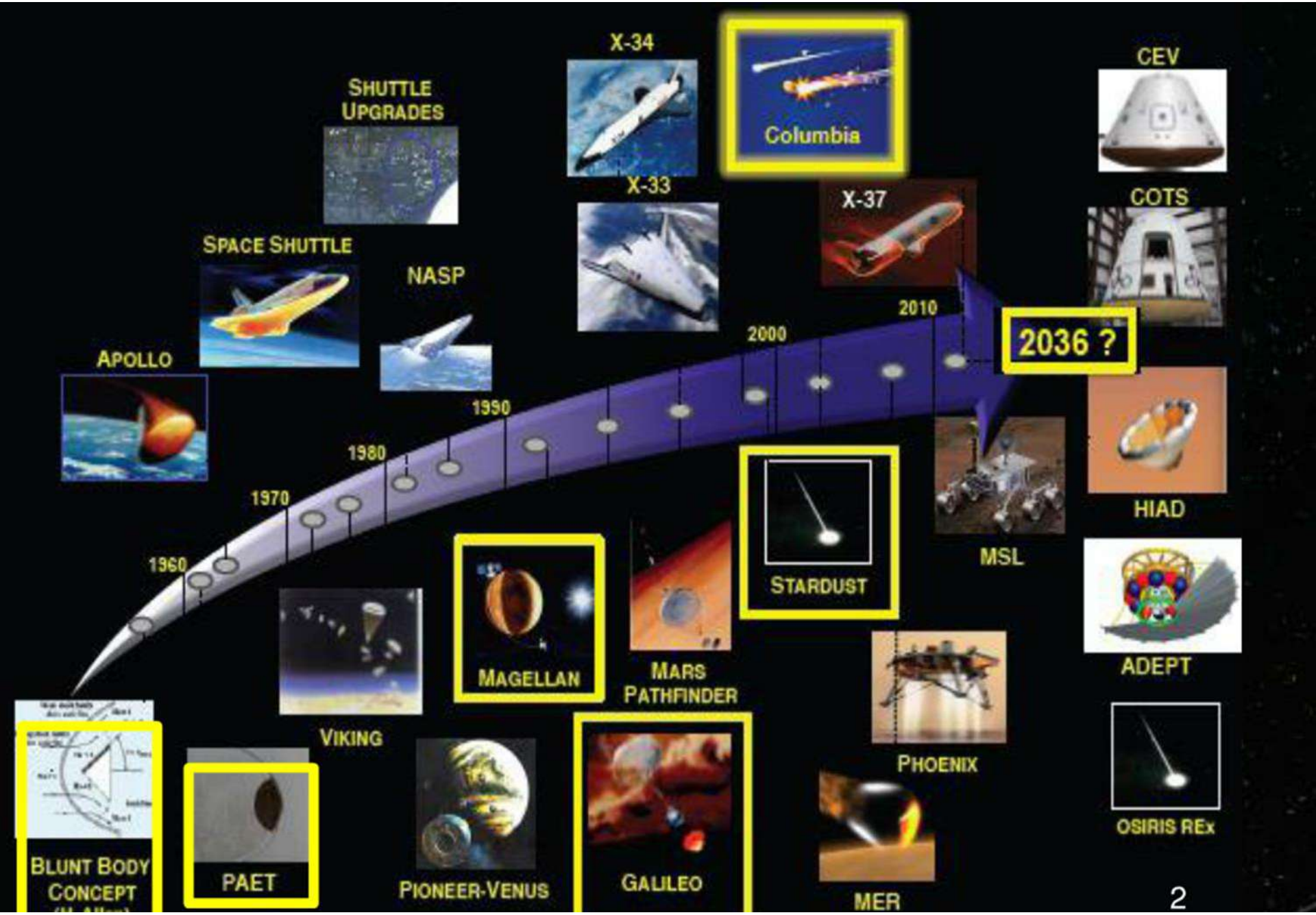

Space Commercialization:
The Next High-Tech Frontier
Small Space Crafts
Commercial Space
Silicon Valley
Artificial Intelligence
Cybersecurity
By: Dr. Periklis Papadopoulos


X-34
Columbia
CEV
SHUTTLE UPGRADES
X-33
X-37
COTS
SPACE SHUTTLE
NASP
2010
2000
2036 ?
APOLLO
1990
1980
1970
1960
HIAD
MSL
STARDUST
MAGELLAN
MARS PATHFINDER
ADEPT
VIKING
PHOENIX
OSIRIS REx
BLUNT BODY CONCEPT
PAET
PIONEER-VENUS
GALILEO
MER

104TH CONGRESS
2D SESSION

H. R. 3936

IN THE SENATE OF THE UNITED STATES

SEPTEMBER 18, 1996
Received

AN ACT

To encourage the development of a commercial space industry in the United States, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the "Space Commercialization Promotion Act of 1996".

National Aeronautics and Space Administration

Commercial Crew Program


Blue Origin


Boeing


Sierra Nevada


Space X


ATK


Excalibur


ULA

www.nasa.gov

SP-2011-11-233-KSC

About the NSG 8 Verticals

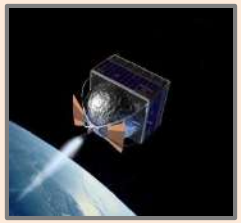
The NSG 8 Verticals inform NSG Analysts' view of the current markets of NewSpace, which exist on a spectrum from existing to potential revenue. The Verticals on the "hot end," such as Spacecraft and Launch Vehicle Providers, generate far more revenue today than the high potential but little to no revenue "cold end."

