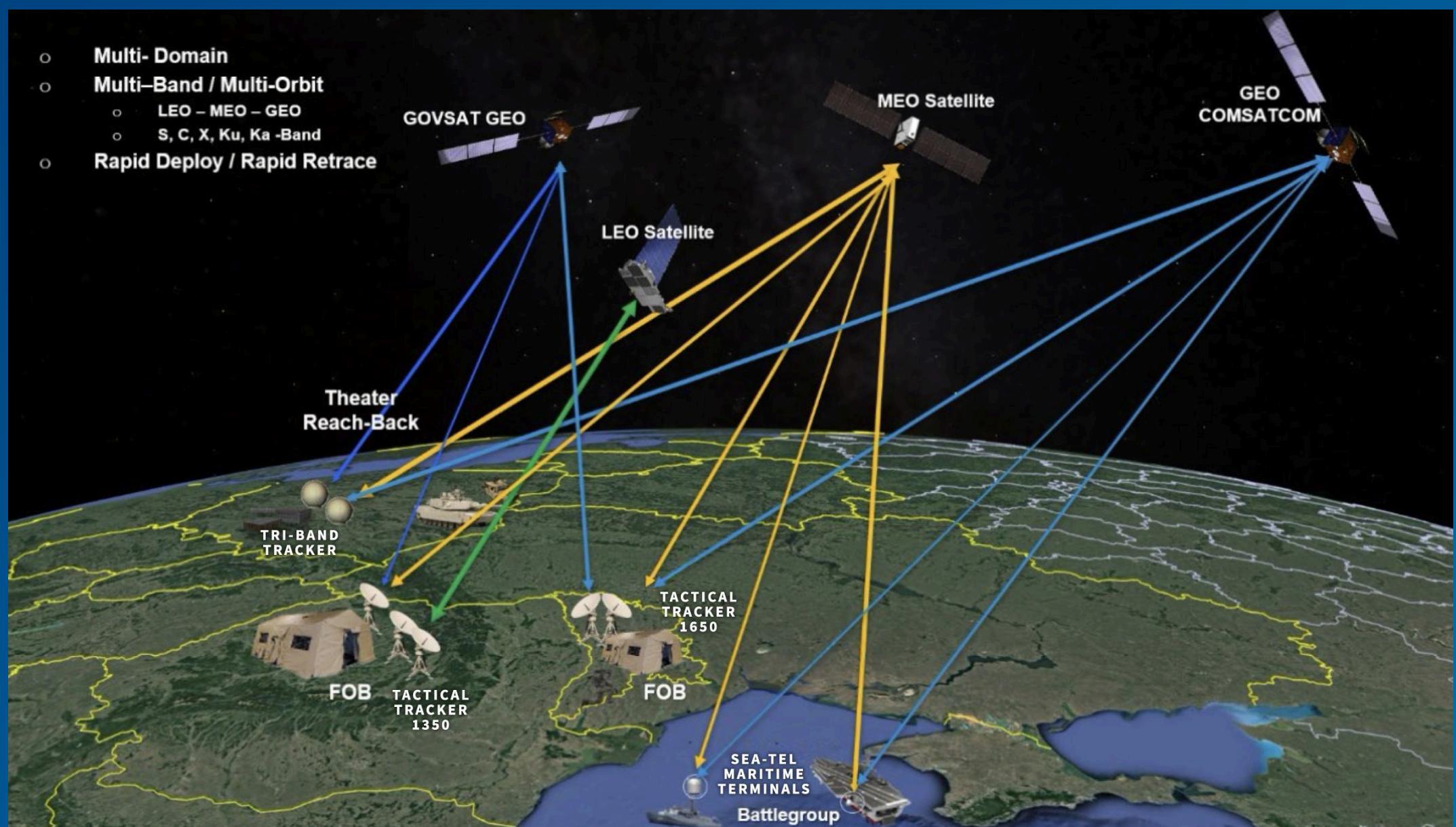


COBHAM SATCOM



TACTICAL TRACKER Technical Specification
S/C/X/Ku/Ka-band



The modern warfighter relies on a network-centric approach and this means flexible, reliable and resilient communications in theater. As threats become more complex, the need for communications increases significantly. In any orbit or at any frequency band, Cobham Satcom's TACTICAL TRACKER products meet the needs of the tactical user.

