



Key Technologies to Watch – *Space and Ground*

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Application Technology Strategy

- Satellite consulting firm founded by Bruce Elbert, over 50 years in the satellite industry
- ATS has performed for clients since March 2000
- Applies *Systems Engineering* principles throughout the Space and Ground Segments
- Bruce Elbert, MSc and MBA – technologist, operations expert, business advisor, program manager, author of industry books, educator
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Technology in Space and Ground

- Technology is anything that is introduced to produce a required outcome – hardware and software
- Space segment includes orbiting satellites that act as repeater stations for service to the earth; includes getting to orbit
- Ground segment not directly related but space cannot operate without it; includes network and user
- Three divisions to technology:
 - *Components* that are developed and produced as identifiable items
 - *Systems* that are composed of a plethora of components, both existing and new
 - *Processes* that exercise the components to perform a wide variety of functions – processes are produced by human staff and software
- The role, if any, of *standards*

Presentation of Elements

	Space Segment	Ground Segment
Technological Devices	Small spacecraft, SSPA, sensors, optical transceivers, onboard processors, beam forming antennas, thrusters and engines	Self-pointing antennas, planar arrays, SSPAs, communications processors
Systems	Constellation, Launchers, Digital Twin	Waveform and multiple access, Network management systems
Processes	Constellation management, Spacecraft manufacturing, Supply chain	Engineering and operations, Customer services
Standards	CCSDS, OISL (SDA), NASA TRL, SO/IEC/IEEE 15288:2023	DVB-S2x, 3GPP NTN, SDN
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Any New System Must Answer These Questions

5W1H From Google AI:

- **Who:** Refers to the person or entity involved.
- **What:** Describes the action, object, or event.
- **Where:** Specifies the location or place.
- **When:** Indicates the time or date.
- **How:** Explains the method or manner in which something happens.
- **Why:** Explains the reason or cause.



Thank You!