Space Technology Portfolio

Transformative & Crosscutting Technology Breakthroughs

Game Changing Development

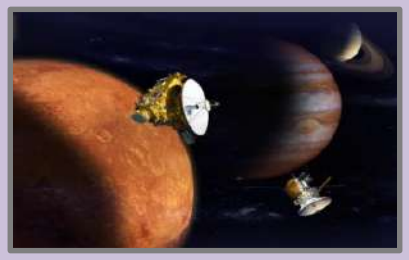
Technology Demonstration Missions



Small Spacecraft Technologies

Pioneering Concepts/ Developing Innovation Community

Space Technology Research Grant



NASA Innovative Advanced Concepts

Center Innovation Fund

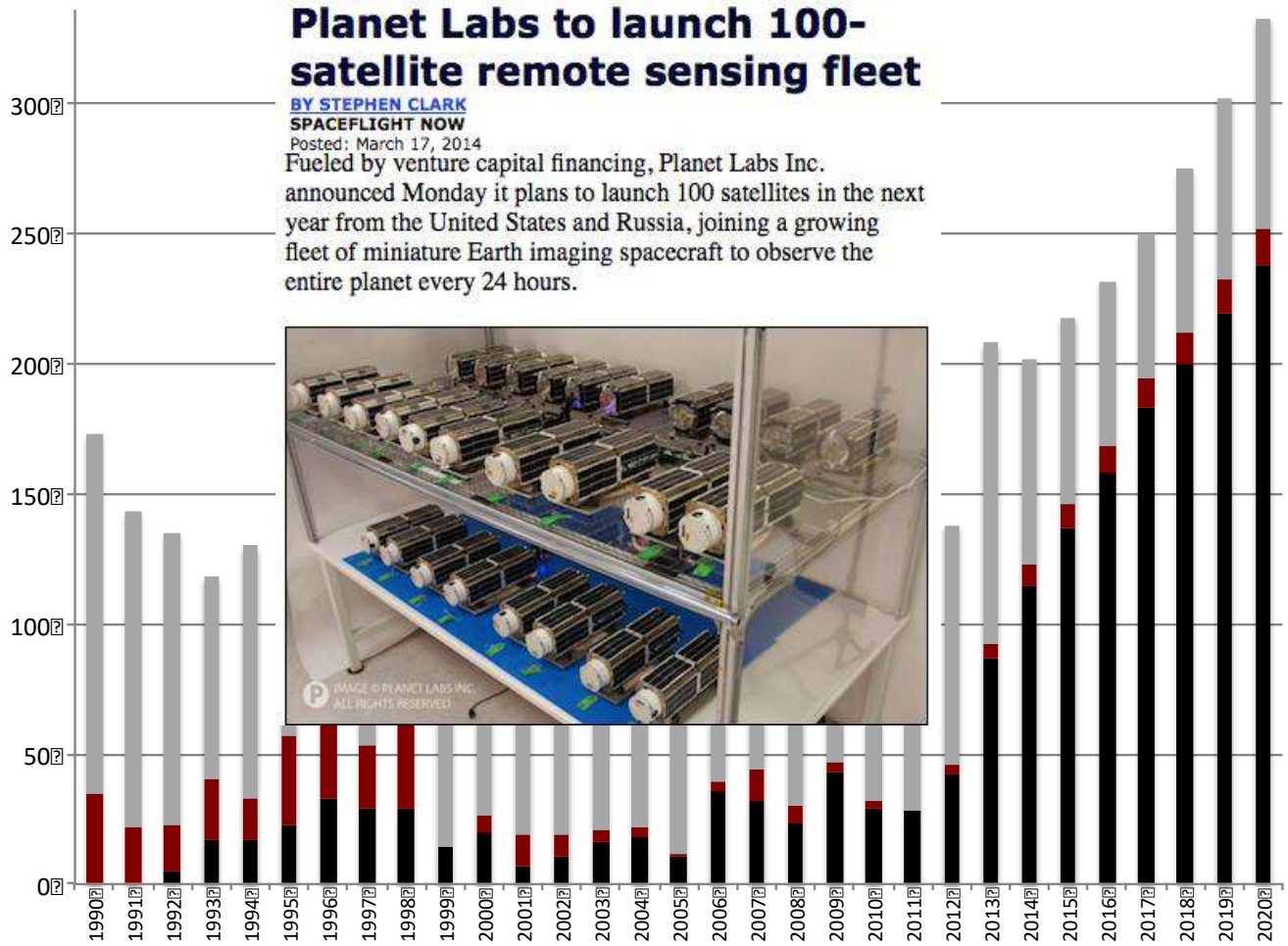
Creating Markets & Growing Innovation Economy

Centennial Challenges Prize

Small Business Innovation Research & Small Business Technology Transfer (SBIR/STTR)

Flight Opportunities

Satellites market forcast

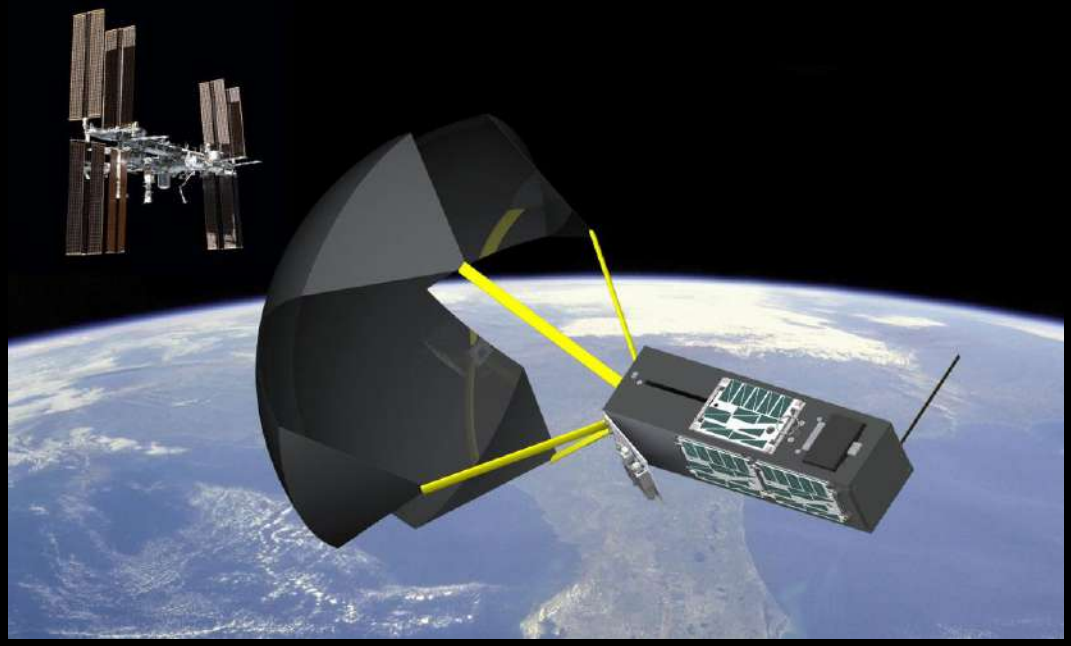


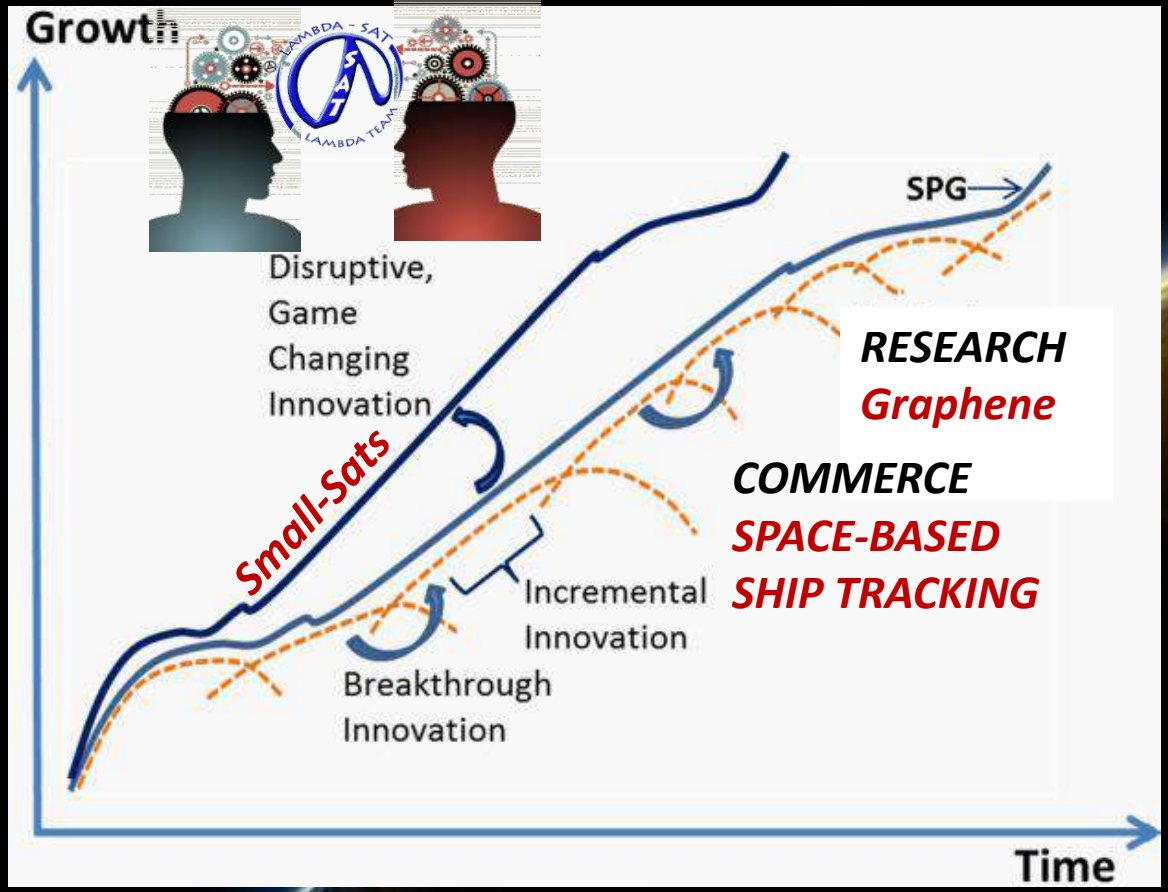
Source: SpaceWorks Enterprises Inc. SEI, 2014

