAR combined with Optical data provides oil classification in terms of its makeup (plant or mineral) and thickness.

**Camouflage Detection:** The penetration capabilities of the SAR sensor would be exploited to detect vehicles or other manmade structures hidden beneath natural or artificial foliage. When the Optical sensor fails to detect the same vehicles or structures, this indicates a likely camouflage situation.

**Decoy Detection:** The material classification capabilities of the SAR sensor would be exploited to differentiate real vehicles from wood, paper or plastic decoys that can easily fool an Optical sensor.

**Disturbed Earth Detection:** The penetration capabilities of the SAR sensor would be exploited to detect changes to the soil. When the Optical sensor fails to detect the same disturbances, this indicates a likely recent change.

**Port Monitoring:** The SAR and Optical sensors would be used to count shipping containers and determine stockpile volumes.

**Car Counting:** The SAR sensor would be used to count parked vehicles located around factories, shopping malls, gathering places and transportation hubs. The medium inclined orbit would be exploited to yield car counts at constantly changing times of day, enabling monitoring of worker shifts, determining peak shopping times and tracking commuter levels.

The applications above are just a snippet of a range of new, exciting and even undiscovered potential from the Constellation.

It's clear that the innovation and applications of the Constellation are considerable, but what does it really take to design a constellation of such complexity? The following section will describe the approach needed to design this constellation at low cost and low risk but which, most importantly, doesn't sacrifice performance.

## THE ORIGINAL 'NEW SPACE' WAY

Over the past decade, the space industry has seen a spike in the number of 'New Space' companies. These companies employ an approach that aims to make access to space affordable through innovation and flexibility and in recent times, miniaturisation. So with the challenging requirements of the Constellation, and an emerging, ambitious company in UrtheCast, why not exploit the 'New Space' approach? What makes SSTL and the company's established approach ideal for implementing this mission?

Within the environment of numerous new companies operating in the 'New Space' arena SSTL continues to successfully put into practise the approach that has made it the world leading provider of low cost satellite systems for over 30 years. These practices result in low cost missions built to time and schedule but which, most importantly, focus on delivering the key mission objectives. This is in contrast to the 'New Space' approach where the focus on reducing costs may result in a mission performance that is severely compromised.

The UrtheCast Constellation calls for a mission that is quality-centric, but with an approach that ensures the cost, schedule and risk is minimised. The SSTL approach is a successful combination of management, technical and operational elements developed specifically to allow the company to supply low cost space missions rapidly and without sacrificing quality. SSTL is well known for the considered application of advanced COTS technology to its satellites and indeed this is one of the key elements of its success. Another key element to SSTL's achievements has been the focus of projects on identifying and meeting key operational objectives. Secondary 'nice-to-have' objectives and derived requirements are managed closely to keep the project within timescale and budget. This involves closely working with customers to determine their key criteria for a successful mission – an approach which has been demonstrated through the close working relationship to date between SSTL and UrtheCast in designing the proposed constellation of Earth observation satellites. This requirements management approach ensures that the final mission design results in a useful performance whilst concurrently optimising important factors such as system mass, size, manufacturing timescales and cost. This is opposed to the 'New Space' approach which is following a trend that looks to minimise mass and size, but limits the useful performance obtained as a result.

The ability to manufacture satellite missions in short timescales also allows SSTL to frequently launch missions, proving its technologies and techniques in orbit and providing flight heritage for future missions. This will help to reduce both the development time and the risk involved when dealing with a constellation of this scale with several new and innovative technologies.

SSTL is both vertically and horizontally integrated, executing missions from pre-feasibility studies to in-orbit operations, and manufacturing systems from the component level upwards. In addition, although each project draws on expertise from throughout the company as needed, SSTL's space systems are designed by integrated teams, consisting of a full-time project manager and a dedicated 'core team' of project engineers and assistants, providing a foundation for project activities. This results in well-informed and flexible trade-offs between system, subsystem and equipment level design decisions. Operating in this way, SSTL can reduce levels of equipment-level qualification, formal documentation and quantitative reliability analysis, replacing them with system-level validation, strong internal communications and demonstrated in-orbit heritage, enabling the company to deliver the high-quality product that is required for the Constellation at a low price.

To support the practices discussed earlier, SSTL has a rigorous systems engineering process which has been employed in over 40 missions to date and ensures that the system it is supplying will meet the mission objectives, including the desired availability and lifetime.

To start with, each new mission is managed as an evolution from a previous, existing mission – the so called 'heritage baseline' approach; every SSTL satellite mission since UoSAT-2 (1984) has been derived from a preceding SSTL mission through a controlled process of changes with each mission representing an evolutionary step. Put simply, the heritage baseline meets certain operational requirements in a certain environment, and the goal of the new project is to extend it to meet new operational requirements in a new environment. This is a fundamentally different task from designing a new product from the ground-up to meet the new requirements and results in substantial cost and time savings. For example, although the operating environment for the Constellation is relatively new (i.e. a very low altitude, high drag orbit), SSTL is still able to utilise the 'heritage baseline' approach for both the Optical and SAR spacecraft, implementing modifications where deemed necessary (e.g. a high delta-V propulsion system).

Changes in requirements between the previous mission and the new mission are identified and risks arising from these requirement changes are carefully managed. Analytical or physical validation of existing designs minimises new developments and where new developments are necessary, they adhere to SSTL's proven methods.

