

The background of the slide is a composite image of space. On the left, the dark, cratered surface of the Moon is visible, with a bright, glowing horizon line. On the right, a bright sun or star is partially obscured by the edge of a planet, creating a lens flare effect. The sky is filled with numerous small, white stars.

SPACEFLIGHT INDUSTRIES

*Enabling access to space
Redefining global intelligence*

Andrew Hanna
VP Sales and Business Development
andrewh@spaceflightindustries.com

Spaceflight Industries – Proprietary and Copyright Material

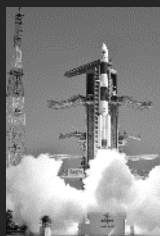
Spaceflight Industries

Unique Eco-System of the New Space Value Chain

Spaceflight Industries Inc.



Launch Services



Small Satellite Design & Manufacturing



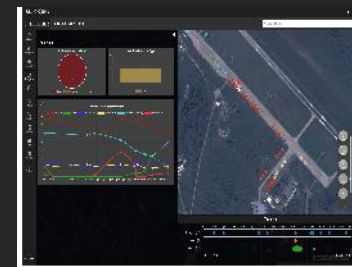
Global Satellite Mission Operations



High Revisit EO Satellite Constellation



Geospatial Data and Analytics



Spaceflight Industries – Proprietary and Copyright Material

Spaceflight Industries

Key Highlights

Spaceflight Industries Inc.



Key Highlights

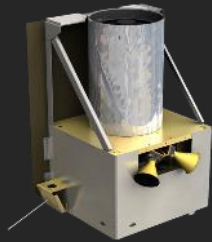
- Founded in 1999
- Headquartered in Herndon, VA
- Space Operations in Seattle, WA
- 150 Employees
- Raised over \$180M

Major Investors

- Mithril Capital Management
- Thales Alenia Space
- RRE Ventures
- Vulcan
- Razor's Edge Ventures

Progress To Date

End to end capabilities in place to deliver high revisit service



Demonstrated On Orbit Optical Satellite
Design, Cost, & Performance
(15 Years of Experience & Proven IP)



Established the Industry's
First and Largest Rideshare
Launch Service



Fully-Financed Manufacture of
24-Satellite Constellation



Own 50% of a Fully Operational
Small Satellite Manufacturing Company
(20 Satellites now in production)

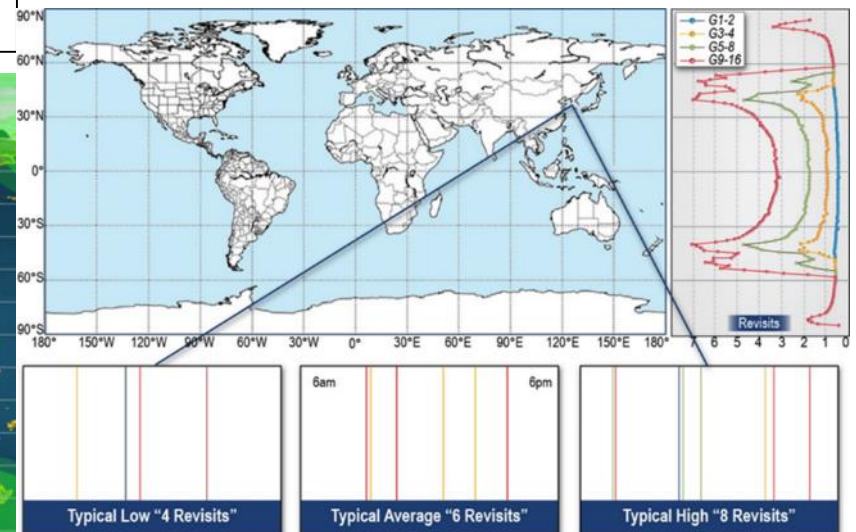
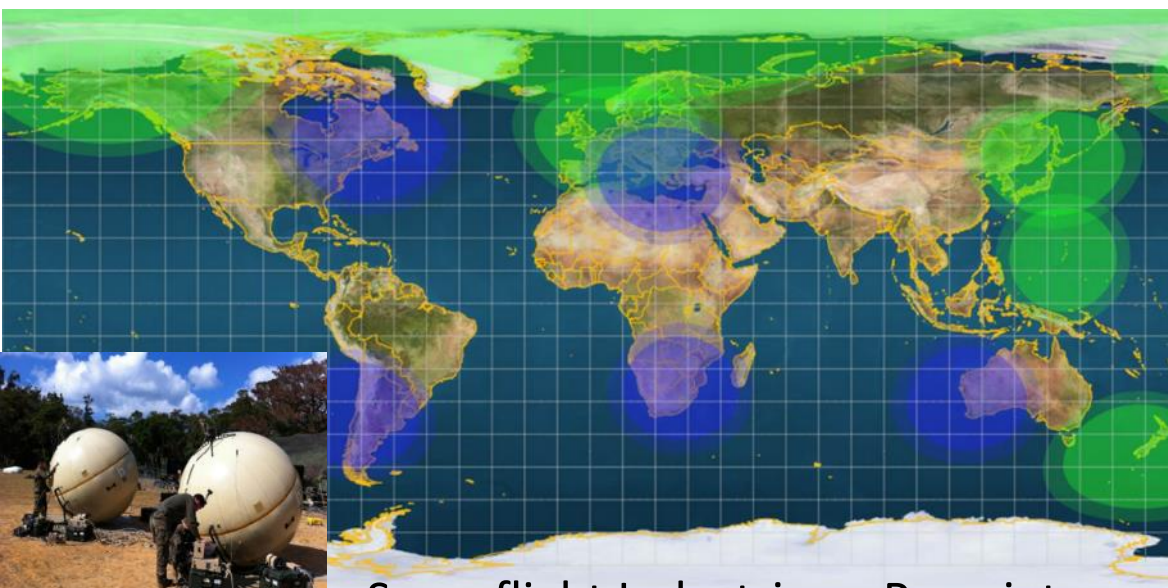
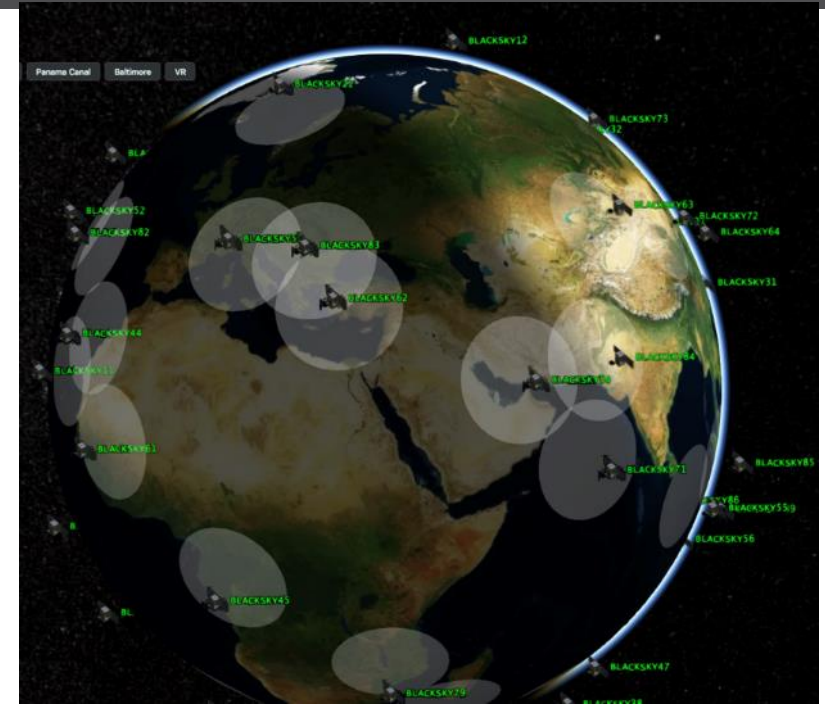


