

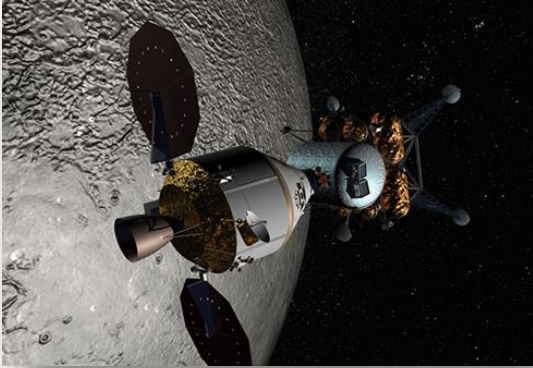


Comtech Space & Component Technology Company Overview and Focus on Antennas and Radomes

July 2021



Space & Component Technology



EEE Components Group (Cypress, CA)

- EEE component supply chain management, procurement, test, quality assurance and engineering services for spacecraft and launch vehicle applications

Ground Stations Group (Cypress, CA)

- Design, software development, construction, operation & maintenance of ground systems for launch, tracking, command and control



Focus

XY Antenna Products Group (Plano, TX, and Cypress, CA)

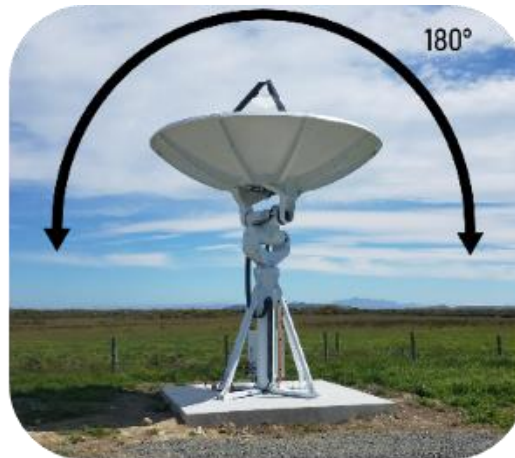
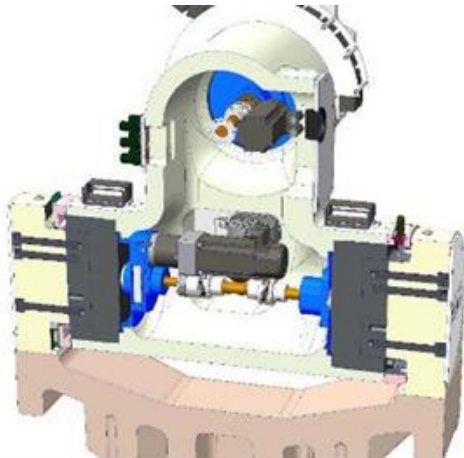
- Supply of X/Y antenna systems, reflectors, radomes, hardware and software for LEO/MEO tracking applications

XY Antennas and Radomes



XY Tracking Antennas

- We specialize in full-motion satellite tracking antennas based in XY configurations
 - Fixed, Transportable/Deployable, User Terminals
 - UHF, L, S, C, X, Ku, Ka, Q, V-bands
 - Antenna size ranges from 30cm to 12+ meters
- Most extensive line of antennas based on the X/Y pedestal geometry in the industry; made for 20 years
- X/Y pedestal is ideally suited for tracking Low Earth Orbit (LEO) and Medium Earth Orbit (MEO) satellites

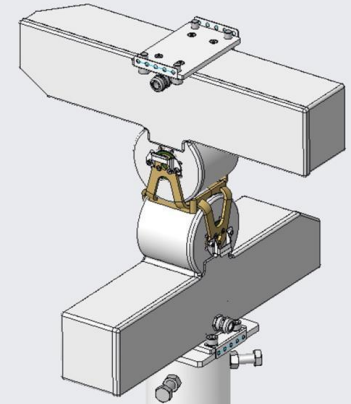
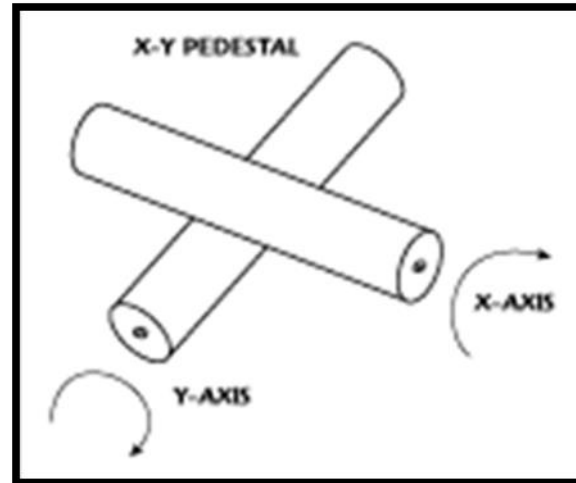


