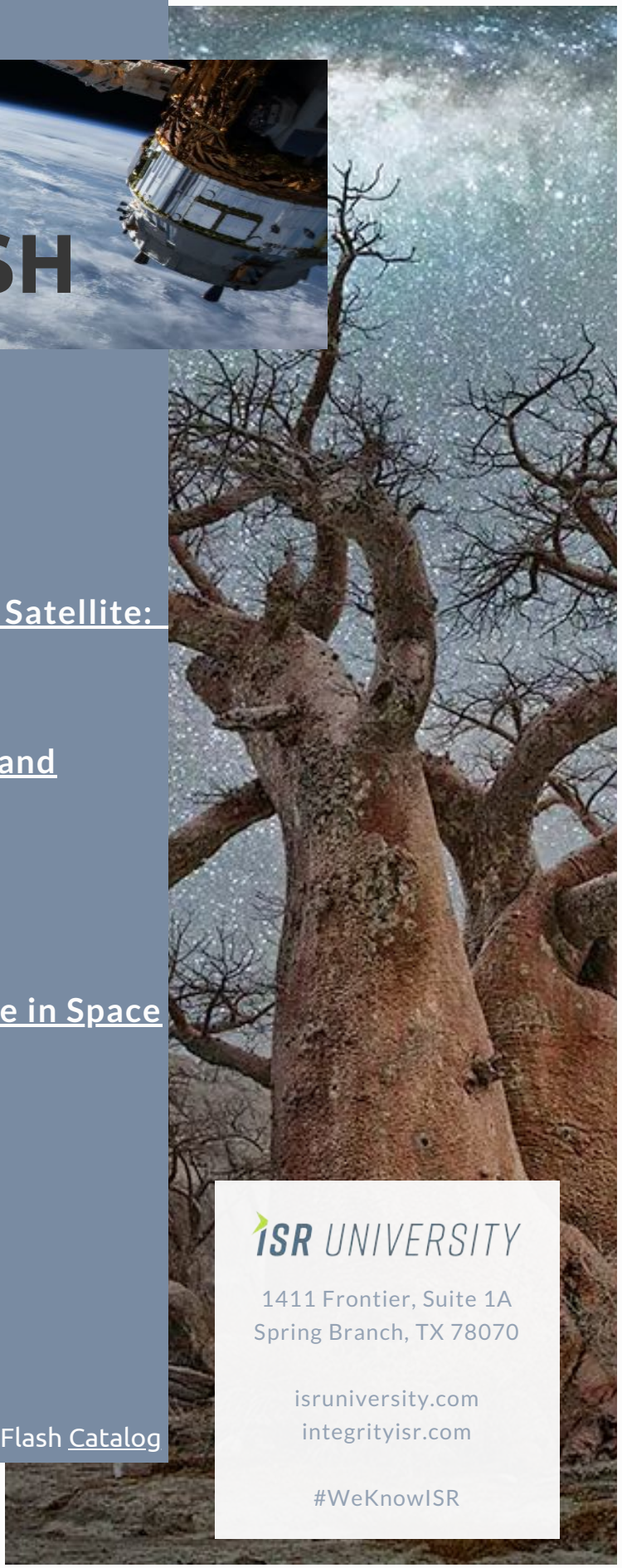
15 AUGUST 2021

THE FINAL FRONTIER FLASH

Developments & Analysis of the Space Domain

In This Issue



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Final Frontier Flash Catalog

All hyperlinks are underlined

China Launches New Communications Satellite: ChinaSat 2E (Zhongxing 2E)

5 August 2021: China launched a Long March 3B rocket from Xichang Launch facility sending ChinaSat 2E (Zhongxing 2E) into geosynchronous transfer orbit. ChinaSat 2E joins a growing family of ChinaSat commercial/military communications satellites. The China Aerospace Science and Technology Corp. (CASC) declared the launch successful. Launch VIDEO.