Fully Autonomous Tasking, Processing, and
Global Ground Network in Place

The BlackSky Constellation

Provides Unique Insight Into Global Change

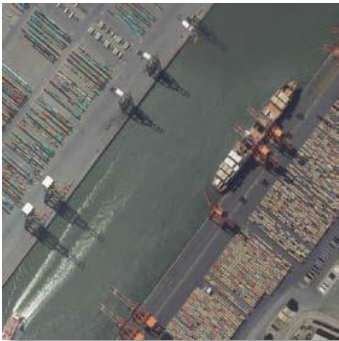
- Commercially funded hi-revisit, 1m resolution, low-cost imagery for global activity & site monitoring
- Combined SSO and phased inclined Orbits (55 to 45 Deg's) to maximize revisit and uniformity
- Responsive, low-latency tasking to data delivery
- Automated collection management operations and image processing
- 4 satellites deployed (Goal 16 by end-2020)



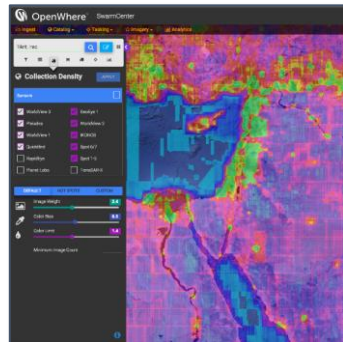
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BlackSky Service Offerings