⇒ **Huge development of Small Satellites (<250 Kg) market due to miniaturization**


TechEdSAT
Launched on HTV on July 3, 2012
Jettisoned from the ISS on October 4, 2012


SPACE INDUSTRY CONSOLIDATION
AVIATIONWEEK
& SPACE TECHNOLOGY
Small Satellites
Doing More
With Less
Beijing's
Narrowbody
Demand Dilemma
SMALL SATELLITES
More With Less
Small satellites gaining users
as capability and applications increase
REMOVE BEFORE FL

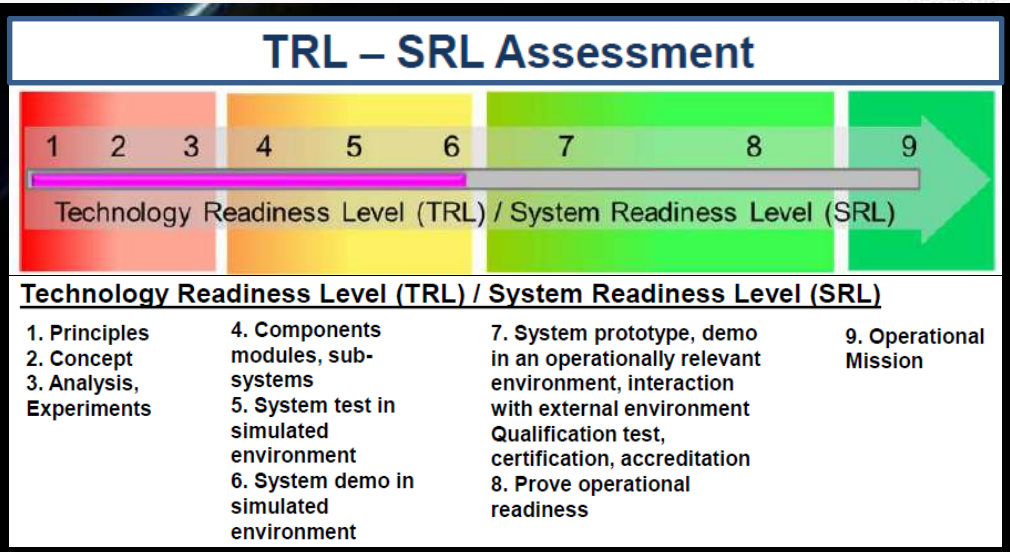




ΛΑΜΔΑ TEAM

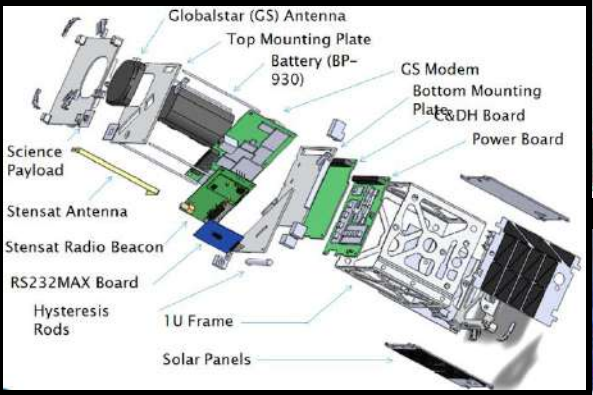
Greek Minds at Work

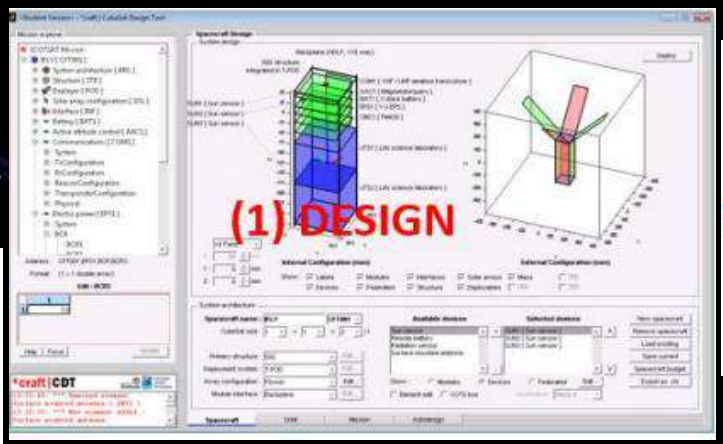
- We don't forget who we are
- 2,500+ yrs accelerating the future
- Re-think everything
- All inclusive - Space for all
- Innovate/sustain/collaborate
- Game changing
- Reposition to win the future