Primary X/Y Antenna Applications

- TT&C, Data Gateways, and Communications for LEO/MEO and GEO constellations
 - Earth Observation/ Remote Sensing/Weather
 - Internet Broadband
 - Internet of Things (IoT)
 - Global Cellular/Mobility
- User Terminals for LEO/MEO constellations
- High Altitude Pseudo-Satellite (HAPS)/Unmanned Aircraft Vehicles (UAV) tracking

Technical Description – X/Y

- Our core range of ground stations are X/Y antenna systems
- Key benefits include:
 - *No Zenith Keyhole*
 - *Full Hemispheric Coverage*
 - *No Cable Wrap*
 - *Two Identical Drive Chains*
 - *Simple and Low Maintenance*
 - *High Reliability*
 - *Low Power Consumption*
 - *Lower Production Costs*
 - *Flexibility of operation – LEO/MEO/HEO/GEO*
- We have used proven, existing mechanical ideas and applied them to antenna positioning, allowing us to offer a smaller, low-cost system with the same benefits as our larger antenna stations



Fixed Antennas – Gateways and TT&C



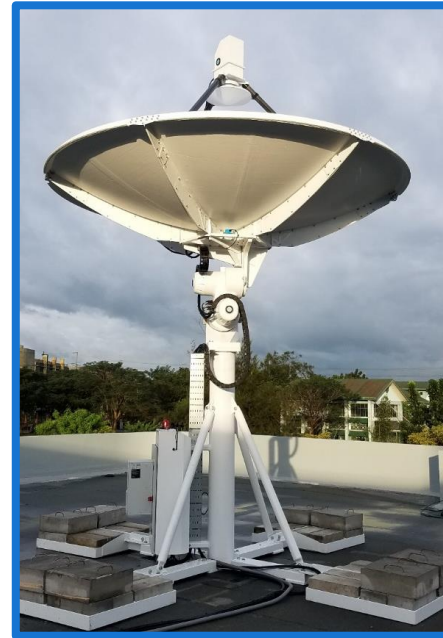
Fixed Antennas – Gateways and TT&C



Transportable and Deployable Antenna Systems



X/Y 1.6m K-band Deployable Split Case Mount



X/Y 3.7 Meter S/X-band with Non-Ground Penetrating Mount



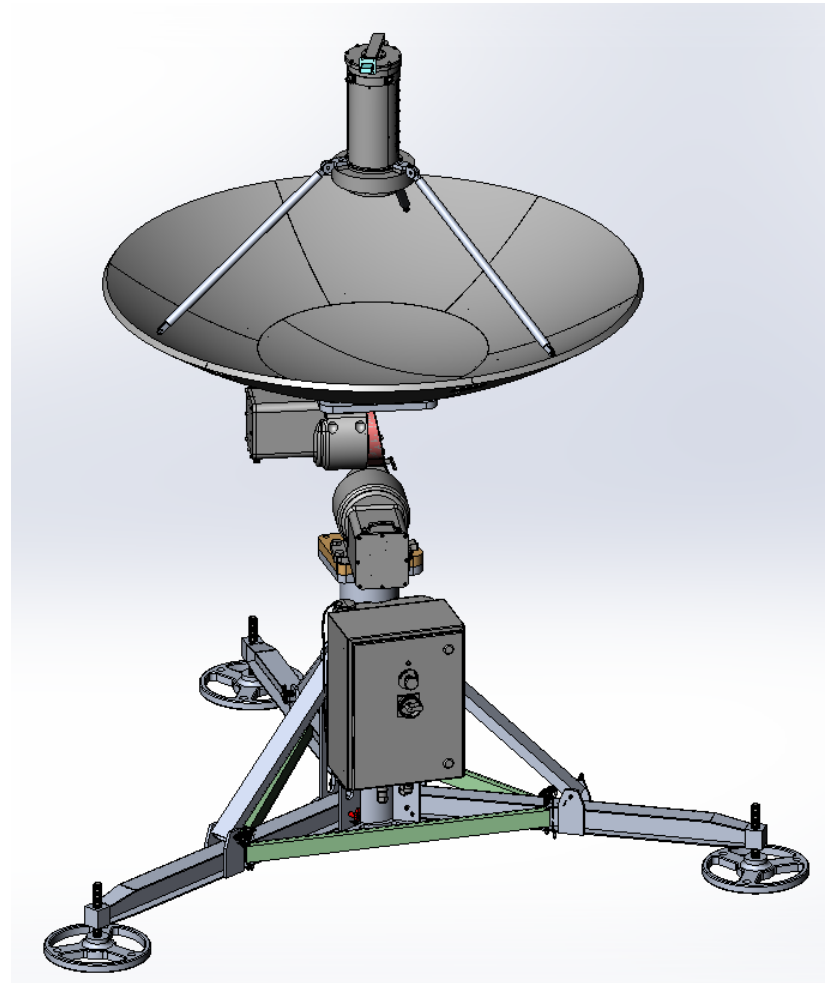
6.3m X/Y Antenna Trailer Mounted



X/Y Antenna Trailer Mounted

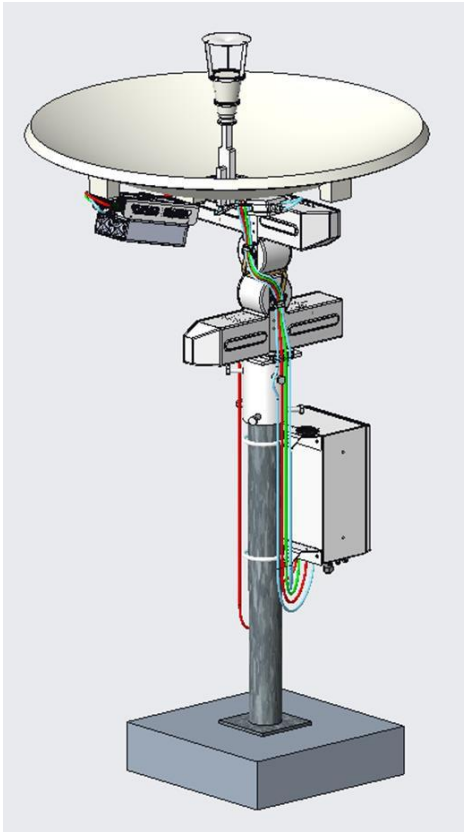
New Global Constellation X/Y Antenna

- Deployable and Fixed configurations
- Multiple Applications
- Holds up to 2.4-meter reflectors
- Lightweight - 370 lbs (not including RF)
- Modular
 - Collapsible Tripod Frame
 - X/Y Motor Assembly can be disassembled
 - Carbon Fiber Reflector (number of panels depends on requirements)
 - Weatherized Electronics Enclosure
 - Can be transit case packaged, pallet mounted, or fixed
- In production Summer/Fall 2021