TACTICAL TRACKER

Any Orbit, Any Band, Supporting Every Mission

Cobham Satcom's TACTICAL TRACKER Terminals are purpose built X over Y tracking antennas designed from the ground up to be modular, enabling communication in any orbit, any constellation and any band - whether it is using GEO, MEO, LEO, HEO or future satellite constellations.

The TACTICAL TRACKER is available in three reflector sizes to meet the widest array of demands: 1.35 meter, 1.65 meter and 2.6 meter. It offers a high degree of flexibility, whether stand-alone, supporting a particular use-case, or working together in clusters of up-to three units where tracking is coordinated among antennas via the Cobham Satcom arbitrator.

Using the arbitrator ensures a seamless hand-over in Non-Geostationary Orbit (NGSO) operation, enabling *make-before-break*, while automating resiliency across products. Additionally, the third antenna can be configured for alternative mission sets, constellations, or frequency bands.

The Cobham Satcom Antenna Controller and drive system offer an industry - leading retrace capability, allowing a single antenna to be used in a NGSO network. This mode, *break-before-make*, has been tested on several constellations and is certified for operation on **SES's mPower MEO** without dropping modem encryption. This minimizes SATCOM system complexities by reducing the number of terminals that are essential to the mission requirements – a single terminal at the FOB.



ENABLE COMMAND AT THE TACTICAL EDGE

The TACTICAL TRACKER is a compact, modular, and cost-effective user terminal that provides secure, critical data and control connectivity to a broad range of missions. Designed to comply with the rigorous DISA standards, and validated using SAST, DAST and IAST frameworks, TACTICAL TRACKER ensures secure communications at the edge.

Quick to deploy, from in the case to on the air in as little as 20 minutes, requiring no specialized tools or training, these units are acquisition ready. Building on Cobham Satcom's heritage of reliability, the TACTICAL TRACKER is designed for the rigorous duty cycle of LEO tracking.

The segmented reflector of each variant is designed for high-performance at multi-band operations. From 2 GHz to 40 GHz, the TACTICAL TRACKER supports the frequency bands of today and into the future, all in a modular and light-weight form factor.

Various RF packages and feeds can be swapped in the field to accommodate virtually any frequency band. Cobham Satcom also offers a wide-band Ka RF kit that seamlessly covers the full 3.5 GHz frequency range from commercial to MIL Ka-band.



The TACTICAL TRACKER supports ***Any Band, Any Orbit*** operation, giving our customers unparalleled capabilities to support current and future constellations.

- Industry leading pointing and tracking
 - GEO, MEO, LEO, HEO or future orbits
- Full hemispheric coverage - *no keyhole*
- RF options supporting S,C,X, Ku and Ka-band
- Full Ka-band Tx RF 27.5 GHz to 31.0 GHz RX RF 17.7 to 21.2 GHz
- High precision carbon fiber reflector technology
- User-friendly assembly and operation - *no tools required*
- Meets MIL-STD-1472G two-person lift



TACTICAL TRACKER 1350

Product Sheet

TRACKER™
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MECHANICAL		PACKAGING (4 Cases)	
Drive	Motorized X over Y Positioner	Reflector Case	26.5 in x 26.5 in x 15.6 in - 65 lbs 67.3 cm x 67.3 cm x 39.6 cm - 29.5 kgs
Polarization	Circular X, Ka, Linear Ku	Positioner Case	37.5 in x 27.5 in x 14.5 in - 90 lbs 95.3 cm x 70 cm x 36.8 cm - 40.8 kgs
Reflector	Segmented 10-Piece Carbon Fiber	Pedestal/Controller Case	44.9 in x 25.3 in x 16.5 in - 115 lbs 114 cm x 64.3 cm x 42 cm - 52.2 kgs
Retrace Speed	30 Degrees per second	RF Case*	26.5 in x 26.5 in x 15.6 in - 60 lbs 67.3 cm x 67.3 cm x 39.6 cm - 27.2 kgs
Power Supply	110/220 V 50/60 Hz	Varies as per configuration	