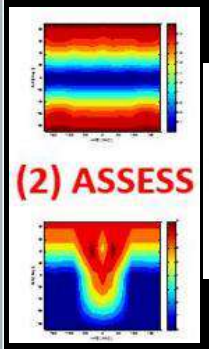


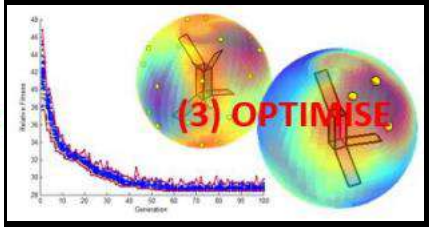
ΛΑΜΔΑ TEAM

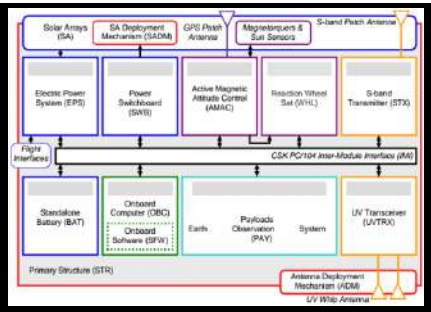
Greek Minds at Work

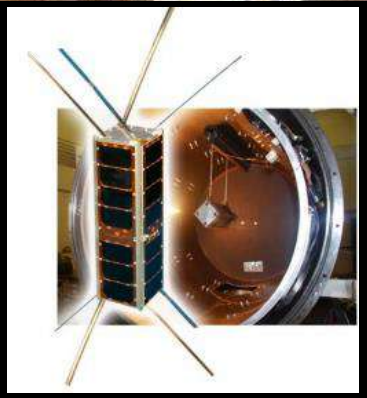






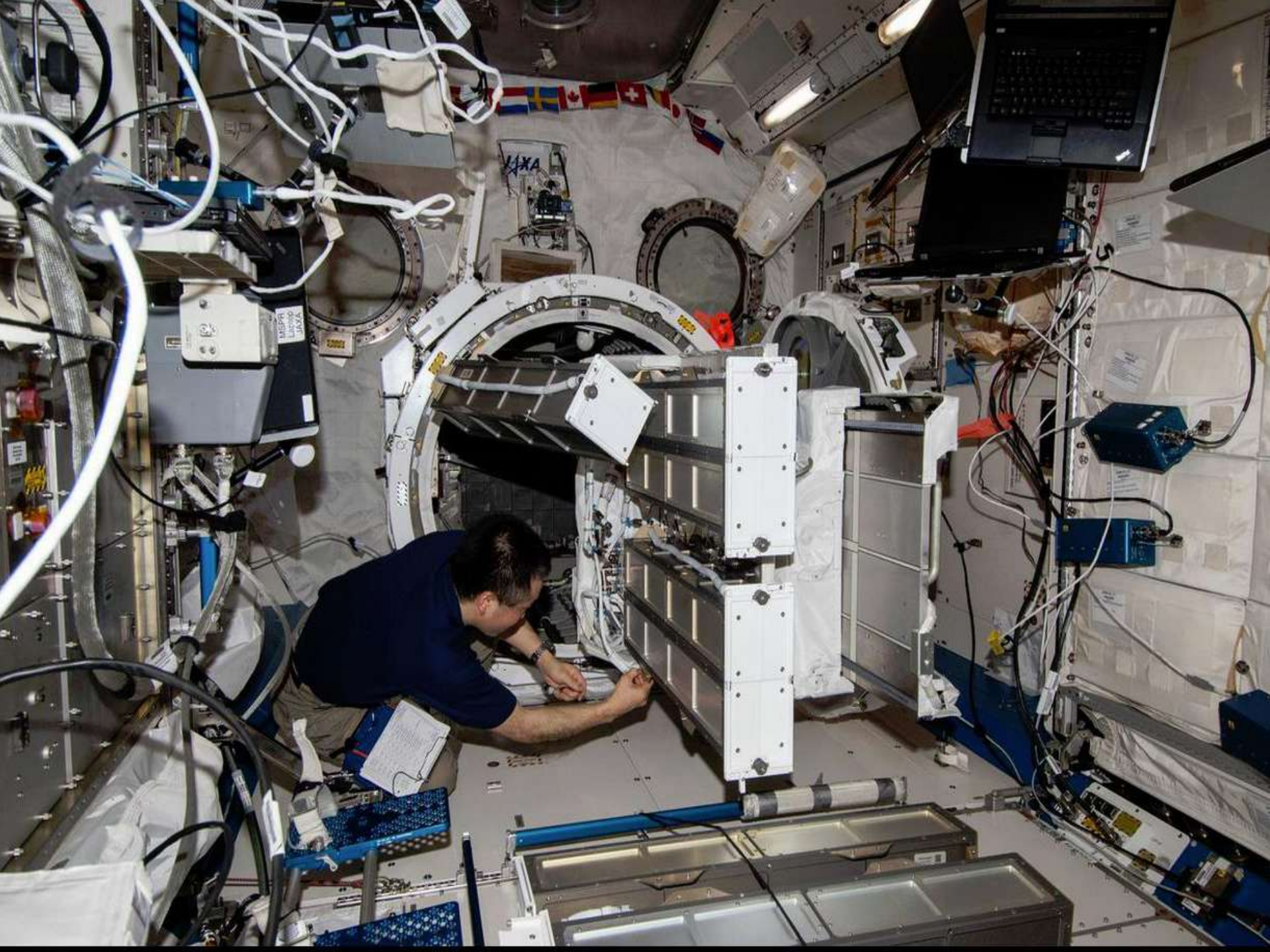




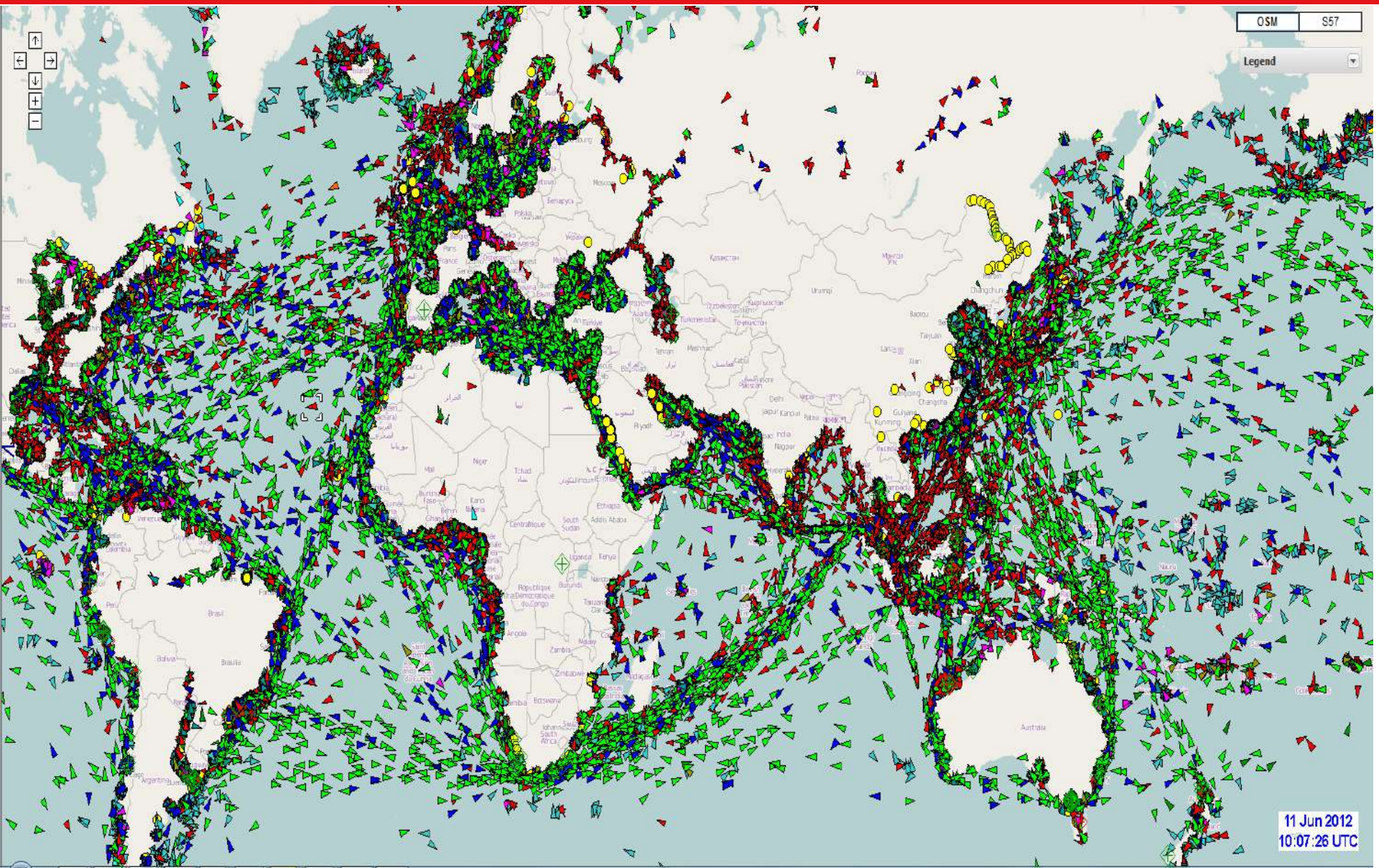



Orbital


Orbital
PWR
ATT



Maritime Security



National Aeronautics and Space Administration

NASA

Space Flight Awareness

TEAM AWARD

Presented to:

Periklis Papadopoulos

Ames Research Center
ISS Team

In recognition of your excellent contributions as a valued team member in support of NASA's human spaceflight programs.

William H. Gerstenmaier

May 14, 2014

Date

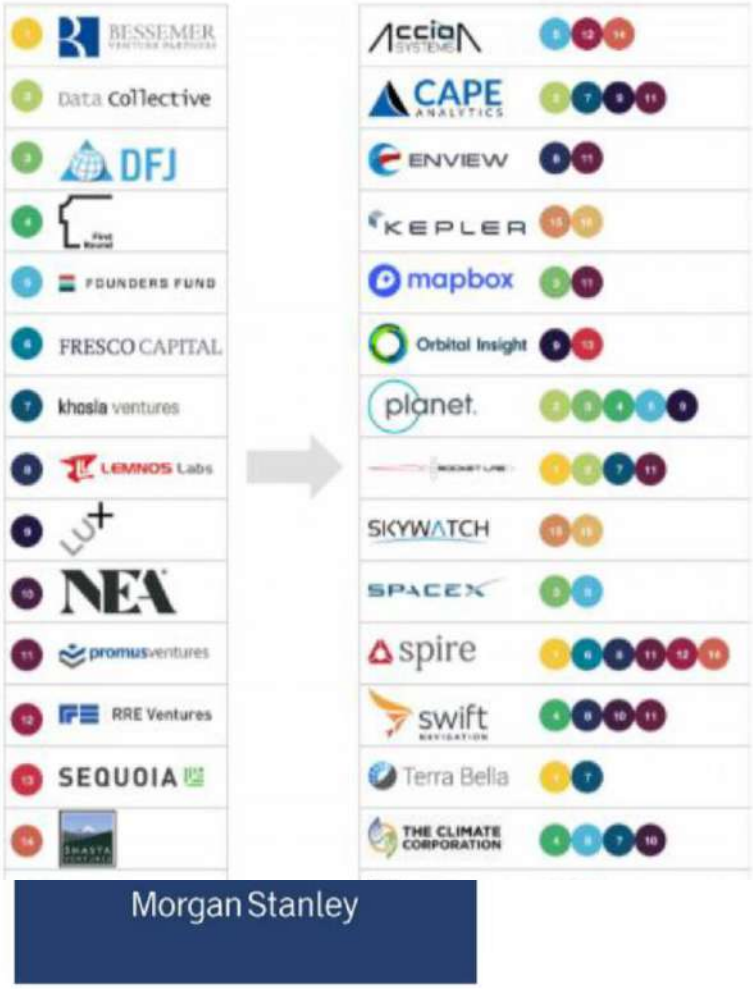
Space Flight Awareness

www.nasa.gov


So we beat on
SLIDE 2 open
2021
Shipping Finance
Phygital Interactive Conference Experience
3 episodes
One-to-one video call meetings
Parallel events, workshops and happenings
Tuesday to Thursday 16-18 March 2021 Time 18:00 - 20:30 (EET)
www.slide2open.net/ShippingFinance2021
VDES – Digital Maritime 2.0


SILICON VALLEY
IS A MINDSET
NOT A LOCATION

Silicon Valley Space Center



UK Space Entrepreneurs in Silicon Valley Space Center

"The global space industry could generate revenue of $1.1 trillion or more in 2040, up from $350 billion, currently."

"Space is an area where we will see significant development, potentially enhancing U.S. technological leadership and addressing opportunities and vulnerabilities in surveillance, mission deployment cyber, and artificial intelligence."


RAPIDLY EXPANDING
TO MEET DEMAND
SPACE AS A SERVICE
All sites supported by Amazon Cloud Infrastructure

Example: One year of cloud-cleared nighttime lights

Collaborators

UNIS

UNIS - The University Centre in Svalbard

COLUMBIA UNIVERSITY

nano avionics

U.PORTO

FEUP FACULDADE DE ENGENHARIA UNIVERSIDADE DO PORTO

UNIVERSIDADE DE VIGO

UNIVERSITY OF CALIFORNIA SANTA CRUZ

FFI Forsvarets forskningsinstitutt

Norwegian Defence Research Establishment

Norsk Romsenter

NORWEGIAN SPACE CENTRE

M B A R I

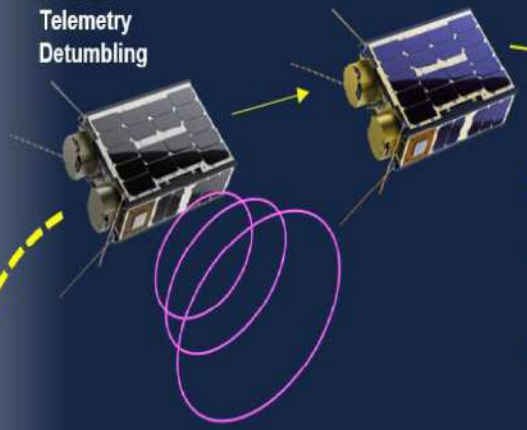
HYPSO CONOPS

Safe Mode
Anomalies in subsystems
Back to LEOP Mode
Automated resets

5. Mission End +8 years
De-commission
De-orbit

3. Cruise +1 week
Idle
Power generation
Beacon and telemetry
Health Monitoring

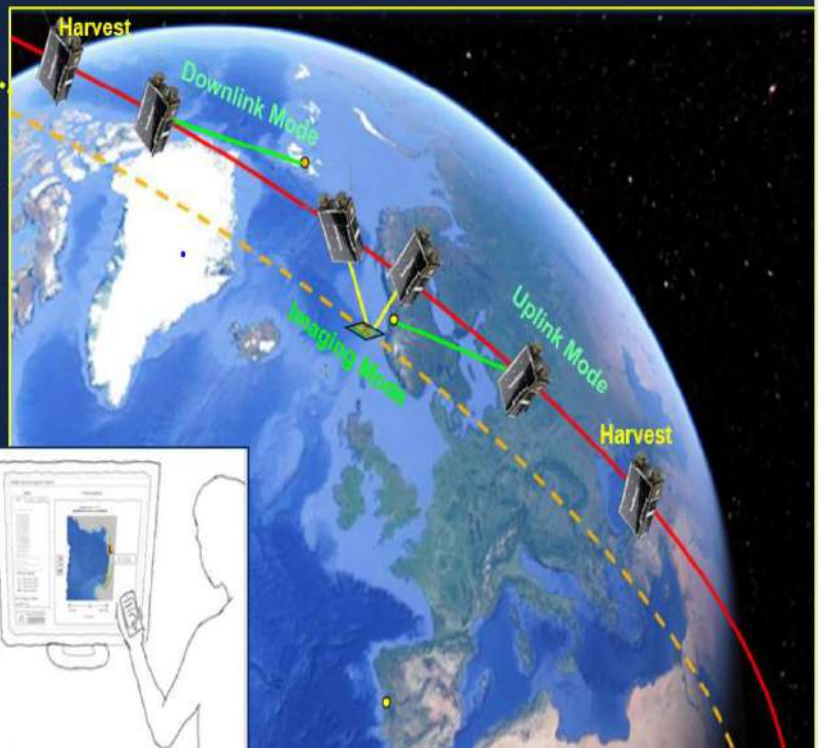
2. LEOP +1 hr
Deployment in 500 km SSO
Beacon
Telemetry
Detumbling