User Terminals and Micro Deployable Antennas

1.2m User Terminal



In production Summer/Fall 2021

Micro Deployable X/Y Terminal 30cm – 60cm, weight 20kg to 25kg



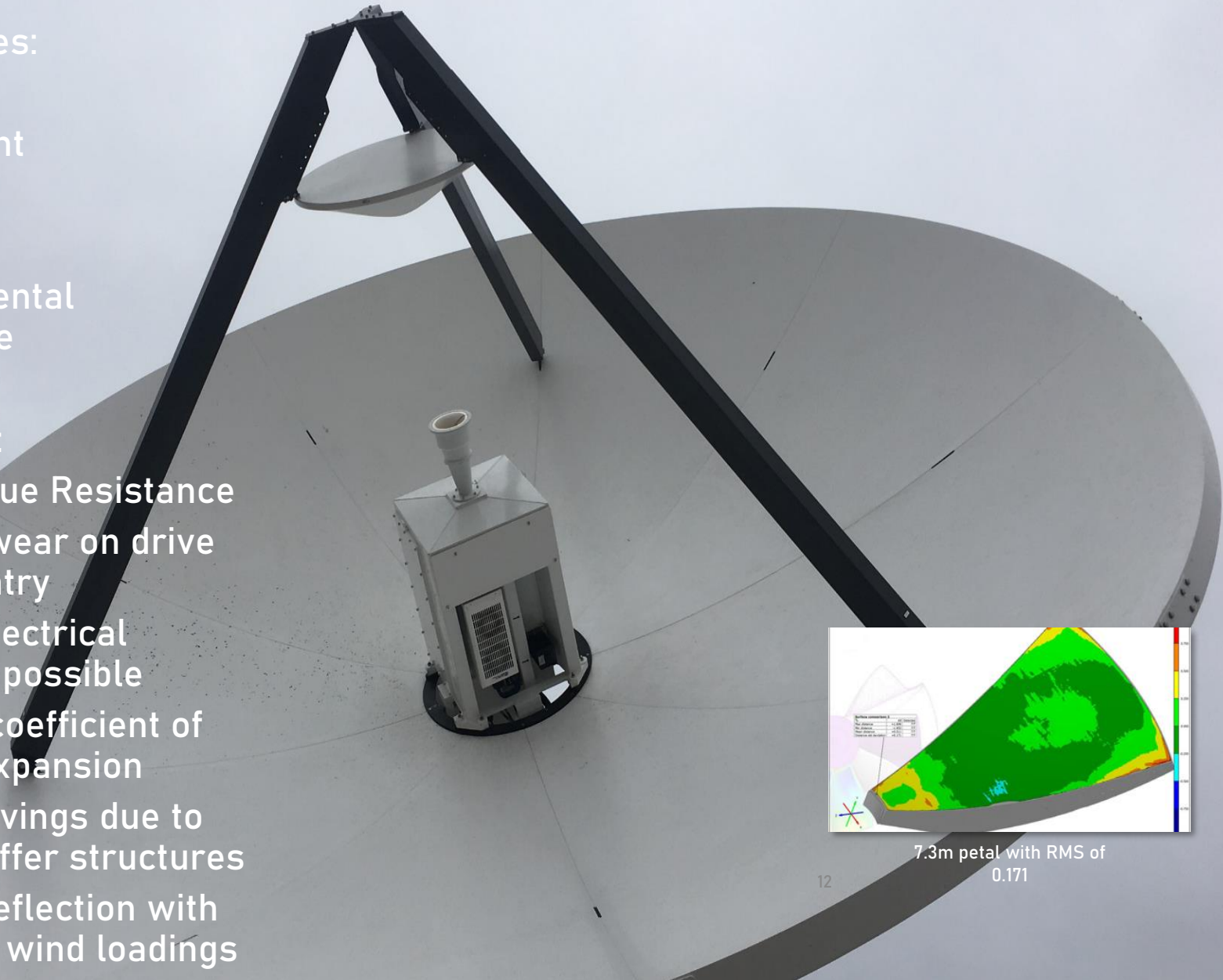
Carbon Fiber Reflectors

Core Attributes:

- Strength
- Low Weight
- Stiffness
- Stability
- Environmental Resistance

Key Features:

- High Fatigue Resistance
- Reduces wear on drive componentry
- Integral electrical heating is possible
- Very low coefficient of thermal expansion
- Overall savings due to lighter, stiffer structures
- Minimal deflection with 100 km/hr wind loadings



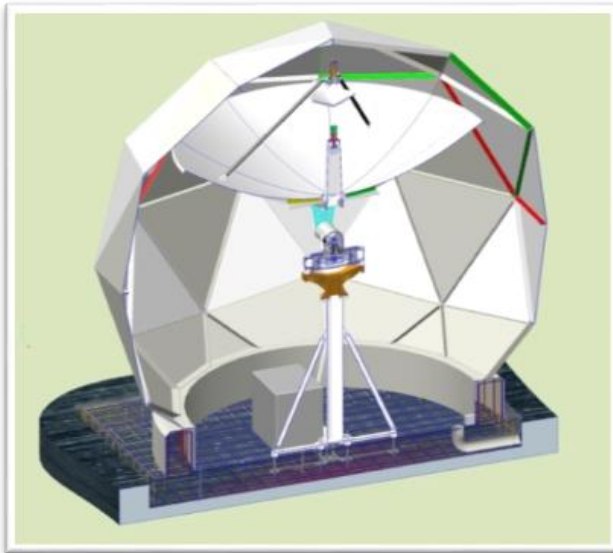
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7.3m petal with RMS of
0.171