- ChinaSat-2E will provide television, radio, broadband multimedia and other transmission services. China Satellite Communications is owned by the Chinese Government, and the line of ChinaSat satellites are also used to provide general communication services for the military.
- Open Source data has ChinaSat-2E in GTO as of 14 August 2021.
- Zhongxing is suspected to be the fourth satellite of the Shentong-2 military communication satellite line. They are operated by the PLA and provide communication services for voice and text communications.
- Liftoff mass for the newest satellite was 4,000 kg, and the service time is expected to be about 15 years.
- The Xichang launch complex is known for it's location, which can also result in dropping stages near civilians after orbital launches. The stages fly over populated areas and continue to pose a danger to residents.
- In the future, launches will slowly transition to the Wenchang Spacecraft Launch Center, closer to the ocean, so that drop zones along the launch corridor do not overfly populated areas.
- This is the 28th orbital launch from China in 2021 and the 64th launch of the Long March 3 B/E. The Long March 3 family has now launched 134 times.

ChinaSat 2E likely belongs to the second generation of Shentong tactical communications satellites. It is designed to deliver secure voice and data communications to ground terminals operating at the Ku-Band frequency (12 to 18 GHz). Moreover, this satellite feature advanced multiple steerable spot beam antenna technology. It allows ground users to communicate while on the move.

By the Book: China's Undergraduate and Graduate Space Training

In Feb and Apr 2021 open-source reporting revealed information about China's Undergraduate and Graduate Space Officer Training. Training appears to be centralized at the PLA Space Engineering University (SEU). Undergraduate Officer training likely takes over 2 years, and it appears SEU has ~1,200 undergraduate students enrolled at one time.

- China's SEU, is located on three campuses in Beijing and is subordinate to the PLASSF Space Systems Department.
- It is the sole military academic institution for China's space force. The curriculum prioritizes space engineering and information countermeasures, as well as intelligence and analytical skills.
- SEU offers undergraduate, master's, and doctoral degrees.

-SEU Undergraduate Curriculum

- Recruiting brochures identified a total of 15 specialties for undergraduate studies.

1) Combat Environment Engineering; 2) Command Information Systems Engineering: 3)Communications Engineering; 4) Early Warning Surveillance; 5) Flight Vehicle Propulsion Engineering; 6) Information Countermeasures Technology; 7) Measurement and Control Engineering; 8) Navigation Engineering; 9) Operations and Mission Planning; 10) Optoelectronic Information Science and Engineering; 11) Radar Engineering; 12) Reconnaissance Intelligence; 13) Remote Sensing Science and Technology; 14) Space Equipment Engineering; and 15) Weapons Launch Engineering.

- Information about specific training objectives and course work was also listed.
- For example the Remote Sensing Science and Technology program, adds up to 882 class hours, roughly equivalent to 60 semester hours or about two years of university work.
- This is just the core program for the major; other required or optional courses available were not found in this research.
- Based on recruiting goals SEU appears to be capable of graduating several hundred officers a year to support a full range of current and future Chinese space missions.

SEU Graduate Curriculum

- Chinese online media released PLA SEU's 2021 graduate research program.
- The announcement identified 52 research specialties offered under 10 majors.
- It also identified two different types of graduate degrees: "academic" degrees (10 listed) and "specialty" degrees (5 listed).
- Academic Degrees: 1) Aerospace Science and Technology; 2) Control Science and Engineering; 3) Cyberspace Security; 4)Information and Communications Engineering; 5) Military Command; 6) Military Equipment; 7) Military Political Work; 8) Military Training; 9) Optical Engineering; and 10) Systems Science.
- Specialty Degrees: 1) Master of Electronic Information; 2) 2.Master of Engineering Management; 3) Master of Mechanics; 4) Military Political Work; and 5) Military Equipment

The majority of research topics fall under "Space Hardware Engineering" suggesting that Space University's top research priority is training space officers in space related hardware, technologies and asset design - not just their operation. The topics under the second category, "Space Mission Development," indicate PLA space officers will be involved in space projects from conception to mission. The third category shows cyber defenses of space assets is a major concern and that space officers are being trained to develop those defenses.