Imaging Services

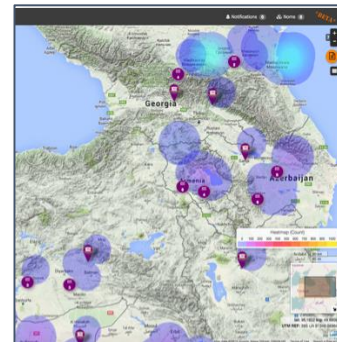


*Imagery
On Demand*

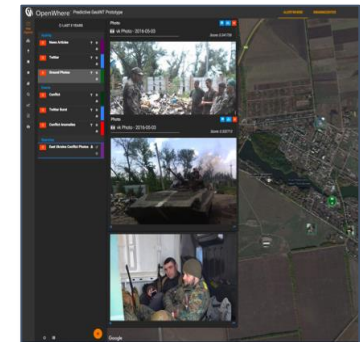


Assured Capacity

Monitoring Services

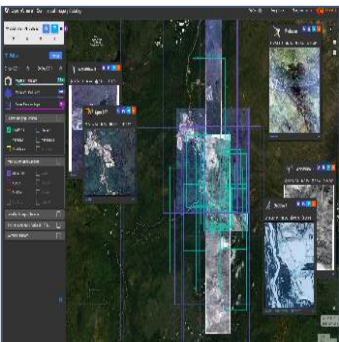


*Activity
Monitoring*



*Site
Monitoring*

Professional Services

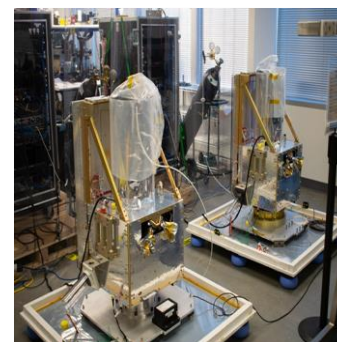


*Training, Collection
Management*



*Custom Platform
Solutions*

Mission Solutions



Satellites



*Ground
Station/Operations*

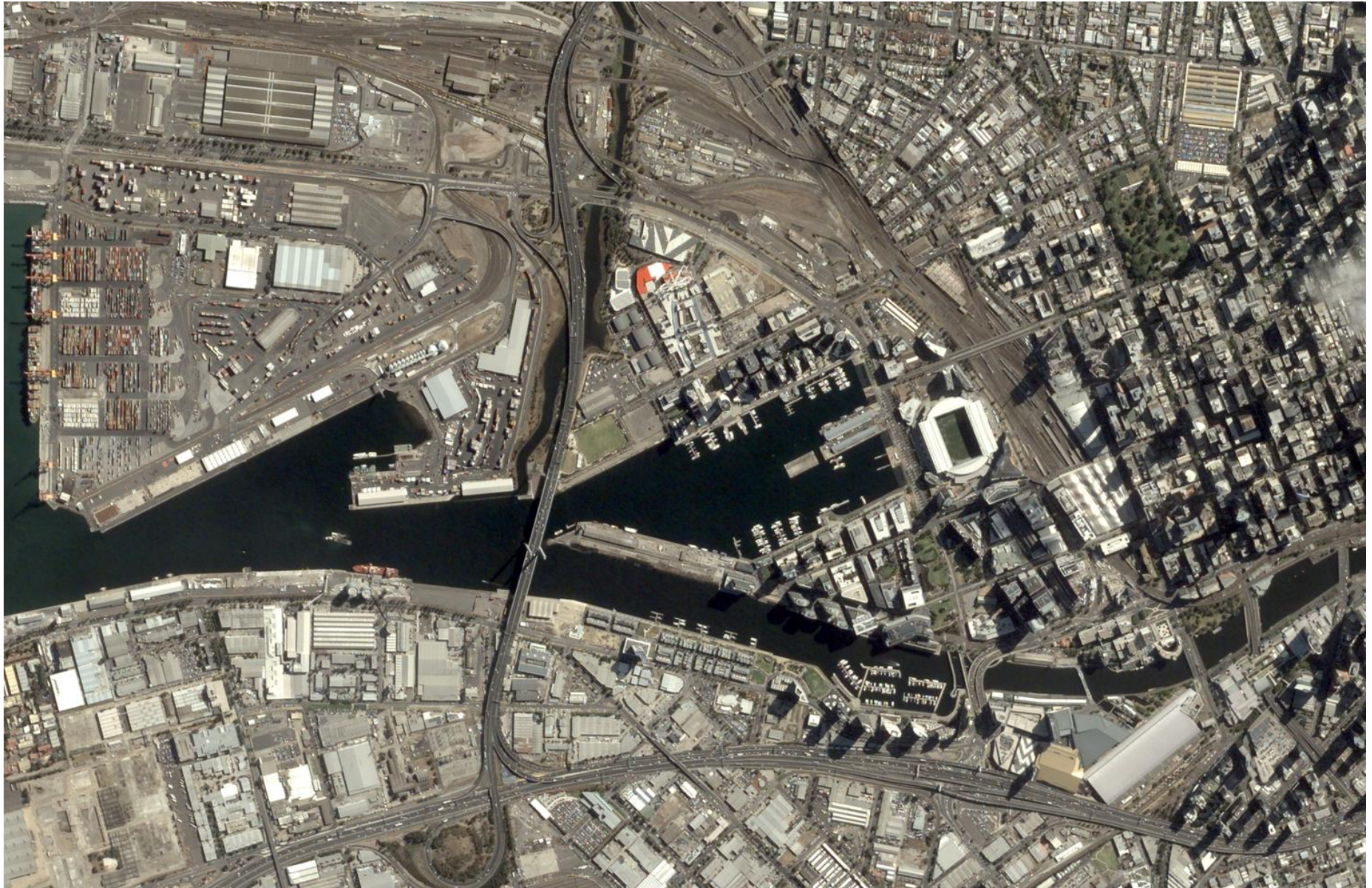
BlackSky

Delivering Timely and Relevant Insights about our Changing World

Continuously Monitor the World to Provide Insights on Events that Matter



Melbourne Harbour, Australia



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BlackSky Monitors Activities... Eventssm

