



# ***SkyLight***<sup>™</sup> – Cubesat Free Space Optical Communication System

*Topic: N122-146 – Space and Naval Warfare Systems Command*

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# SA Photonics History / Background

- **SA Photonics principals background is a combination of space/military, commercial, and venture capital startup:**
  - > 120 technical staff members: 12 PhDs and 22 Sr. Engineers
- **Established in 2002**
- **Consists of two main technology areas**
  - **Communication and Sensors Group** - specialized in optical, RF and high performance mixed signal communication and sensing systems
  - **Vision Systems Group** – specialized in human factors and developing leading edge augmented reality and high vision systems
- **Over 40,000 square feet of mixed office/laboratory space in Bay Area**
  - New 10,000 sq. ft. clean room facility recently leased to support space system test, assembly and manufacturing
  - Establishing 13,000 sq. ft. manufacturing facility in Florida to support OISL volume production
- **Proven record of product development from concept generation through qualification and manufacturing general availability**
  - Over \$10M invested in 2020-2021 to enhance OISL manufacturing capabilities



**Electro-optical R&D lab & assembly Area**

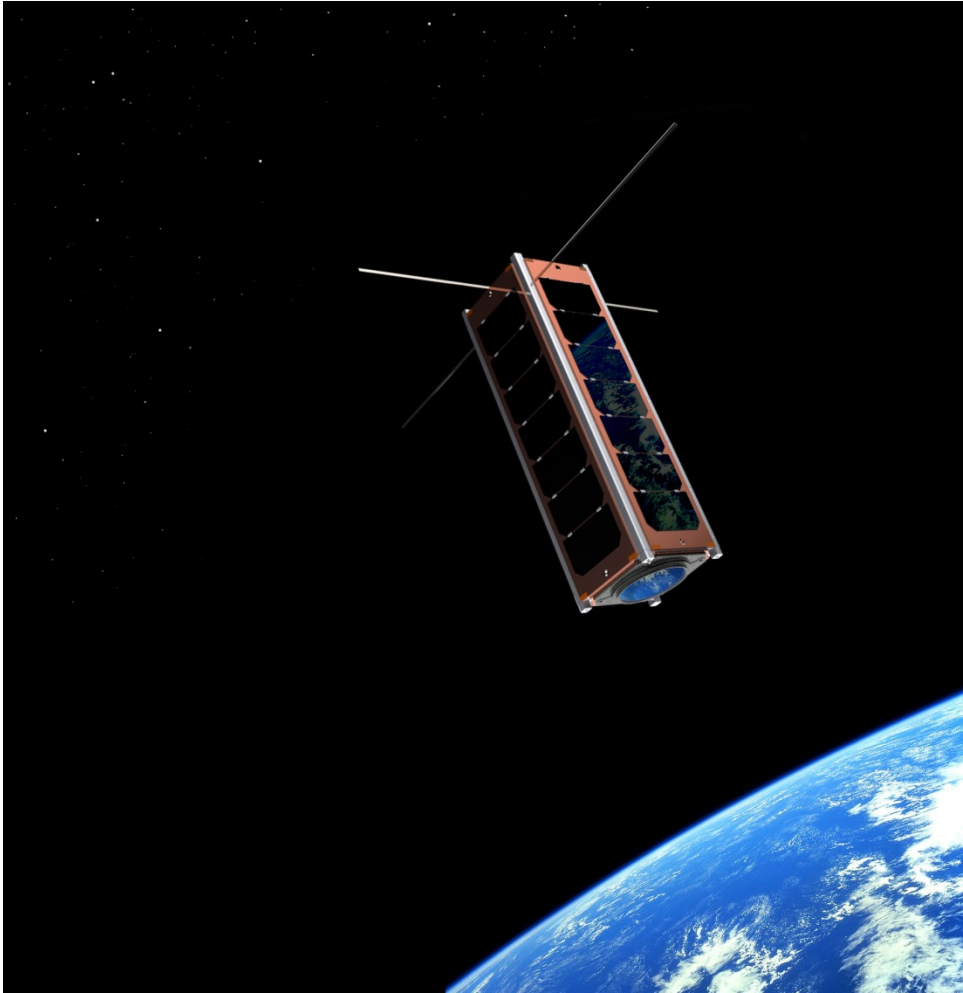


**Environmental Testing**



**3800 sq. ft. Clean Room**

# Navy Challenge



Credit: Clyde Space

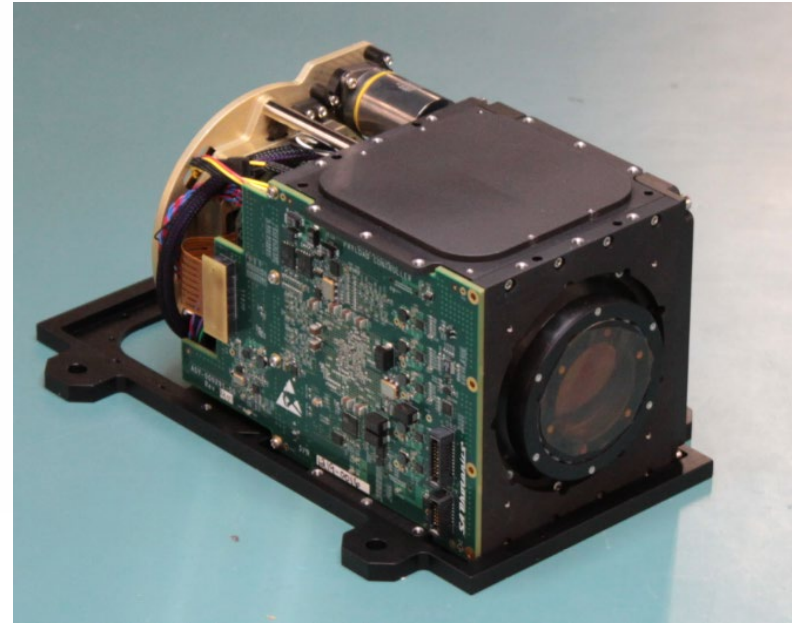
- **Strong demand to offload data from small low earth orbit (LEO) satellites**
- **Short orbit flyby requires high data rates**
- **Free-space optical communication enhances signal security, is harder to intercept and increases the amount of data delivered in a low size, weight and power (SWaP) package**

# Operational Need and Improvement

- **Small satellites require a high data rate communication capability that is**
  - Resilient to RF interference and jamming
  - LPI/LPD (low probability of intercept/detection)
  - Extremely low SWaP
- **SkyLight FSO communications system provides these capabilities and is suitable for both crosslink and space-to-ground applications**

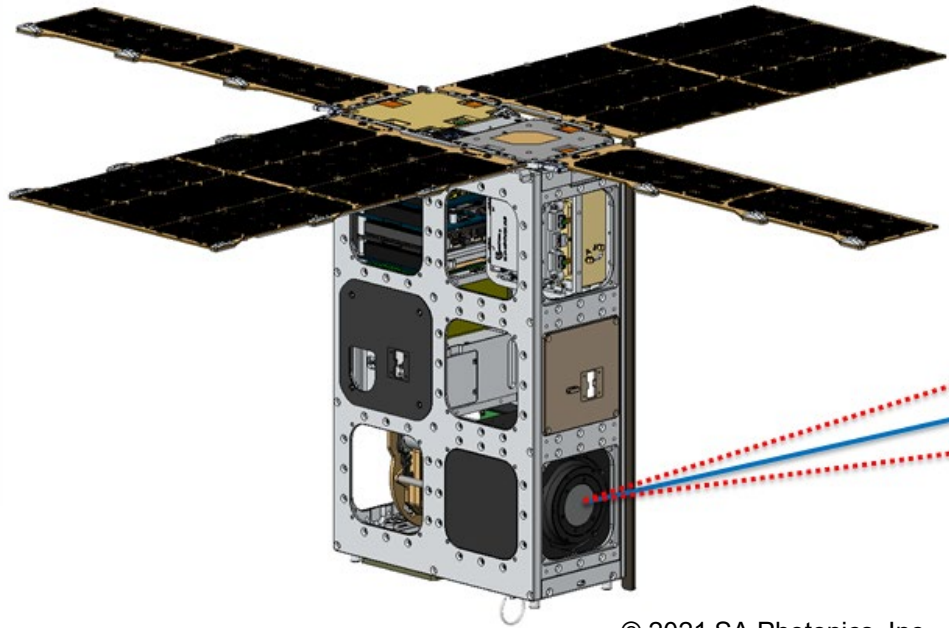
## SkyLight is a fully integrated FSO solution

- Includes beam steering, a closed loop beam tracking system, fiber laser source and modem