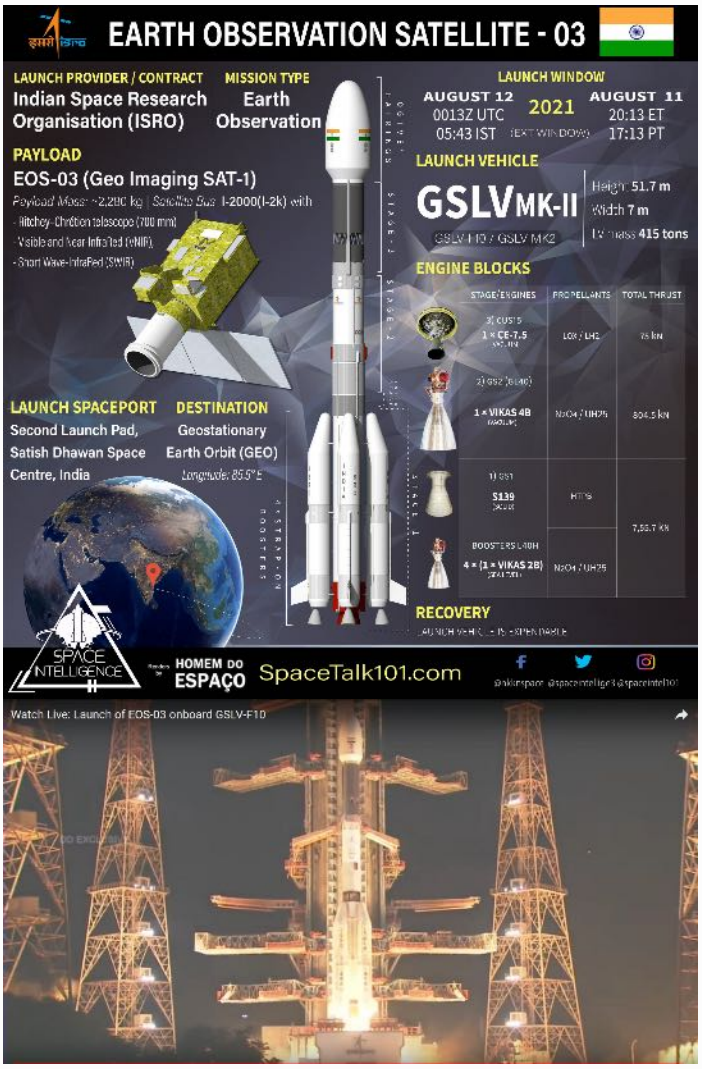
India GISAT-1 (EOS-03) Launch Fails

11 Aug 2021: The Indian Geosynchronous Satellite Launch Vehicle (GSLV) suffered a malfunction of its upper stage during an Aug. 11 launch, causing the loss of an imaging satellite, GISAT-1 (renamed EOS-03).

- The GSLV lifted off from the Satish Dhawan Space Centre at 8:15 p.m. Eastern.
- The initial phases of the flight, including burns by four strap-on boosters and the first and second stages, appeared to go as planned, as did the separation of the rocket's payload fairing.
- After second stage separation, the upper stage's cryogenic engine ignited. The stage appeared to start to roll and lose attitude control moments later, based on animations derived from launch vehicle telemetry shown on the webcast by the Indian space agency ISRO.
- The EOS-03 satellite and the GSLV CUS third stage reached a -4500 x 140 km x 17.9 deg orbit and impacted the Andaman Sea near the second stage impact zone at about 0023 UTC, 10 minutes after launch from Satish Dhawan Space Centre.
- This was the 14th flight of the GSLV, India's largest launch vehicle, and the eighth of the Mark 2 version, which has an upper stage with a domestically developed cryogenic engine that uses liquid hydrogen and liquid oxygen.

The first Mark 2 launch, in 2010, failed to reach orbit because of a failure of that upper stage engine, but subsequent launches were successful until this latest flight.

Space is hard. China remains the only nation with a "high resolution" satellite in GEO with Gaufen-4 (40m) and Gaufen-13 (15m).



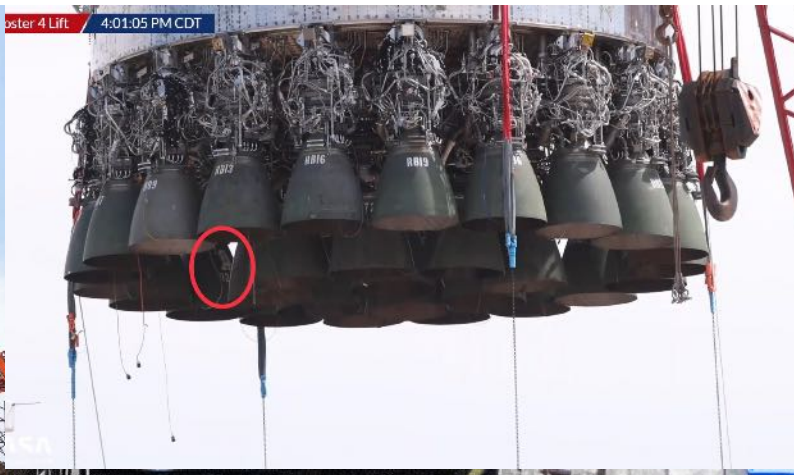
Russia Gears Up for Electronic Warfare in Space