Radomes



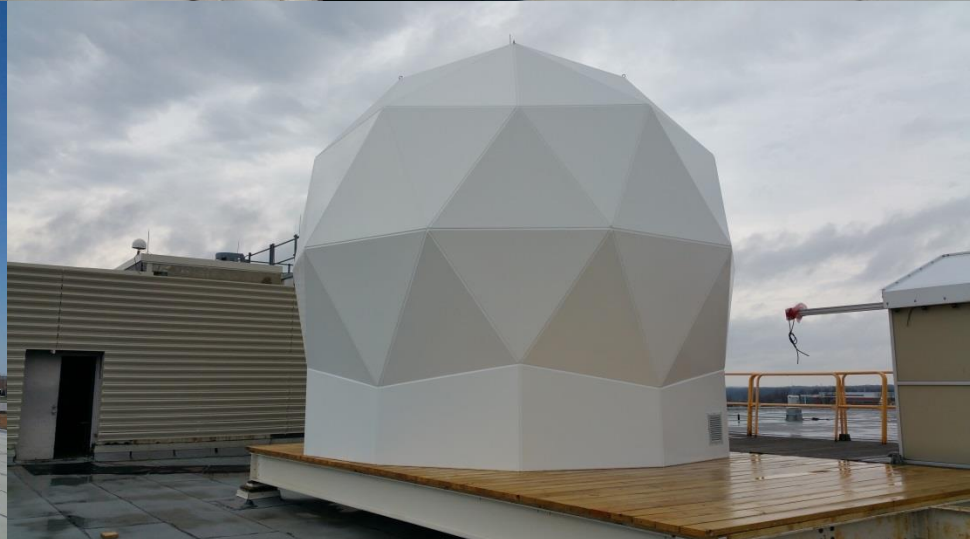
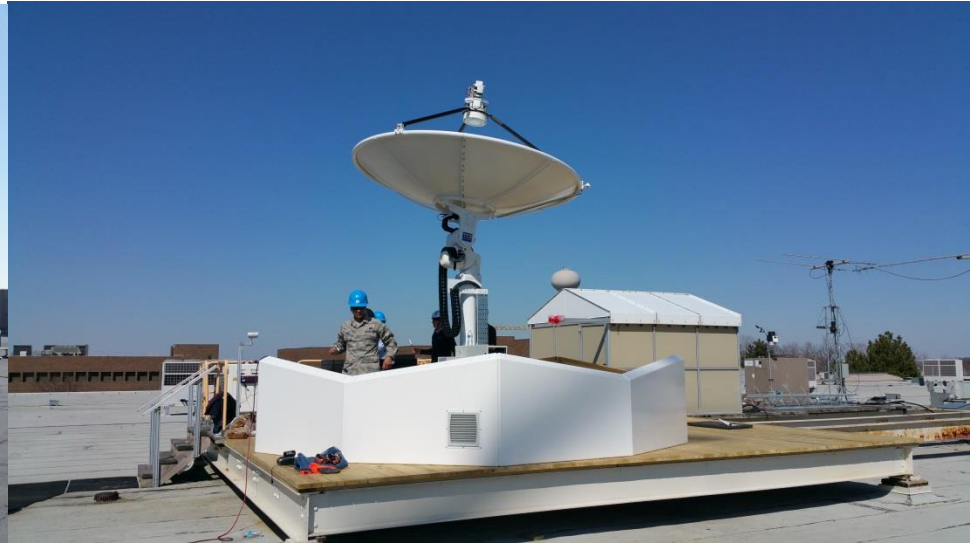
- Cover any kind of antennas (GEO, LEO, MEO, range, air traffic control, radar, etc.)
- Low loss radomes for UHF, L, S, C, X, Ku, Ka, Q, and V-band antennas
- Protection in difficult environments: wind, snow, dust, salt
- Size range: 2m – 20m
- Multiple constructions:
 - Solid Construction -Thin skin framed onto a structural space frame
 - ‘A’ Sandwich 2 skins Foam Core
 - ‘C’ Sandwich 2 Skins 2 Foam Cores and Central loaded layer
 - ‘S’ PTFE (Teflon) Fabric and Space Frame
- High Performance, low RF losses
- Low cost



