

# The business case for Global Visioning Systems

The FleetSAR Constellation

National Space Conference 2023



**GLOBAL VISIONING SYSTEMS**



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**FleetSAR is a Synthetic Aperture Radar  
Satellite Constellation digital infrastructure  
project to develop next generation space  
systems.**

EARTH OBSERVATION REDEFINED AS  
**GLOBAL VISIONING**



# Public Private Partnership for project development

Currently South Africa is reliant on international satellites for data about its 1.2-million km<sup>2</sup> territory, excluding its oceans. Reliance on foreign satellites also means that South African satellite-data users have no control over what images they are sent, what the images focus on and when they will get them.

The FleetSAR Project is focused on a Greenfields project that intends to design, manufacture, launch and operate a fleet of 12 small satellites in low earth orbit around the earth.

Fleetsar will add not only to the country's ability to monitor its oceans, agriculture, industry and human settlements, but also many other African countries across the continent, enabling South Africa to participate in the lucrative commercial satellite economy. This project will be a wholly owned South African project that will service local, regional and international customers.

## FleetSAR Economic Highlights

Project value	USD 840 000 000
Capex	USD 345 000 000
NPV	USD 210 000 000
IRR	15.93
Initial direct jobs created	50
Potential indirect jobs	200
High socio-economic impact	

# Institutional arrangement

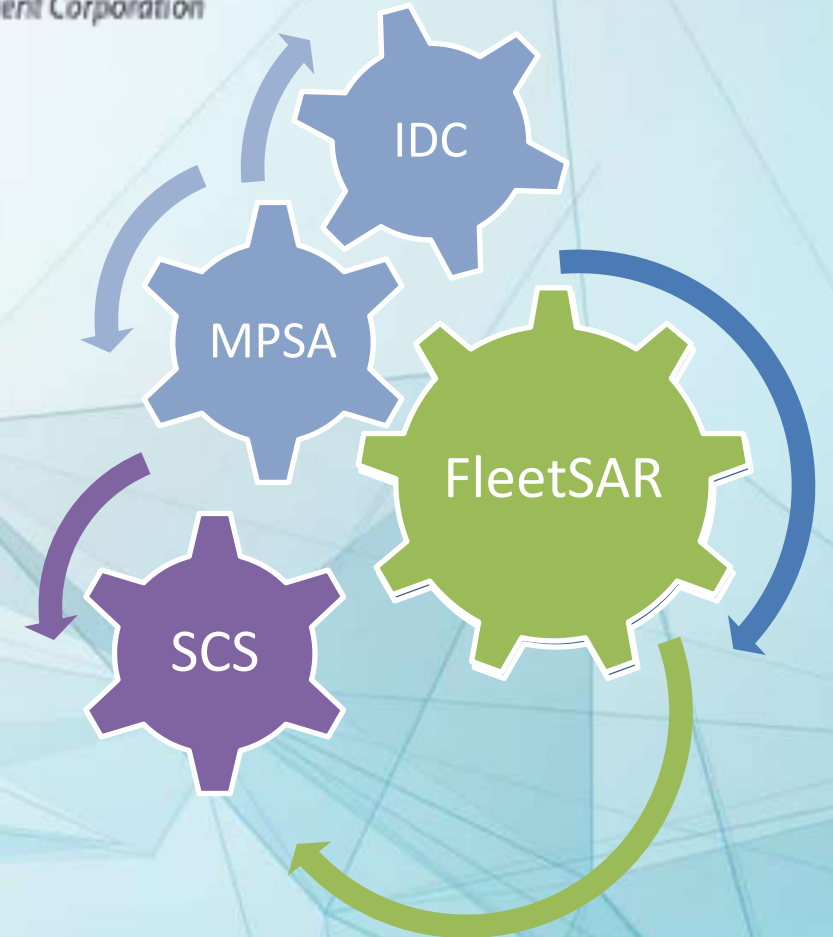
The Project is in development phase.

The co-development parties are

- MPSA Space Infrastructure
- Space Commercial Services Holdings
- Industrial Development Corporation of South Africa

Parties are invited to join as co-developers and/or funding partners who participate in the revenue opportunity.