BLACK SKY



Search Channel Titles



PREVIOUS 3 DAYS

Gibraltar Straits Refugees · 7 · [Share] [Star]

Migrant arrivals to Spain so far in 2018 via sea supersede last year's total

07/31/2018

Boats loaded with illegal immigrants caught on camera as they land on Spanish tourist beaches

07/30/2018

Salvage rescue more than 200 people from 20 boats in the Strait

07/29/2018

Spain rescues 123 migrants in the Strait of Gibraltar

07/29/2018

Spain rescues 123 migrants in the Strait of Gibraltar

07/29/2018

211 migrants rescued in the Strait of Gibraltar, between the Morocco and the Spain

07/29/2018

Images of the civil guards seriously injured in the border of Ceuta and which are being hidden to

07/29/2018

BlackSky Natural Disasters · 2360 · [Share] [Star]

Senate averts flood insurance shutdown, but fix is brief

07/31/2018

Climate change can make wildfires spread, but it's not the only factor

07/31/2018

In the southwest of Moscow fire

07/31/2018

Air quality statement remains in effect

07/31/2018

McPhillips Street lanes to be rerouted while water main repairs completed

07/31/2018

Longview crews responding to structure fire

07/31/2018

United States President Trump Declares California Wildfires State of Emergency

07/31/2018

KOMPSAT-3A APEX New Imagery Alerts · 6 · [Share] [Star]

KOMPSAT-3A Imagery over Khāshim Abraq al Habāri, Basra, Iraq

07/30/2018

KOMPSAT-3A Imagery over Muṭayr, Kuwait

07/30/2018

KOMPSAT-3A Imagery over 'Amārat ar Ruqī, Kuwait

07/30/2018

KOMPSAT-3A Imagery over Iraq

07/29/2018

KOMPSAT-3A Imagery over Markaz Hudūd as Salmī, Kuwait

07/29/2018

KOMPSAT-3A Imagery over Kuwait

07/29/2018

Yemen Impact on Saudi oil prices · 9 · [Share] [Star]

"Eden" announces the size and pricing of Internet service subscription packages for mobile

07/31/2018

King Abdullah Petroleum Studies Center holds workshop on oil alternatives

07/31/2018

Red Sea strait 'unrest' barely to affect crude prices: expert

07/30/2018

Øæçéf: raise fuel next month.

07/30/2018

Oil and gas double up barrels of gas rose 40 yuan

07/30/2018

Oil prices on Sunday 29-7-2018

07/29/2018

Khazanah board's resignation not expected to impact local stock market

07/29/2018

BBC Monitoring · 14 · [Share] [Star]

IS French media outfit publishes letter urging support for group

07/31/2018

Highlights from Kosovo press 31 Jul 18

07/31/2018

Over 2,500 displaced Iraqis return to Nineveh

07/31/2018

Ukrainian activist injured in suspected acid attack

07/31/2018

Highlights from Hungarian press 31 Jul 18

07/31/2018

BBCM Watchlist: Key stories 31 July

07/31/2018

N Korea defector group slams South restaurant workers' probe

07/31/2018

Iranian Protests · 19 · [Share] [Star]

Iranian People Continue Their Water Shortage Protest

07/31/2018

Iraq Security Forces Disperse Oil Field Sit-Ins

07/31/2018

Iraq has spent more than \$700 billion oil wealth since 2005

07/31/2018

The arrest of the 13 قانونشکن in Isfahan the police operation villains

07/31/2018

Arabic News-Iraqi security removes the tents of protesters in front of Basra by force