Radomes

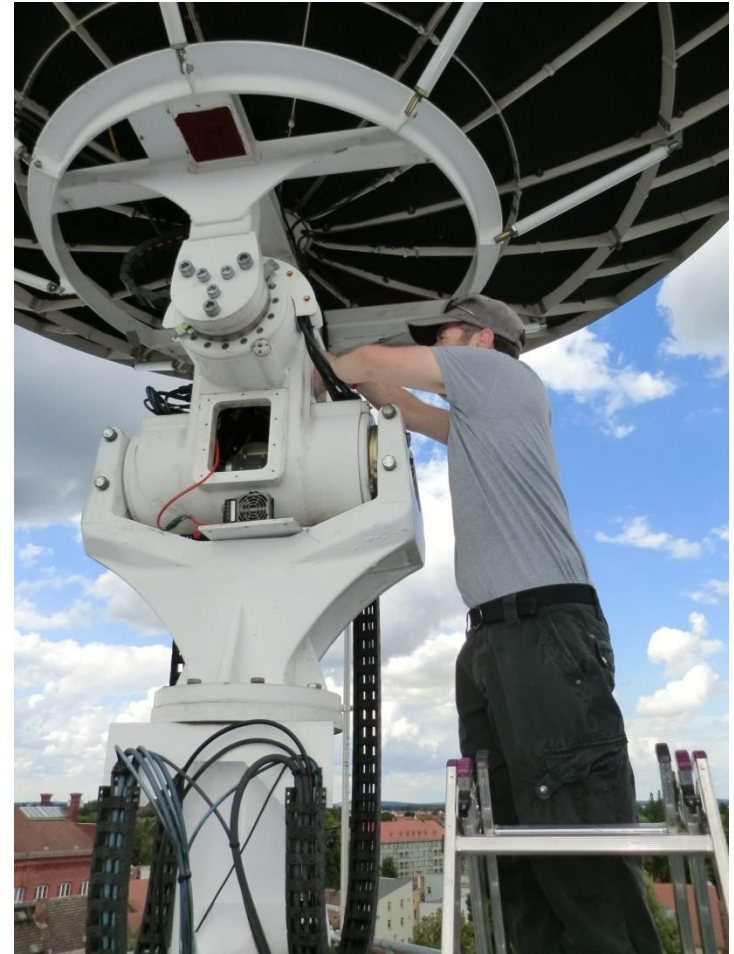


Assembly of 3m S-band Type 1 in Radome



Warranty & Maintenance Support

- Systems designed with maintainability and reliability in mind
 - Low parts count and a modular approach to design
 - Low maintenance & high reliability built-in
- Designed for >15 year life
- Help Desks providing remote assistance
 - Remote operation diagnostics
- Service & Maintenance Contracts include offsite and onsite support
 - Worldwide installation teams able to cover any site in any country, and capable of operating in all environments
 - Preventative Maintenance & call-out visits
 - Service Level Agreements
 - Obsolescence Management
- Spares Packages



SCT Advantages

- Lights-out full remote operation, including Ethernet (TCP/IP) M&C, Http XML SNMP
- Low maintenance
- Well developed, mature Monitoring and Control Software and Graphical User Interface
 - Can be integrated with customer software
- Carbon fiber reflectors/dishes used on most of our antennas (lightweight, low coefficient of thermal expansion
 - We make our own carbon fiber reflectors
- Customer focus - We can customize our standard products for specific customer needs

Summary

- Comtech -- specialists in LEO and MEO satellite tracking antennas
- Comtech has the most extensive line of X/Y antennas in the industry covering UHF, L through Q and V-band, with sizes ranging from 30cm to over 12-meters, along with radomes
- 20-year heritage of building X/Y pedestals and antenna systems
- The antennas and its operating software are mature systems with strong track records
- Carbon fiber reflectors/dishes used on most of our antennas (lightweight, low coefficient of thermal expansion)
- Comtech also manufactures Radomes
- Business rapidly expanding with growth in the LEO/MEO market
- Supporting commercial and government users worldwide
- Customer focus - We can customize our standard products for specific customer needs

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