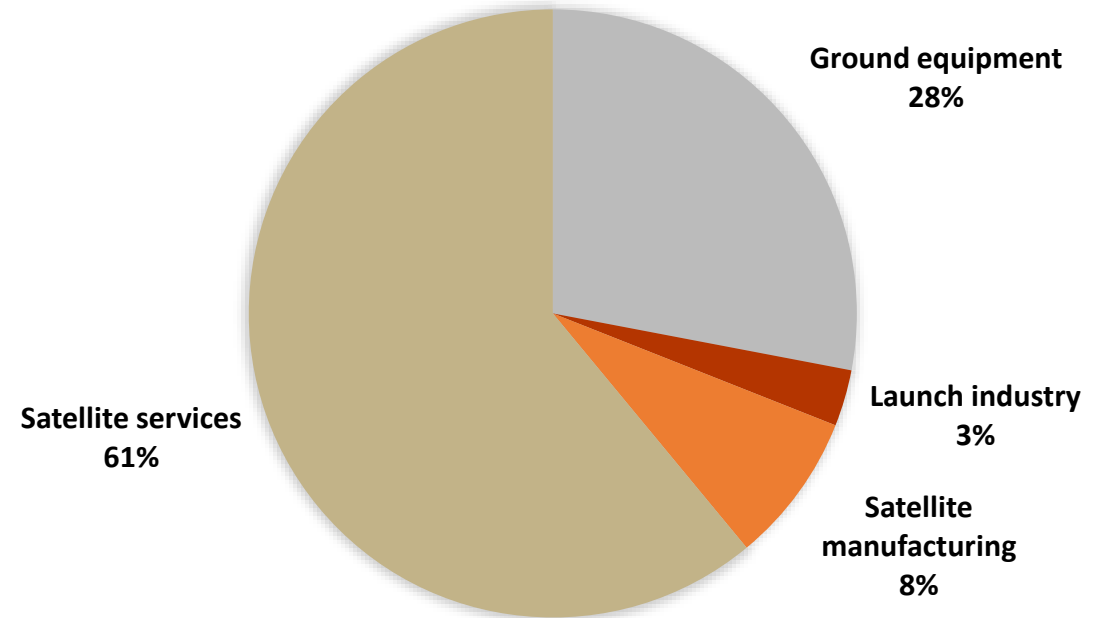
The model also ensures sustainability in ensuring that the high level skills and expertise are retained within the project. A focus of the project is to transfer and develop skills within this niche sector.



# Market Analysis

<b>Manufacturing p.a</b>	<b>USD 14.1 BN</b>
Defense	USD 4.7 BN
Communications	USD 7.5 BN
Navigation	USD 0.6 BN
Scientific	USD 1.3 BN
Commercial	Undefined
<b>Potential market growth in 2021</b>	<b>USD 3.0 BN</b>
Manufacturing	15%
Additional services	75%
<b>Additional services</b>	
Non recurring development	5%
Constellation Management	20%
Launch advisory	30%
Data management	15%
Other - commercial	Undefined

## MARKET \*USD 200 BN



\*Satellite Industry association, State of the satellite industry report 2016  
<http://www.sia.org/wp-content/uploads/2016/06/SSIR16-Pdf-Copy-for-Website-Compressed.pdf>