07/31/2018

Iraq says Saudi Arabia to sell it power after protests

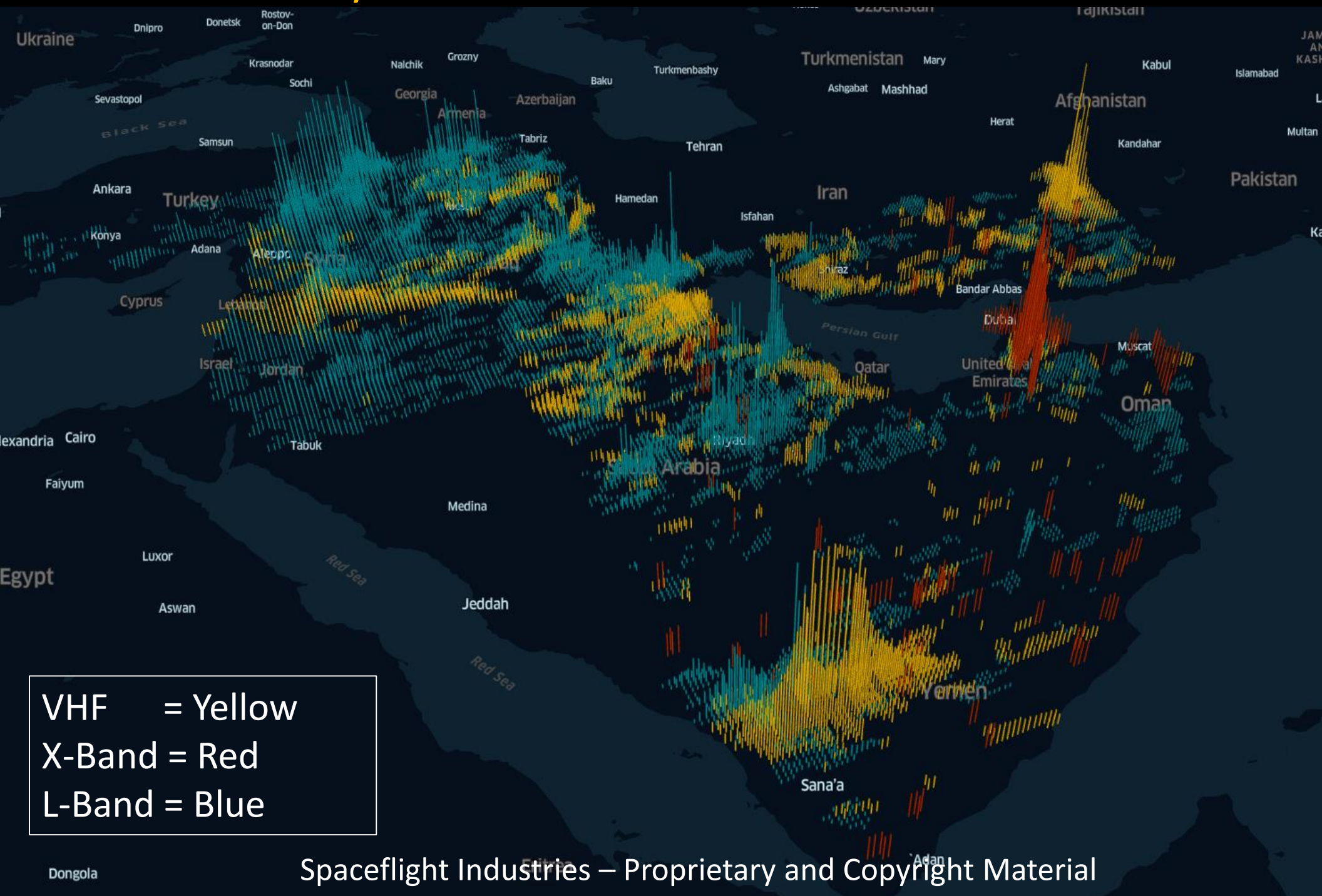
07/31/2018

Strikes cripple Iran after the collapse of the "tomans" authorities struggling folk bang

07/30/2018

Natural Disaster Alerts · 0 · [Share] [Star]

Multiple Frequencies – HawkEye³⁶⁰ Density Plot within BlackSky Eventssm.



BlackSky Collection Recommendation



Events and Observations

- Multi-INT Derivation
- High Confidence Targets
- Natural Disaster
- Military Exercises
- Industrial Accident
- Missile Test Preparations
- Battle Damage Assessment



Asset Recommendation

- Satisfy Constraints
- Temporal
- Spectral Resolution
- Spatial Resolution
- Perspective
- Asset Type

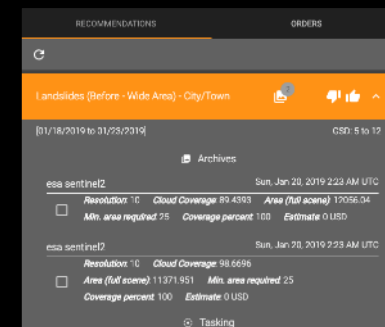
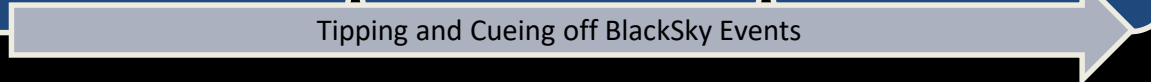


Collection Recommendation

- BlackSky Globals**
- Rapid Revisit
- Low Latency

Virtual Constellation

- Airbus
- SIIS
- Urthecast
- Planet
- TerraSAR



Tasking and Archive



Multi-Sensor Fusion for All-Source Analysis

BLACK SKY

SITE DOSSIER CRIMEAN BRIDGE

Search map

Alerts Imagery Events Analytics Info Photos Tracks Mobile Feasibility Notes Orders Timeline

Events
Associated channel: Kerch Strait


PREVIOUS 90 DAYS

- Senator Kovitidi said that the actions of the ships of Ukraine in the Black Sea contradict the laws
Crimean Bridge, Ukraine
- The UN Security Council considered the actions of the Russian Federation as a provocation in relations with Ukraine
Crimean Bridge, Ukraine
- Russian Navy 'opens fire on Ukrainian navy boat' off Crimea
Crimean Bridge, Ukraine
- Poroshenko says tried to talk to Putin following detention of Ukrainian naval vessels in Kerch Strait, but received no reply from Russia
Kerch Strait, Russia
- Russia and Ukraine reported on the nomination of warships and helicopters in the Kerch Strait
Kerch Strait, Russia
- FSB declares detection of "machine guns and cannons" on ships of Ukrainian navy
Kerch Strait, Russia
- Shareholders of "Dixie" decided to make the company non-public-Vedomosti
Kerch Strait, Russia
- Ukraine Says Russia Seizes Three of Its Ships in Black Sea
Kerch Strait, Russia
- Russian Border Guards in Kerch Strait Fulfilled Duties to Protect Border
Kerch Strait, Russia
- KIEV, Ukraine | Ukraine: Russian jet, copter fired at our boats
Kerch Strait, Russia
- Russian special forces storm three Ukrainian