SSTL also employs timely and thorough testing to provide the greatest level of product assurance possible within the constraints of each project. SSTL's testing approach focuses testing where it counts most – reducing key risks early in the project, then verifying and validating performance at system level prior to launch.

SSTL tests each item of equipment following manufacture in order to exercise interfaces and verify functionality and key operating parameters prior to system integration. SSTL's assembly, integration and validation (AIV) phase covers an extensive period of functional, verification and validation tests spanning the equipment, subsystem and system levels. As equipment units are brought together to form the integrated system, they are tested individually, in groups, and ultimately as a complete system. This period of integration and testing verifies interface and subsystem functions. The AIV phase also provides an opportunity for a mission-level end-to-end test involving the ground segment hardware and software interacting with the space-segment in a meaningful (yet affordable) dress rehearsal for in-orbit operations. This greatly reduces and optimises the time spent getting the spacecraft to a fully operational state once in orbit – a big advantage especially when considering the size of the constellation. Following AIV, the spacecraft undergoes system-level Environmental Testing (EVT), SSTL's final and most important source of pre-launch quality assurance.

In order to reliably ensure that the mission objectives are met for a specified lifetime, the SSTL approach focuses on providing system robustness, for example, through the use of redundancy. For most SSTL missions, including the Constellation, a high degree of cold parallel redundancy is employed – sometimes utilising equipment of different designs to avoid systematic failures. In addition, SSTL's previous missions provide invaluable knowledge for reliability enhancement with experience from missions in orbit fed back directly to all product teams. SSTL also aims for a safe system and mission design; in which transient events (e.g. radiation-induced upset) or temporary upsets to maintainable systems do not cascade to cause loss of mission or decreased lifetime.

The SSTL approach has been successfully demonstrated in the 43 missions it has launched to date and will continue to be the corner stone in the development of the UrtheCast system ensuring that the SSTL-UrtheCast partnership derives maximum utility from its ambitious and exciting planned constellation of Optical and SAR satellites.

**STRATEGIC PARTNERSHIP**

The annual turnover of the UK space industry is currently £11 billion, employing over 37,000 people[2]. A target has been set for this to reach £40 billion per annum by 2030. There are several different initiatives and recommendations on how to reach this target, including a big drive to improve competence and innovation in the downstream applications sector, an improvement of the core knowledge base for the future engineers and entrepreneurial business leaders and a significant strengthening of the UK's export activities both upstream and downstream.

The space industry is arguably at its most exciting phase ever, with the 'New Space' age pushing public demand and perception to an all-time high. With the USA currently at the forefront of capitalising on the 'New Space' demand, providing constellations that deliver affordable access to space, there is a view that the UK has remained stagnant, not profiting from this newfound interest through export opportunities.

The announcement earlier this year that SSTL is to team with UrtheCast as the implementation partner for the Constellation mission clearly highlights that this is in fact not the case. This announcement followed over a year of close co-operation between the SSTL and UrtheCast teams to design the high performance low Earth orbiting platforms that will fulfil the ambitious requirements of the UrtheCast Constellation mission.

For over 30 years, the UK industry has shown adaptability and capability to meet consumer demands and to lower costs (i.e. the original ‘New Space’ approach) for many Earth observation missions. This has led to the UK gaining a formidable reputation in the upstream space sector, leading the advancement and export of satellite technology. The partnership and the resulting Constellation is proof that the UK has been actively pursuing commercial export opportunities in the ‘New Space’ domain and further enhances the UK’s status as a hub for Earth observation excellence. It is hoped that this will demonstrate and improve the perception of the UK as a world leader in space innovation and low cost, high performance satellites, stimulating economic growth in the UK space sector by capitalising on the ‘New Space’ demand.

## CONCLUSIONS

The 16-satellite UrtheCast SAR and Optical Constellation clearly offers an Earth observation capability unrivalled in the industry. The benefits gained from the individual performance of each satellite and the novel concept of operations are wide-spanning and include significant improvements to monitoring, change detection, situational awareness and activity characterisation capabilities as compared to traditional space-based remote sensing systems.

The advantages of SAR sensors are well known, providing reliable image acquisition at any time of day or night, and any weather conditions. It is therefore possible to guarantee, as a minimum, a SAR image in case the Optical image is not adequately illuminated by the Sun. Another advantage of SAR is that it provides texture and roughness information that characterises the scene content.

The advantages of Optical sensors are equally well known, where the spectral information provides easy to interpret and classify imagery. With a rich set of imagery and metadata acquired over a longer dwell time, accurate 3D model reconstruction and motion vector analysis of the scene is possible. Furthermore, this information is useful in generating accurate and higher-value products.

The Constellation will give much greater context regarding the nature of the location and activities being viewed. Rather than just seeing static numbers of people, vehicles or marine traffic within the targeted area, imagery analysts can better detect temporal patterns and assess their significance in the context of the scene which, with the combination of both planes, enables them do so in a time frame that matters to people.

In short, the Constellation exemplifies the old adage of “one plus one equals three” by combining the best of both Optical and SAR sensors yielding more than can be achieved from either sensor alone.

By choosing SSTL as the strategic implementation partner of the mission, UrtheCast can exploit the low cost satellite systems approach pioneered by the company, without the need to sacrifice performance. This partnership highlights and acknowledges the formidable reputation of the UK space industry, stimulating economic growth by encouraging involvement in the exciting ‘New Space’ age.

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