# Ecosystemic models



## Satellite Manufacturing

Advanced components

## Launch and Operations

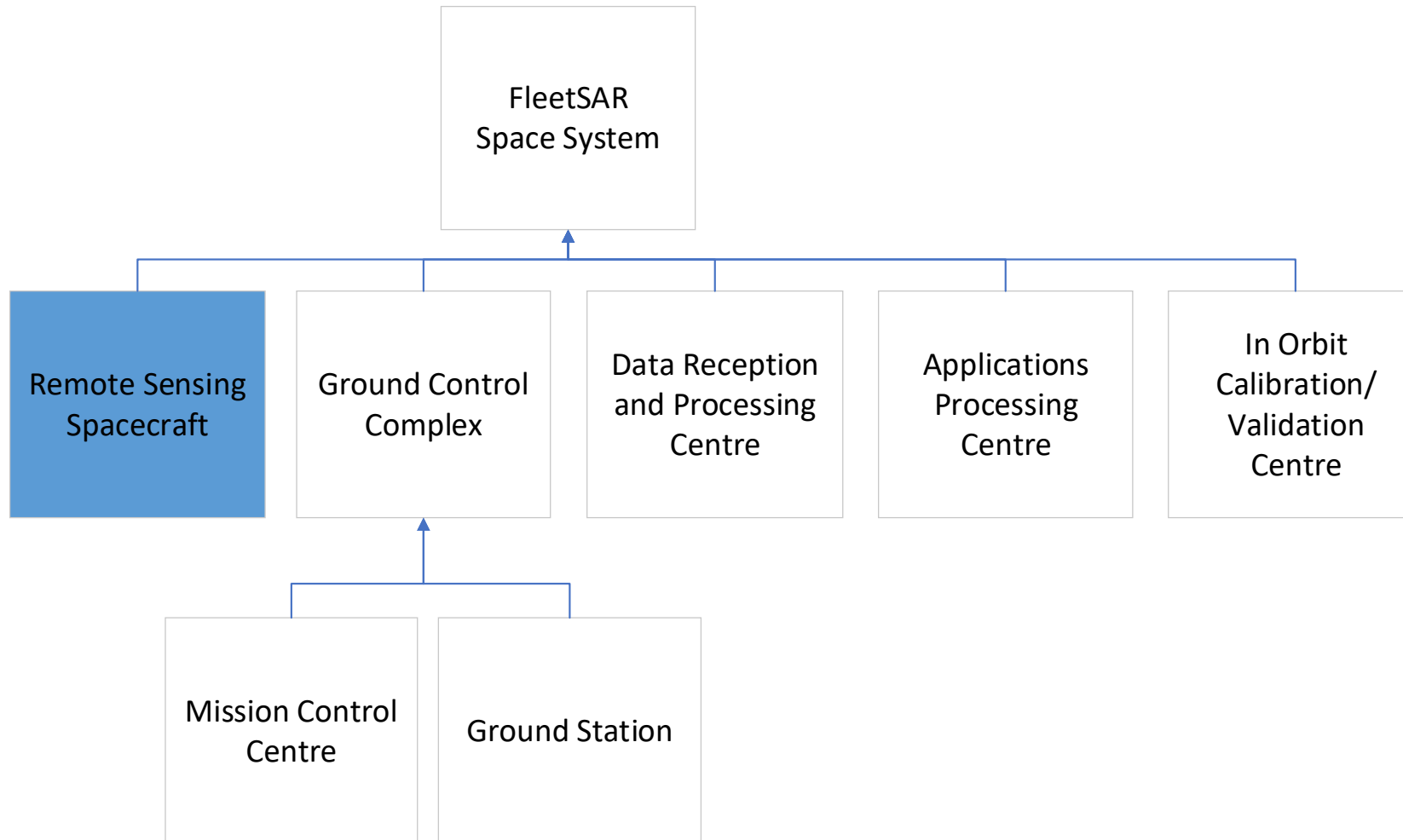
Launch Advisory

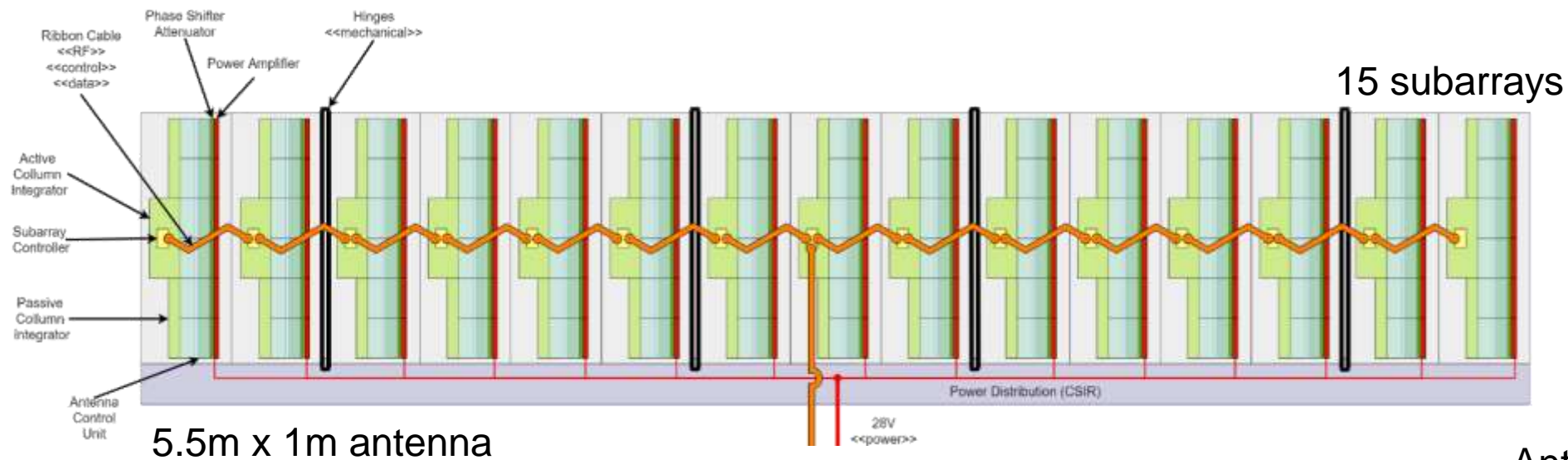
Constellation operations and management

## Services

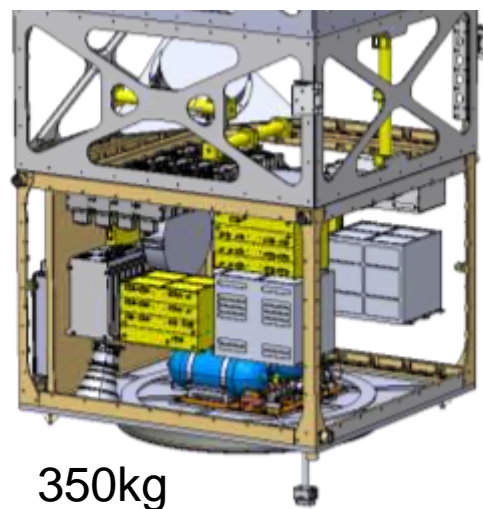
Data delivery  
Information products

# System Infrastructure

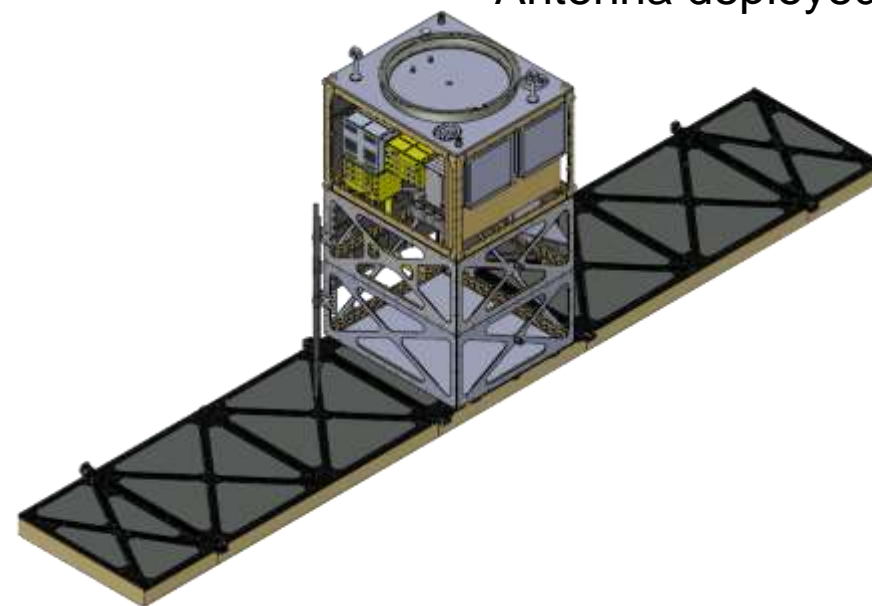




Stowed for launch



350kg



Antenna deployed

## DEMAND FOR EARTH OBSERVATION SOLUTIONS

# DATA REQUIREMENTS BY SECTOR

### RELATIVE DATA USE BY SECTOR

	High Use
	Moderate Use
	Low/No Use

	SCIENTIFIC FOCUS DATA	HIGH-MOD. RES. OPTICAL	VHR OPTICAL	SAR	HYPERSENSITIVE (POTENTIAL)
<b>DEFENSE</b>					
<b>NATURAL RESOURCE MON.</b>					
<b>ENERGY</b>					
<b>ENGINEERING/INFRASTRUCTURE</b>					
<b>LBS (POTENTIAL)</b>					
<b>FINANCE (POTENTIAL)</b>					
<b>MARITIME</b>					
<b>DISASTER MANAGEMENT</b>					
<b>ENVIRONMENT MONITORING</b>					