11 die as ships with Indian, Turkish crews catch fire in Kerch Strait - Pragativadi

01/21/2019 (Updated 01/22/2019) Kerch Strait, Russia

Energy	Confidence	Location Certainty	GeoPrecision	Data Sources	Correlated Events
⚡	5	6	7	30	3
⚡	Medium (5)	Medium (6)	Neighborhood (7)		



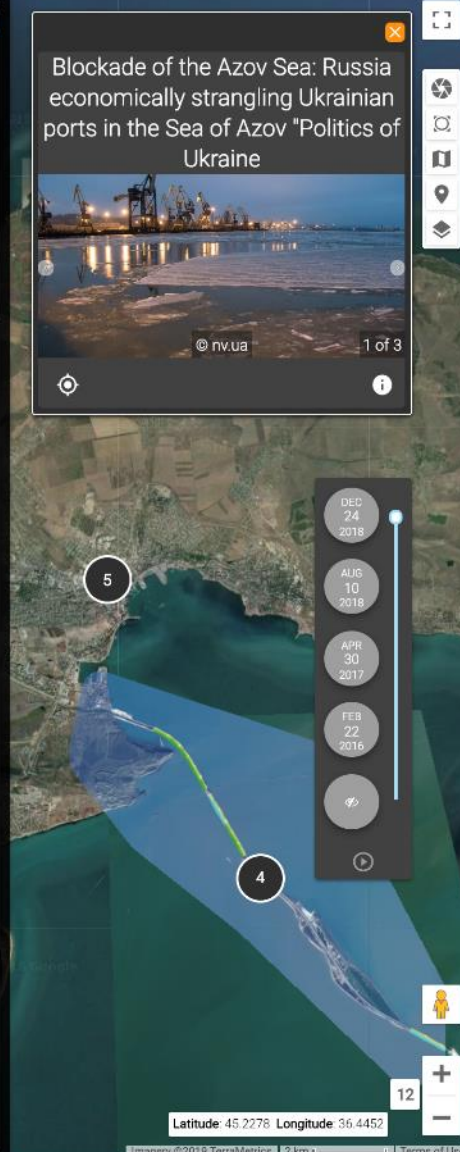
© swarajyamag.com 11 of 14

Moscow [Russia], Jan 22 (ANI): Eleven people died after two liquefied natural gas (LNG) tankers, bearing Tanzania's flag, in the Kerch Strait caught fire on Monday. Most of the surviving crew members saved their lives by jumping into the sea. Sailors from India and Turkey were on board the vessels when the incident occurred. (ANI) Around seven vessels were on scene as part of rescue efforts. There is no data on the remaining sailors as of yet. Moscow [Russia], Jan 22 (ANI): Nine people are missing in the fire that broke on board two liquefied natural gas (LNG) vessels in the Kerch Strait.

Summary Copyright:

- russiaherald.com
- africaleader.com
- indiagzette.com
- bignewsnetwork.com

Blockade of the Azov Sea: Russia economically strangling Ukrainian ports in the Sea of Azov "Politics of Ukraine"



Latitude: 45.2278 Longitude: 36.4452

Imagery ©2019 TerraMetrics | 2 km Terms of Use

Smallsats bring new, distinctive advantages..

More looks and faster access to information.

They bring resiliency and assuredness that can overcome the risks of a few large satellites.

Ultimately, *the economics of smallsats offer a rapid tech refresh* cycle unavailable with older exquisite satellites, which *enables constant improvement of* breadth and depth of *information* available to help our users and customers .

Faster and more accurate information helps make better decisions.

All of this changes some of the Cal/Val Paradigm....

Cal/Val In the BlackSky Architecture

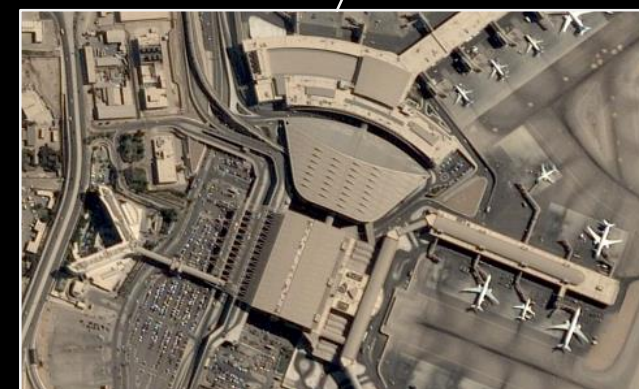
Lorcan McGonigle,
Imaging Lead

lorcanm@spaceflightindustries.com

BlackSky Imagery Product Overview

Parameter	Value			
Sensor-level GSD (at nadir & at 450 km altitude)	1 m			
Minimum image dimensions	4 km x 6 km			
Minimum satellite elevation angle for imaging (default)	60°			
Minimum solar elevation angle for imaging (default)	10°			
Instrument type	Framing camera with color filter array			
Spectral bands (nm)	Red	Green	Blue	Pan
	590 nm – 700 nm	500 nm – 550 nm	450 nm – 520 nm	450 nm – 700 nm
Bits per pixel	12			
Geolocation accuracy	< 20 m (CE90)			