If clouds/no observability

SDR Comms. Mode + 2 weeks
TX/RX from NTNU (UHF)
1. Noise measurements
2. Adaptive modulation & scheduling
TX to sensor node (stationary)
TX to flying node (drone)

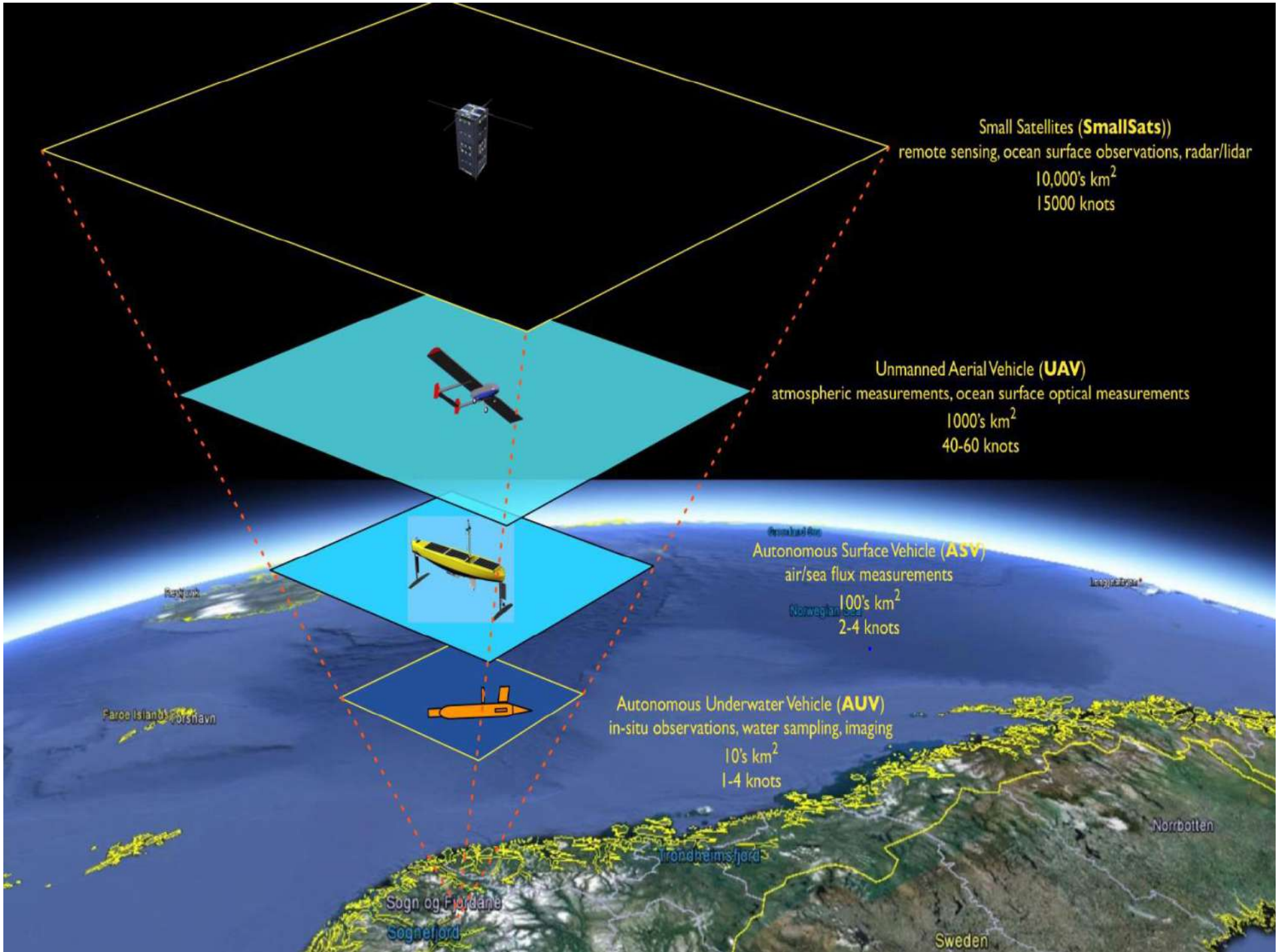
4. Hyperspectral Imaging Mode + 2 weeks
Uplink of mission plan data
Hyperspectral Imaging
1. Nadir
2. Slew Maneuver
Onboard Data Processing
1. L1a data (raw)
2. Operational data (target detection)
Downlink payload data