ENVIRONMENTAL		
Wind - Operational*	30 MPH gusting to 45 MPH	(48 KPH gusting to 72 KPH)
Wind - Survival*	60 MPH	(96 KPH)
Temperature Operational	- 22° to 140° Fahrenheit	(- 30° to 60° Celsius)
Temperature Survival	- 40° to 158° Fahrenheit	(- 40° to 70° Celsius)

RF/ELECTRICAL	Ka BAND MILITARY		Ka BAND COMMERCIAL		Ku BAND		X BAND	
RF Parameters	Receive	Transmit	Receive	Transmit	Receive	Transmit	Receive	Transmit
Frequency	20.2-21.2 GHz	30.0-31.0 GHz	17.7-20.2 GHz	27.5-30.0 GHz	10.7-12.75 GHz	13.75 - 14.5 GHz	7.25-7.75 GHz	7.9-8.4 GHz
Polarization	Circular Xpol	Circular Xpol	Circular Xpol	Circular Xpol	Linear Xpol	Linear Xpol	Circular Xpol	Circular Xpol
Gain @ Mid Band (dBi)	47.3 dBi	49.6 dBi	46.4 dBi	49.4 dBi	42.5 dBi	43.8 dBi	38.4 dBi	38.6 dBi
VSWR	1.3: 1 Typical	1.3: 1 Typical	1.3: 1 Typical	1.3: 1 Typical	1.3: 1 Typical	1.3: 1 Typical	1.3: 1 Typical	1.3: 1 Typical
Radiation Pattern Compliance	Mil-STD-188-164A	Mil-STD-188-164A	FCC 25.209, Mil-STD-188-164A	FCC 25.209, Mil-STD-188-164A	FCC 25.209, ITU-R S.580-6	FCC 25.209, ITU-R S.580-6	Mil-STD-188-164A	Mil-STD-188-164A
Power Handling Capability	NA	250 Watts	NA	250 Watts	NA	400 Watts	NA	500 Watts
G/T @ Mid-Band (40 Degrees)	24.5 dB/K	NA	23.9 dB/K	NA	20.7 dB/K	NA	18.4 dB/K	NA
Axial Ratio	1.5	1.0	1.5	1.0			1.2	2.0
Cross Pol Isolation	>22 dB Typical	>25 dB Typical	>22 dB Typical	>25 dB Typical	>30 dB	>30 dB	>23 dB Typical	>20 dB Typical
Feed Port Isolation	> 35 dB	> 80 dB	> 35 dB	> 80 dB	> 35 dB	> 80 dB	> 110 dB	> 110 dB

CONTROL INTERFACE	OPTIONS
Controller is embedded into pedestal	Various RF kits available: Ka, Ku, X Bands available upon request
OpenAMIP and closed loop mode compatible	Various BUC options with mounting kits available
Enhanced GUI for ease of setup and operation	Anchoring kit options available
Advanced software to actively track the best signal available	Spare Parts kit available
Support GEO, MEO, LEO, HEO tracking	Other packaging configurations available upon request
Supports HTTPS for secure connection	
Support for TLE as well as CLI protocols	

TACTICAL TRACKER 1650

Product Sheet

TRACKER™
COBHAM SATCOM

MECHANICAL		PACKAGING (4 Cases)	
Drive	Motorized X over Y Positioner	Reflector Case	26.5 in x 26.5 in x 15.6 in - 70 lbs 67.3 cm x 67.3 cm x 39.6 cm - 31.7 kgs
Polarization	Circular X, Ka, Linear Ku	Positioner Case	37.5 in x 27.5 in x 14.5 in - 90 lbs 95.3 cm x 70 cm x 36.8 cm - 40.8 kgs
Reflector	Segmented 10-Piece Carbon Fiber	Pedestal/Controller Case	44.9 in x 25.3 in x 16.5 in - 115 lbs 114 cm x 64.3 cm x 42 cm - 52.2 kgs
Retrace Speed	30 Degrees per second	RF Case*	26.5 in x 26.5 in x 15.6 in - 60 lbs 67.3 cm x 67.3 cm x 39.6 cm - 27.2 kgs
Power Supply	110/220 V 50/60 Hz	Varies as per configuration	