Sample Image of Cairo Airport



1.0 km

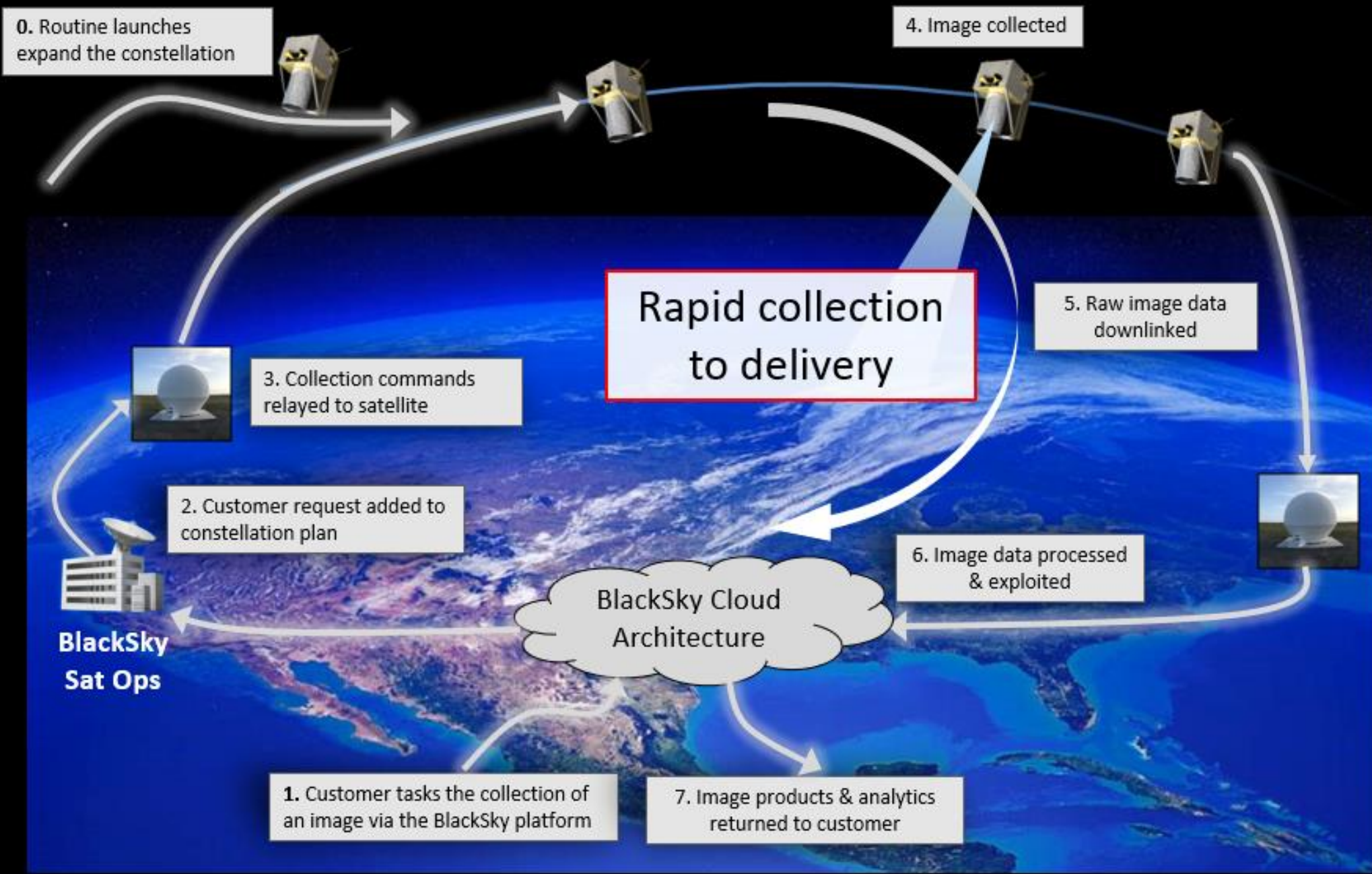
Sample Image of Barcelona Seaport



2.5 km

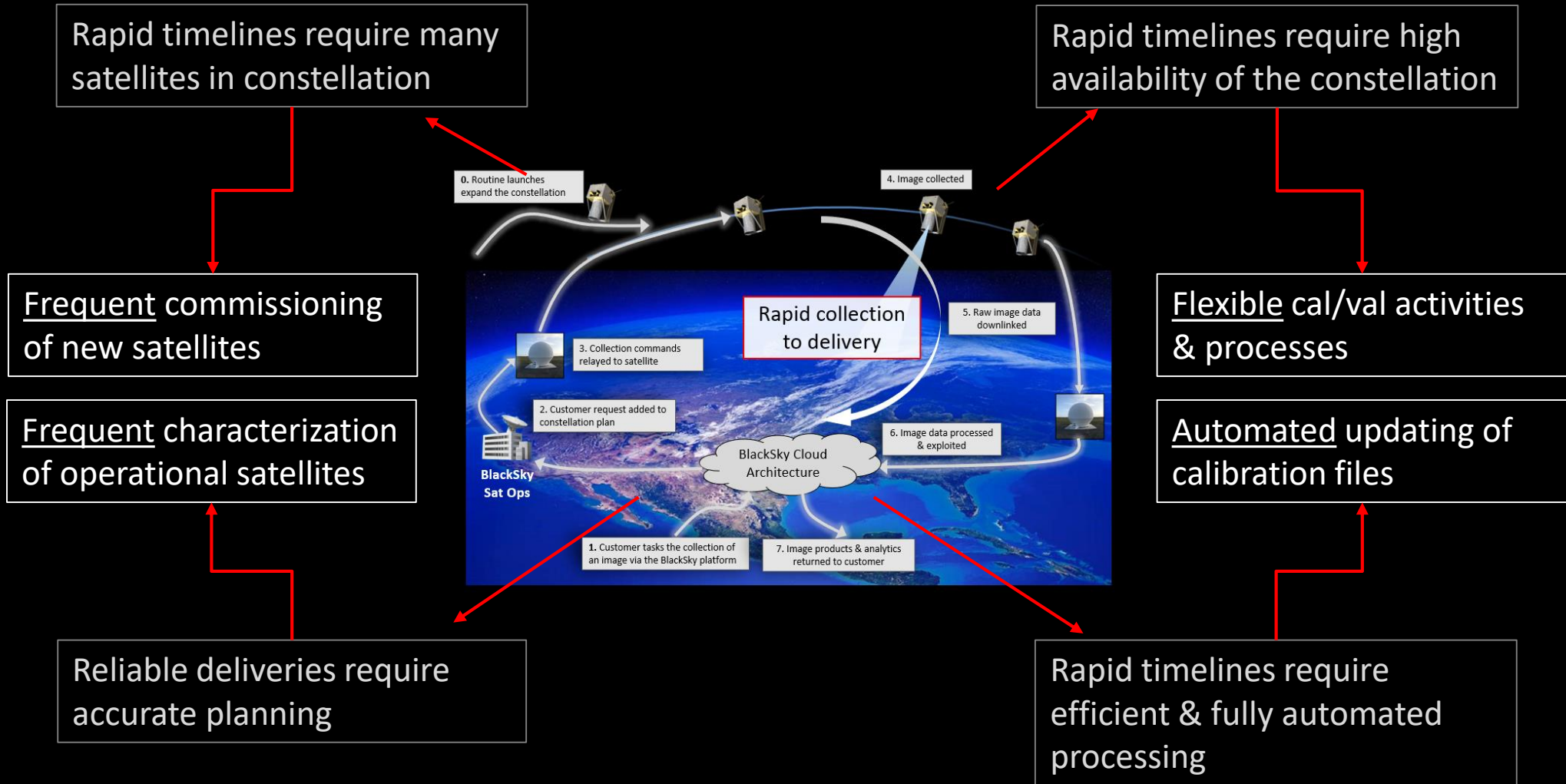
Spaceflight Industries
Proprietary and Copyright
Material

Lifecycle of an Image Product



How Cal/Val Fits into the BlackSky Architecture

Cal/Val for BlackSky Must Be Frequent, Flexible, and Automated



Primary Cal/Val Activities

All Cal/Val Imagery Is Tasked & Processed Autonomously

Area	Quantity	Activities
Image quality	Point spread function (PSF)	<ul style="list-style-type: none"> Measured from star images
Image quality	Modulation transfer function (MTF)	<ul style="list-style-type: none"> Derived from PSF Derived from edge response function
Image quality	Signal-difference-to-noise ratio (SDNR)	<ul style="list-style-type: none"> Measured from calibration targets
Geometric performance	Camera model	<ul style="list-style-type: none"> Measured from star images
Geometric performance	Geolocation accuracy	<ul style="list-style-type: none"> Measured from globally distributed ground calibration sites
Radiometric performance	Relative radiometric calibration (non-uniformity)	<ul style="list-style-type: none"> Measured from cloudy images & ground calibration sites
Radiometric performance	Radiometric trending	<ul style="list-style-type: none"> Measured from lunar images
Radiometric performance	Absolute radiometric calibration (coming in 2020)	<ul style="list-style-type: none"> Derived from measurements from lunar images, star images, and ground calibration sites

Data Types & Sites

Stars



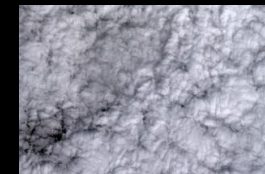
2x2 Checkerboards



Geolocation Calibration Sites



Cloudy Images



Antarctica Images



Lunar Images



RadCalNet Sites