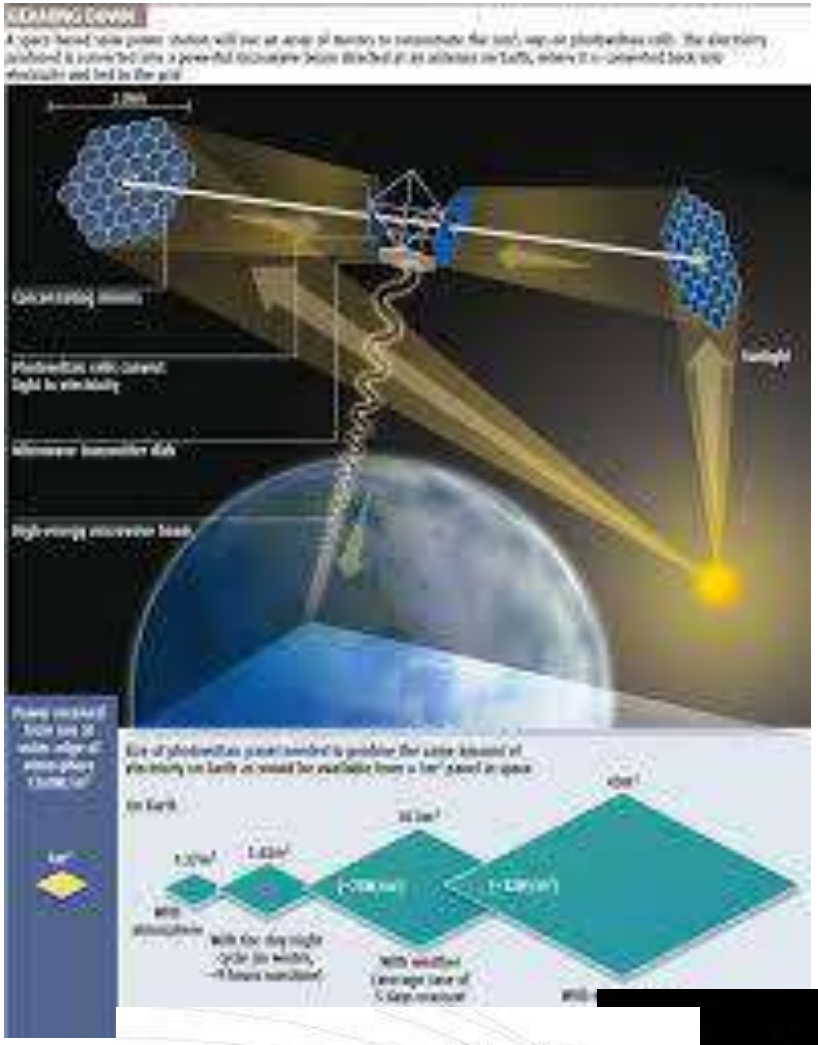


1. Launch Q1 2020
10:00 AM LTAN
Spacecraft switched off

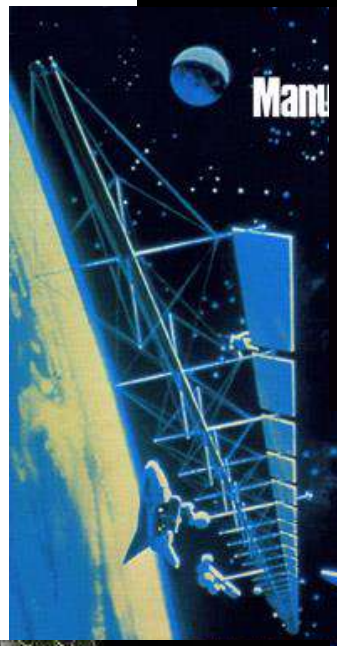
Ground System
Identification
Tracking
Upload, Trondheim
Download, Svalbard

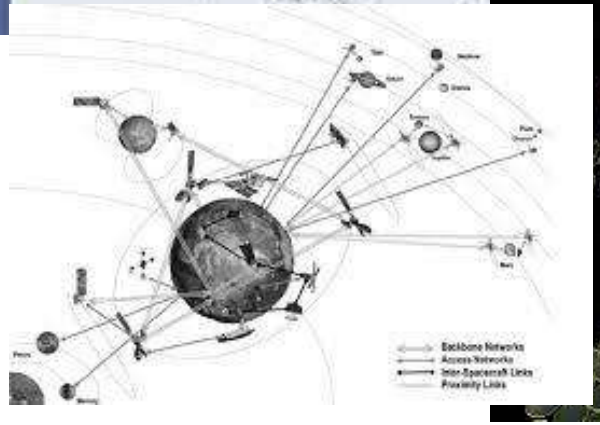
Mission Control
In-situ validation, robotic agents
Data fusion (images & samples)
Data interpretation & analysis
Visualization
Modeling & simulation
Decision Making & Command
Planning & scheduling

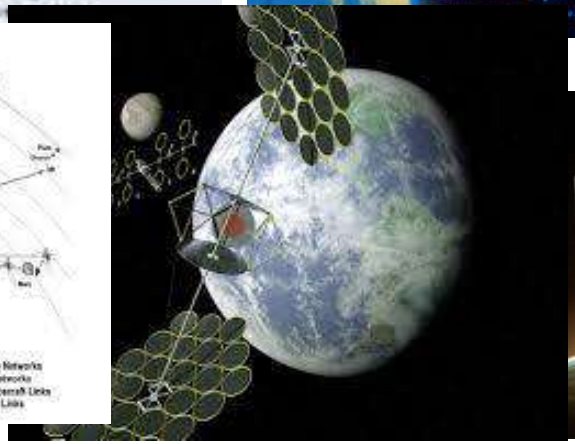

Small Satellites (**SmallSats**))
remote sensing, ocean surface observations, radar/lidar
10,000's km^2
15000 knots
Unmanned Aerial Vehicle (**UAV**)
atmospheric measurements, ocean surface optical measurements
1000's km^2
40-60 knots
Autonomous Surface Vehicle (**ASV**)
air/sea flux measurements
100's km^2
2-4 knots
Autonomous Underwater Vehicle (**AUV**)
in-situ observations, water sampling, imaging
10's km^2
1-4 knots
Norwegian Sea
Faroe Islands
Tórshavn
Trondheimsfjord
Sogn og Fjordane
Sognefjord
Norrbotten
Sweden



THE CENTER FOR
espace
ENTREPRENEURSHIP







Advanced Situational Awareness International

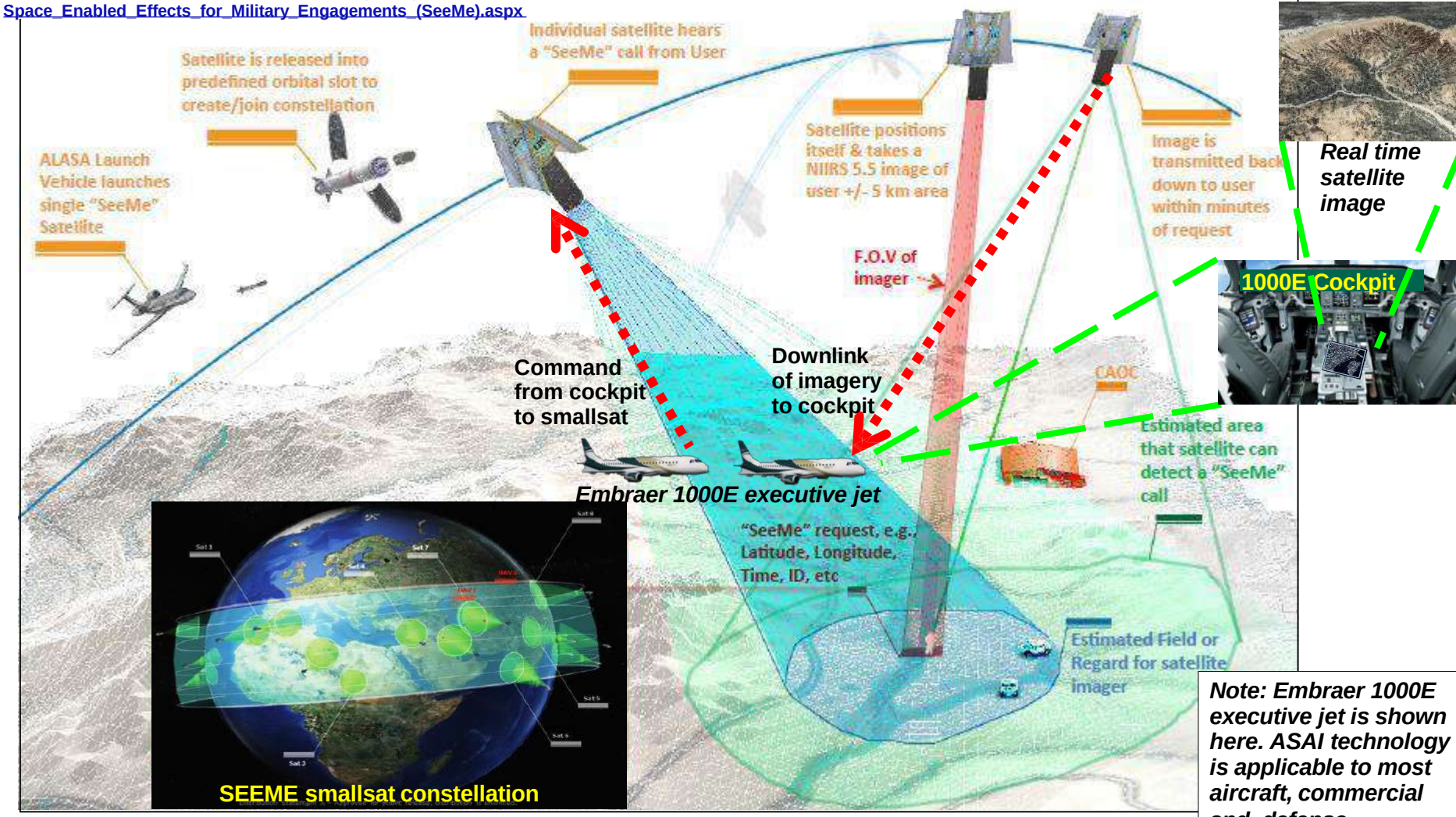
ASAI aircraft related SA takes advantage of technology from programs such as SEEME