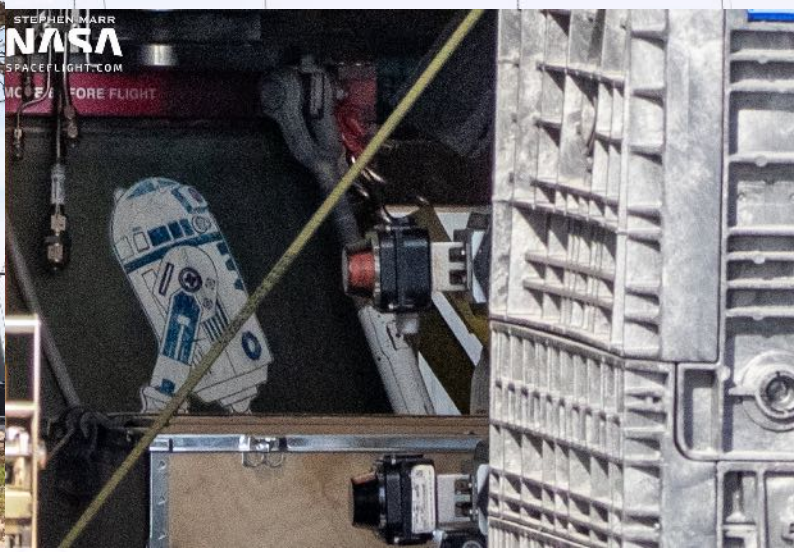
Since the beginning of this century, Russia has been gradually building up a capability to perform electronic warfare against orbiting satellites. There is convincing evidence that at least four ground-based mobile electronic warfare systems have the ability to interfere with satellite operations. Work may also be underway on a ground-based EW system targeted against LEO satellite constellations as well as an airborne system with an electronic warfare counterspace capability. Intelligence in support of these EW systems may be collected by three SIGINT complexes currently under construction at various locations in Russia and infrastructure is being built at 6 Russian satellite tracking facilities under the Tobol project to possibly protect Russian satellites from electronic attack.