ENVIRONMENTAL		
Wind - Operational*	30 MPH gusting to 45 MPH	(48 KPH gusting to 72 KPH)
Wind - Survival*	60 MPH	(96 KPH)
Temperature Operational	- 22° to 140° Fahrenheit	(- 30° to 60° Celsius)
Temperature Survival	- 40° to 158° Fahrenheit	(- 40° to 70° Celsius)

RF/ELECTRICAL	Ka BAND MILITARY		Ka BAND COMMERCIAL		Ku BAND		X BAND	
RF Parameters	Receive	Transmit	Receive	Transmit	Receive	Transmit	Receive	Transmit
Frequency	20.2-21.2 GHz	30.0-31.0 GHz	17.7-20.2 GHz	27.5-30.0 GHz	10.7-12.75 GHz	13.75-14.5 GHz	7.25-7.75 GHz	7.9-8.4 GHz
Polarization	Circular Xpol	Circular Xpol	Circular Xpol	Circular Xpol	Linear Xpol	Linear Xpol	Circular Xpol	Circular Xpol
Gain @ Mid Band (dBi)	48.6 dBi	51.1 dBi	48.1 dBi	50.9 dBi	43.9 dBi	45.2 dBi	40.1 dBi	40.5 dBi
VSWR	1.3: 1 Typical	1.3: 1 Typical	1.3: 1 Typical	1.3: 1 Typical	1.3: 1 Typical	1.3: 1 Typical	1.3: 1 Typical	1.3: 1 Typical
Radiation Pattern Compliance	Mil-STD-188-164A	Mil-STD-188-164A	FCC 25.209, Mil-STD-188-164A	FCC 25.209, Mil-STD-188-164A	FCC 25.209, ITU-R S.580-6	FCC 25.209, ITU-R S.580-6	Mil-STD-188-164A	Mil-STD-188-164A
Power Handling Capability	NA	250 Watts	NA	250 Watts	NA	400 Watts	NA	500 Watts
G/T @ Mid-Band	26.1 dB/K	NA	25.8 dB/K	NA	23.9 dB/K	NA	20.6 dB/K	NA
Axial Ratio	1.5	1.0	1.5	1.0			1.2	2.0
Cross Pol Isolation	>22 dB Typical	>25 dB Typical	>22 dB Typical	>25 dB Typical	>30 dB	>30 dB	>23 dB Typical	>20 dB Typical
Feed Port Isolation	> 35 dB	> 80 dB	> 35 dB	> 80 dB	> 35 dB	> 80 dB	> 110 dB	> 110 dB

CONTROL INTERFACE	OPTIONS
Controller is embedded into pedestal	Various RF kits available: Ka, Ku, X Bands available upon request
OpenAMIP and closed loop mode compatible	Various BUC options with mounting kits available
Enhanced GUI for ease of setup and operation	Anchoring kit options available
Advanced software to actively track the best signal available	Spare Parts kit available
Support GEO, MEO, LEO, HEO tracking	Other packaging configurations available upon request
Supports HTTPS for secure connection	
Support for TLE as well as CLI protocols	

TACTICAL TRACKER 2600

Product Sheet

TRACKER™
COBHAM SATCOM

MECHANICAL		PACKAGING (6 Cases)	* All case weights are estimated
Drive	Motorized X over Y Positioner	Reflector Case	24 in x 45 in x 41 in - 176 lbs 61 cm x 114.3 cm x 104.1 cm - 79.8 kgs
Polarization	Circular X, Ka, Linear Ku	Leg/Strut Case	13 in x 66 in x 21 in - 120 lbs 33 cm x 167.6 cm x 53.3 cm - 54.4 kgs
Reflector	Segmented 8-Piece Carbon Fiber	Lower Positioner Case	18 in x 36 in x 20 in - 89.5 lbs 45.7 cm x 91.4 cm x 50.8 cm - 40.6 kgs
Retrace Speed	5 Degrees per second	Upper Positioner Case	18 in x 36 in x 20 in - 85.3 lbs 45.7 cm x 91.4 cm x 50.8 cm - 38.7 kgs
Power Supply	110/220 V 50/60 Hz	Pedestal/Controller Case	17 in x 23 in x 54 in - 155 lbs 43.3 cm x 58.4 cm x 137.2 cm - 38.7 kgs
		RF Case*	13 in x 32 in x 20 in - 69.4 lbs 33.3 cm x 81.3 cm x 50.8 cm - 31.5 kgs
Varies as per configuration			