Note: The graphics of aircraft to satellite comm links, satellite imagery in cockpit, etc. have been added by ASAI to DARPA's "user on the ground" SEEME chart to show real time aircraft/satellite SA support.

DARPA

SeeMe Notional Concept of Operations

Note: chart from DARPA's Industry Day for SEEME: http://www.darpa.mil/Our_Work/TTO/Programs/Space_Enabled_Effects_for_Military_Engagements_(SeeMe).aspx



Real time satellite image

Note: Embraer 1000E executive jet is shown here. ASAI technology is applicable to most aircraft, commercial and defense.

ASAI
Advanced Situational Awareness International

ASAI Products are Applicable to Many Customer Areas
(Chart 1 of 2)

Wireless Environmental Data Collection

Wireless sensors used in conjunction with aircraft and satellite imagery for agricultural, residential and other applications.

Industrial Uses

Interactive visualization of industrial plants, environmental areas, etc., displaying operation and system events including:

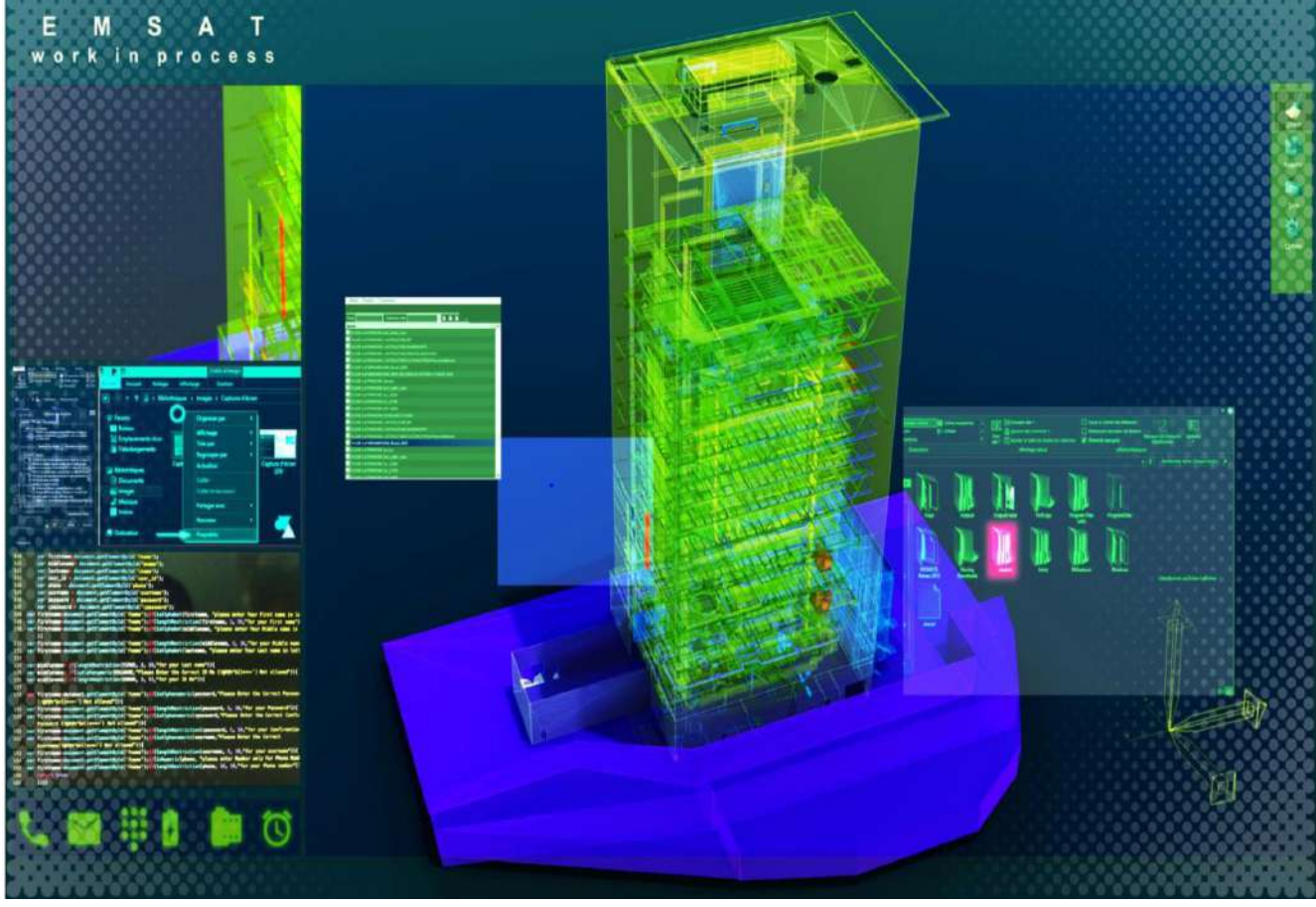
- **Alarm indications, Sensor statuses triggered by events**
- **Layered visibility of sensors, assets, blocked areas, risk and hazard zones.**
- **Complementing imagery from above.**

Accident scenario for the demonstration:

- **Cause**: Cyberattack on the Control System of the BLRB (Black Liquor Reservoir Boiler)
- **Consequences**: Overfilling of the boiler water in the super-heater tubes, leading to an explosion of the boiler, and by domino effect: loss of electricity, loss the internal network.

Operational training scenario for the demonstration:

- Additional training scenario is proposed to educate/train operators.



- Operational and crisis Management
- Monitoring service and supervising service
- EO processing service
- Cyber secure Network and control including authentication
- Drones data

AI IA FORUM 2021

AI IA ARTIFICIAL INTELLIGENCE IN ACTION

Democratizing the Power of AI

Phygital Interactive Forum

Held simultaneously in Athens, Greece and San Jose, CA, USA

Friday
November 5 / 2021

9:00 - 21:00 (Athens - EEST) &
9:00 - 18:00 (San Jose - PDT)

Physical locations
- Ancient Agora, Stoa of Attalos, Athens, Greece
- San Jose State University, San Jose, CA, USA

Digital location
www.ai-action.org

REPOSITION TO WIN THE FUTURE