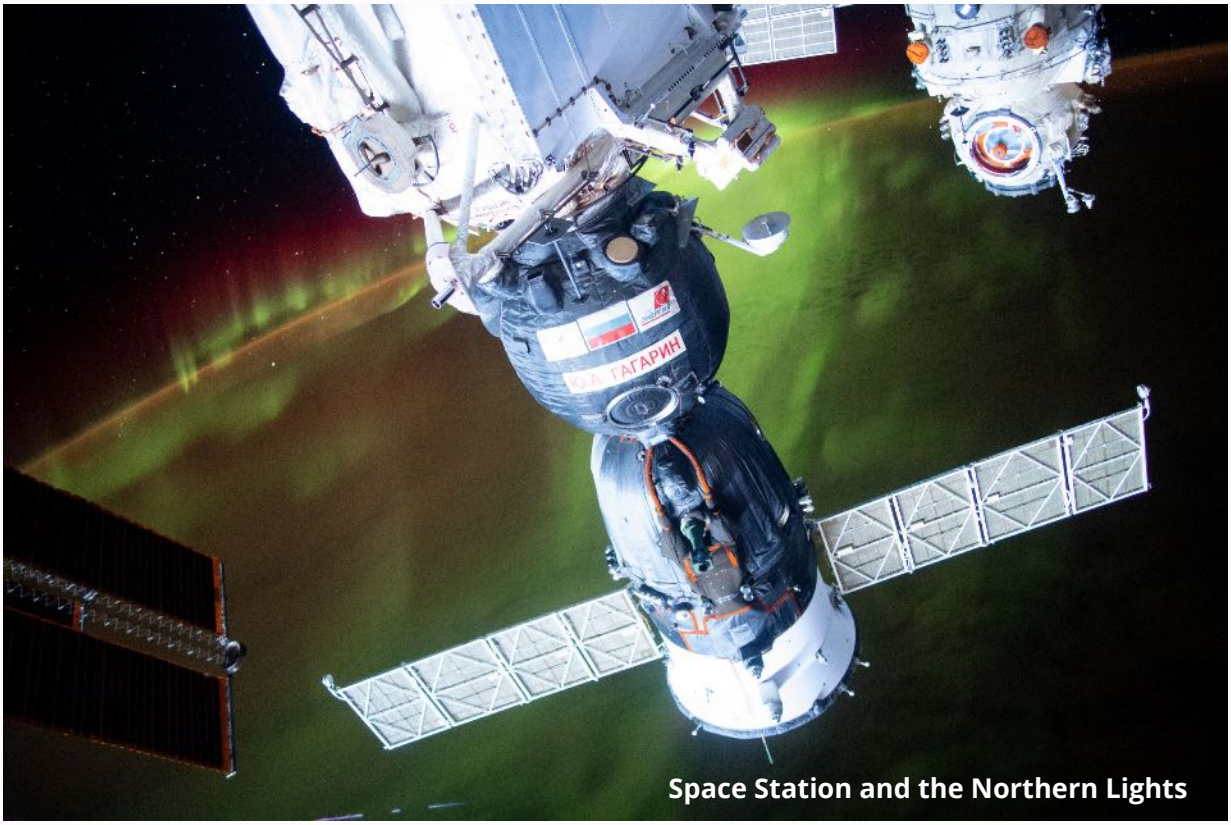
- Electronic warfare has gained tremendous significance in Russia's military doctrine over the past decade with the establishment of the Electronic Warfare Troops and the formation of a headquarters for the EW commander within the General Staff in 2009.
- Russia has consistently invested in EW modernization and fielded a variety of new EW systems to augment the capabilities of all service branches. Some of them have been tested on the battlefield in Eastern Ukraine and Syria.
- Mobile SATCOM Uplink Jammers: Tirada-2 and Bylina-MM
- Tirada-2 officially got underway on December 19, 2001 and there appear to be four versions under development Tirada-2S, Tirada-2.2, Tirada-2.3, and Tirada-2.4. The different versions of Tirada-2 may be designed to cover different parts of the radio spectrum.
- There are at least two accounts of EW units testing jammers against operational communications satellites, and indications are that Tirada-2 has reached at least some level of operational capability.
- Bylina-MM appears to be specifically designed to jam satellite communication channels operating in the "millimeter band," 30-300 Ghz. Specific targets include Milstar and AEHF.
- Indications are that Bylina-MM is part of a much larger "Bylina" EW project.
- Research ongoing for project KRBSS which stands for "Electronic Warfare Complex to Counter Satellite Systems in Low Circular Orbits". KRBSS is designed to target LEO satellite constellations such as Iridium, Globalstar, and OneWeb and would primarily be deployed in the Arctic region.
- Russia has also developed EW capabilities to counter radar reconnaissance satellites
- Two radar imagery jammers currently being used are called Krasukha-2 and Krasukha-4
- Manufacturer website described Krasukha-4 as a "mobile electronic warfare system to suppress spy satellites, ground-based radars and AWACS airborne systems," adding that it can "fully cover an object from radar detection at 150–300 km."
- Anonymous military official quoted as saying that Krasukha-4 was being successfully used against US radar reconnaissance satellites of the Lacrosse type, which in his words were "mainly intended to observe the deployment sites of Topol and Yars mobile ICBM complexes," adding they could "search for those satellites and ensure the necessary jamming."
- New SIGINT Sites (Project Sledopyt): Russia is currently constructing three ground-based signals intelligence (SIGINT) sites intended to pick up and analyze radio signals emitted by foreign satellites flying over Russian territory.
- Intelligence gathered by these sites could potentially be used to help prepare electronic attacks against foreign satellites.
- Tobol: installing infrastructure at 6 satellite tracking facilities likely indicate that it is for protecting Russian satellites from electronic attack rather than launching electronic attacks against foreign satellites.

The EW systems operating in the radio band of the electromagnetic spectrum will be complemented by ground-based and airborne laser systems designed to dazzle or blind satellite sensors. Russia is also continuing the development of more traditional kinetic ASAT weapons. Few of these systems seem to have reached operational maturity yet, but once they do, they should give Russia a counterspace capability unmatched by that of any other country in the world.

Pics o' the week!