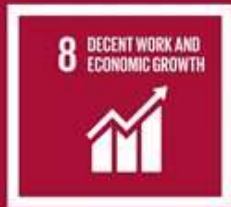


# SUSTAINABLE DEVELOPMENT GOALS

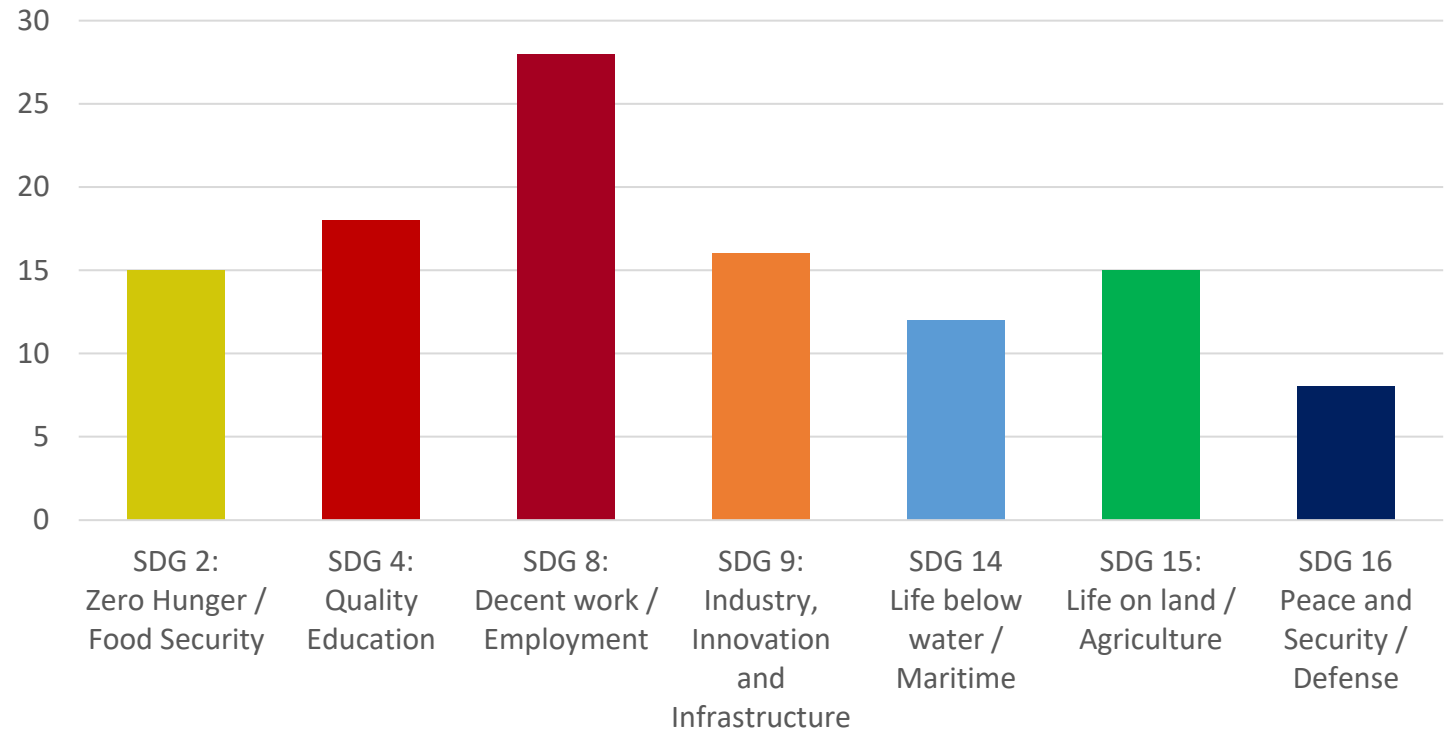




# Sustainable Development

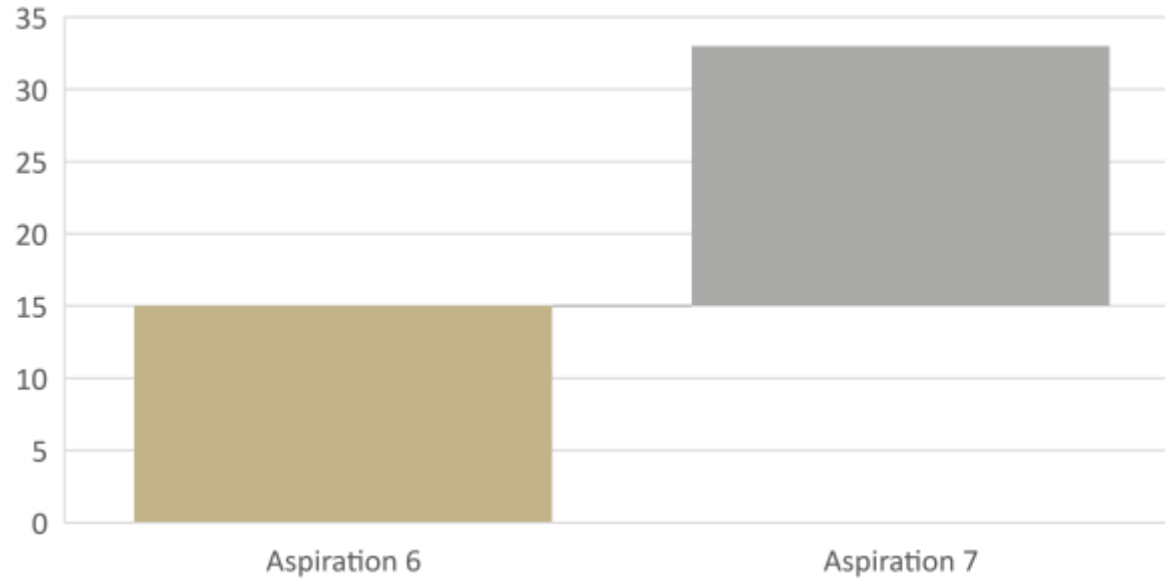


**Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all**



# Agenda 2063

The Africa we Want



**ASPIRATION 6:** An Africa whose development is people-driven, relying on the potential of African people, especially its women and youth, and caring for children

**ASPIRATION 7:** Africa as a strong, united and influential global player and partner

REQUIREMENTS								
Sub-Segments	Optical	Radar	GSD <1m	GSD 1-5m	GSD >5m	Archive	Revisit/ Low Latency	3D
Precision Agriculture	High	Med	High	Med	Low	Low	High	Med
Agricultural Policies	High	Low	Med	High	High	Med	Low	Low
Food Security	Med	Med	Low	Low	High	High	Low	Low
Forestry	Med	High	High	Med	High	Med	Low	Med
Water Mgmt.	Med	Med	Med	Med	High	Low	Low	Med

High
Med
Low

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REQUIREMENTS									
Sub-Segments	Optical	Radar	GSD <1m	GSD 1-5m	GSD >5m	High Revisit	Archive	Low Latency	3D
Monitoring Activities	High	High	High	Med	Low	High	Low	High	Med
Mission Planning	High	High	High	Med	Low	High	Low	High	Med
Border Monitoring	High	High	High	Med	Low	High	Low	High	Med

High
Med
Low

REQUIREMENTS								
Sub-Segments	Optical	Radar	GSD <1m	GSD 1-5m	GSD >5m	Archive	Revisit/ Low Latency	3D
Sea state/ sea ice monitoring	Med	High	Med	Med	High	Low	Med	Low
Integrated Coastal Zone Monitoring	High	Low	Low	Low	High	Med	Low	Low
Pollution	Low	High	Med	High	High	Low	Med	Low
Ship Detection and Tracking	Low	High	High	High	High	Low	High	Low