- Supports high data rate downlink and crosslink capability
- Integrated +/- 50 degree beam steering – **satellite body beam pointing NOT required**
- 100 Mbps data rate – can be increased to 1+ Gbps
- Supports link distances up to 1500 km
- Very low power consumption (<25 W) when active
- 1.5U (4" x 4" x 6"), 1.6 kg
- LDPC based FSO modem with physical layer retransmission to overcome atmospheric fading



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# Current Status



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- **Program started September 2017**
- **Two flight units to be delivered in early 2021**
- **Launch planned for September 2021**



# Key Features / Advantages / Benefits

- Provides high data rate secure and resilient communications between small satellites
- Space-to-ground and space-to-air applications as well
- Low SWaP enables use on small platforms such as small UAVs and man-portable ground terminals
- Provides communications without RF emissions, allowing use during Emissions Control (EMCON) conditions
- Accurate range and time-transfer capability can be used to provide “GPS-free” alternative PNT to distribute position, velocity and time to optically connected platforms
- Its optical communications system is immune to RF interference and jamming, and highly tolerant to optical jamming

# Transition to Fleet

- Strong interest from multiple agencies (Navy, Air Force, MDA, DARPA, SDA, Army, etc..) for low SWaP resilient communications
- Key technology can be scaled to support wide range of applications
  - LEO constellations
  - Geosynchronous / medium earth orbit (GEO/MEO) and other space applications
  - Small UAVs
- Related system has been transitioned to DARPA's Blackjack and SDA T0 proliferated LEO constellations



# Types of Partners Sought/Transition

- **Organizations or companies looking for low SWaP-C resilient communications**
- **FSO also provides multiple mission critical functions**
  - High data rate communications
  - LPI/LPD
  - Operate in RF denied environments
  - Ranging can be used to provide relative and/or absolute navigation and time transfer
- **Likely path forward**
  - 1) Manufacture and sell SkyLight systems
  - 2) Also able to license design

# Contact Information

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