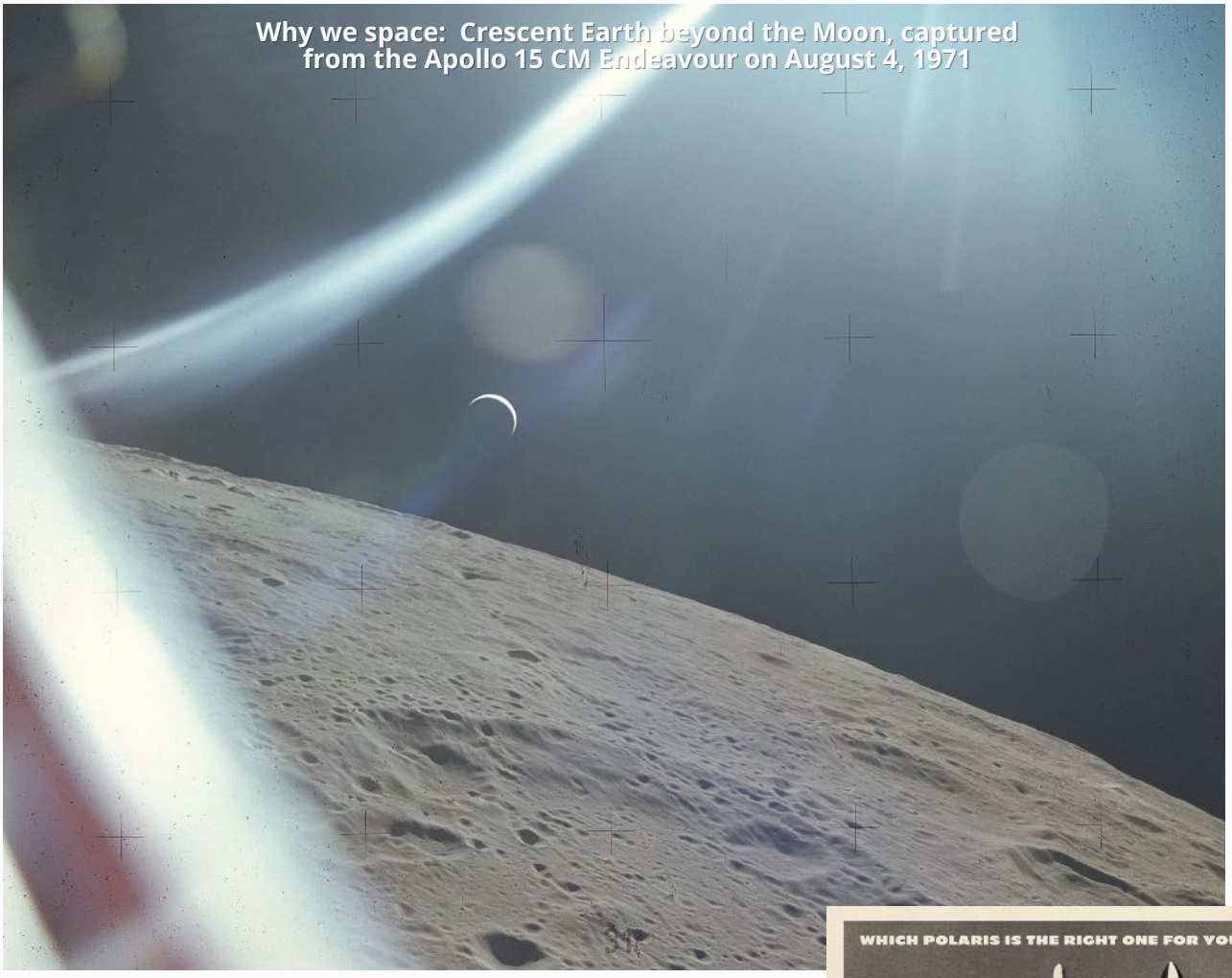




Space Station and the Northern Lights

Edwards AFB circa 1964-67

If this was an airshow, it was the best one ever!


Why we space: Crescent Earth beyond the Moon, captured from the Apollo 15 CM Endeavour on August 4, 1971


Starship
Saturn V
New Glenn


WHICH POLARIS IS THE RIGHT ONE FOR YOU?
THE ALL NEW '63s ARE HERE!
LOCKHEED


Randy Shaffer?