High
Med
Low

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DEMAND FOR EARTH OBSERVATION SOLUTIONS

**DATA REQUIREMENTS BY KEY APPLICATIONS**

APPLICATION DOMAIN	PRIMARY SATELLITE DATA REQUIREMENTS				TYPES OF DATA SOURCES
	RADAR	OPTICAL	POTENTIAL HYPERSPECTRAL	REVISIT	
<b>DEFENSE</b>	High-resolution data, with the benefit of all-weather day/night imaging plus high-accuracy DTM (DTED2 and DTED3 levels coming soon)	Requires very high-resolution data (<1 m), high-accuracy and pan/multispectral data for IMINT, plus high-accuracy DTM (DTED2 on a large scale and DTED3 in strategic fields)	<i>Combined with higher-resolution (&lt;10 m) data, hyperspectral can develop solutions to improve land classifications. Band range in the SWIR to detect camouflaged objects.</i>	Very frequent revisits required for numerous situation-monitoring applications	High- and very high-resolution commercial data or data collected by proprietary systems
<b>NATURAL RESOURCES MANAGEMENT</b>	Radar imaging for surface texture/water content used in land applications, including geology and agriculture; high-resolution radar complements optical data; creation of topographic maps using InSAR and 3D modeling	Mid-resolution (20-30 m) data will suffice for infrared bands in a range of applications, such as wide-area agriculture; high-resolution data used in precision agriculture and forest mapping; DEM/DTM used to estimate biomass	<i>Data in red-edge, SWIR for monitoring chemical/biophysical properties. Use in forestry/agriculture for invasive species detection/monitoring</i>	Lower revisit times required for monitoring applications, being able to monitor in specific windows, such as planting season to harvest	Mostly low-cost moderate- and high-resolution data; in some cases, high-resolution commercial data are used for precise mapping
<b>ENERGY, UTILITIES AND MINING</b>	Medium- to high-resolution radar data utilized in offshore seep monitoring, in combination with optical data for geological mapping; InSAR used to measure subsidence	Very high-resolution data for infrastructure monitoring and logistics; low-cost, moderate resolutions solutions for wide-area geological mapping; DEMs for geology and infrastructure	<i>Data along the visible, NIR and SWIR wavelengths to capture details (surface topography, rare minerals)</i>	Ranging from recent/near real time for monitoring; archive data will suffice for geological mapping	Very high-resolution commercial data; low-cost moderate- or high-resolution data
<b>INFRASTRUCTURE AND ENGINEERING</b>	Used for DEMs and assessing subsidence using InSAR, which could impact the stability of infrastructure	Very high-resolution data enhances details, particularly in urban areas; wider-scale projects can make do with lower resolution and increased swaths	<i>Detect pipeline leakages through alteration minerals, improved land cover classifications</i>	Medium (2 weeks-monthly) revisits required for regular monitoring; time series from archives for land change	High-resolution data for detailed projects; lower-cost/resolution for wider-area projects



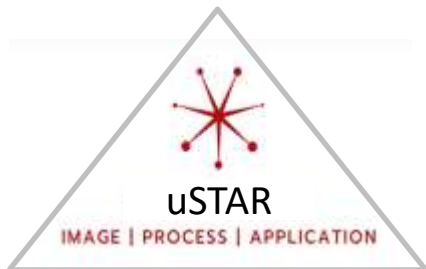
DEMAND FOR EARTH OBSERVATION SOLUTIONS  
**DATA REQUIREMENTS BY KEY APPLICATIONS**

APPLICATION DOMAIN	PRIMARY SATELLITE DATA REQUIREMENTS				TYPES OF DATA SOURCES
	RADAR	OPTICAL	POTENTIAL HYPERSPECTRAL	REVISIT	
<b>LOCATION-BASED SERVICES</b>	Limited opportunities at this stage; applications require a more "visual" element, provided by optical data	Very high-resolution optics; bands in at least the visible range.	<i>Limited applications due to a focus on VHR datasets. Crossover into precision agriculture applications.</i>	Refresh rate is the key to defining change detection at high frequencies; key market for new constellation solutions	VHR data; high location accuracy (native or processed) is needed for more precision applications
<b>FINANCE</b>	Focus is more on optical; however, certain applications such as elevation changes in oil storage will use SAR. Companies like Ursa specifically focus in this area	Very high-resolution optics; bands in at least the visible range.	<i>Expected to be limited at this stage. Most applications do not call for greater spectral ranges.</i>	Refresh rate is key to defining change detection at high frequencies; key market for new constellation solutions	VHR data; receiving information as soon as possible requires low latency and high revisit
<b>MARITIME OPERATIONS</b>	Medium- to high-resolution data used in sea ice detection; higher resolutions used for ship tracking and marine transport	Algal bloom monitoring using low- to medium-resolution data; data used in fishing industry and coastal zones for environmental purposes	<i>Data requirements for greater delineation along the red edge (detailing ocean color and algal blooms), high-resolution data for maritime monitoring</i>	High revisit times required for ship tracking; less of an issue for algal bloom monitoring	Low-cost, moderate-resolution data; high-cost commercial data at higher resolution
<b>DISASTER MANAGEMENT</b>	Higher resolution preferred, which is a key element in flood monitoring/mapping given the likely cloud cover and ability to measure the extent of good water	Higher resolutions preferred in areas such as logistical support and crisis mapping	<i>Data in VNIR, SWIR with high spectral/spatial resolution and high dynamic range for emergency response and fire risk assessment; potential usage in monitoring invasive species</i>	Higher revisit times are better; responsiveness is a key issue; a number of applications require regular mapping	High-resolution commercial data and data acquired through the International Charter
<b>ENVIRONMENT MONITORING</b>	Ocean current modeling and tidal information, ocean forecasts with radar altimetry and surface feature discrimination for land-use applications	Range of instruments for atmospheric analysis; the specific instruments depend on the application area, e.g., global land/ocean monitoring	<i>Greater spectral resolution required, in particular to support vegetation monitoring (global forestry monitoring, food security)</i>	Daily revisits for operational services (such as meteorology, air quality); otherwise, time is less of a constraint	Specific science-oriented civil government systems; low-cost commercial and government data



# SCS SPACE FOCUS AREAS

## CONSTELLATIONS AND MISSIONS PARTNER



## ENGINEERING SERVICES

**Procurement Management (Level 5 to Level 8)**

**Program Management**

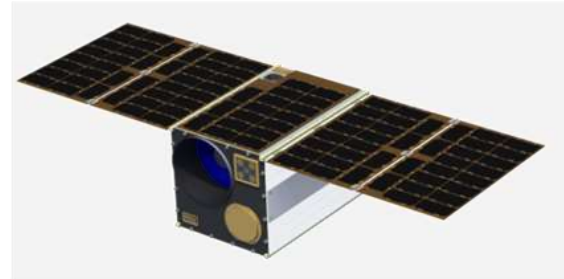
**Space System Engineering**

**Product Assurance**

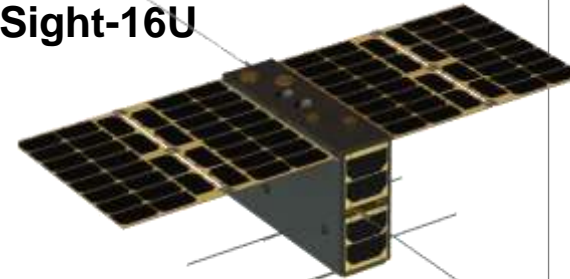
**Technology Management**



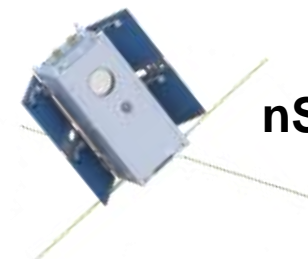
## NANO SATELLITES



**NSight-16U**



**nSight-6U**



**nSight-1**

## HANDS ON TRAINING

**Mission Analysis and Design**

**Space System Engineering**

**Theory and Practice designing and building 2U, 3U and 6U satellites**

**Establish own space engineering laboratory**



# nSight-1 to -3 Project Partners



# Thank You

SCS Aerospace Group,  
Space Commercial Services

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