ENVIRONMENTAL		
Wind - Operational*	30 MPH gusting to 45 MPH	(48 KPH gusting to 72 KPH)
Wind - Survival*	60 MPH	(96 KPH)
Temperature Operational	- 22° to 140° Fahrenheit	(- 30° to 60° Celsius)
Temperature Survival	- 40° to 158° Fahrenheit	(- 40° to 70° Celsius)

RF/ELECTRICAL	Ka BAND MILITARY	Ka BAND COMMERCIAL	Ku BAND		X BAND			
RF Parameters	Receive	Transmit	Receive	Transmit	Receive	Transmit	Receive	Transmit
Frequency	20.2-21.2 GHz	30.0-31.0 GHz	17.7-20.2 GHz	27.5-30.0 GHz	10.7-12.75 GHz	13.75-14.5 GHz	7.25-7.75 GHz	7.9-8.4 GHz
Polarization	Circular Xpol	Circular Xpol	Circular Xpol	Circular Xpol	Linear Xpol	Linear Xpol	Circular Xpol	Circular Xpol
Gain @ Mid Band (dBi)	52.2 dBi	54.7 dBi	51.8 dBi	54.7 dBi	47.6 dBi	48.7 dBi	43.8 dBi	44.0 dBi
VSWR	1.3: 1 Typical	1.3: 1 Typical	1.3: 1 Typical	1.3: 1 Typical	1.3: 1 Typical	1.3: 1 Typical	1.3: 1 Typical	1.3: 1 Typical
Radiation Pattern Compliance	Mil-STD-188-164A	Mil-STD-188-164A	FCC 25.209, Mil-STD-188-164A	FCC 25.209, Mil-STD-188-164A	FCC 25.209, ITU-R S.580-6	FCC 25.209, ITU-R S.580-6	Mil-STD-188-164A	Mil-STD-188-164A
Power Handling Capability	NA	250 Watts	NA	250 Watts	NA	400 Watts	NA	500 Watts
G/T @ Mid-Band	29.5 dB/K	NA	29.2 dB/K	NA	27.3 dB/K	NA	23.9 dB/K	NA
Axial Ratio	1.5	1.0	1.5	1.0			1.2	2.0
Cross Pol Isolation	>22 dB Typical	>25 dB Typical	>22 dB Typical	>25 dB Typical	>30 dB	>30 dB	>23 dB Typical	>20 dB Typical
Feed Port Isolation	> 35 dB	> 80 dB	> 35 dB	> 80 dB	> 35 dB	> 80 dB	> 110 dB	> 110 dB

CONTROL INTERFACE	OPTIONS
Controller is embedded into pedestal	Various RF kits available: Ka, Ku, X, C and S Bands available upon request
OpenAMIP and closed loop mode compatible	Various BUC options with mounting kits available
Enhanced GUI for ease of setup and operation	Anchoring kit options available
Advanced software to actively track the best signal available	Spare Parts kit available
Support GEO, MEO, LEO, HEO tracking	Other packaging configurations available upon request
Supports HTTPS for secure connection	
Support for TLE as well as CLI protocols	

TRACKER IN DETAIL

TRACKER™
COBHAM SATCOM

The Cobham Satcom TACTICAL TRACKER antenna system is purpose-built as the industry's premier any orbit, quick deploy tracking antenna. It supports a rapid retrace functionality fast enough that encryption is not lost during a retrace event. While packet loss does occur, the time without link is short enough to be accommodated by the encryption buffer.

The rapid retrace is supported by the lightweight, high-precision carbon fiber reflector and the Cobham Satcom Integrated Control Unit (ICU). Consisting of a closed-loop motor control and sophisticated pointing and tracking algorithms, the TACTICAL TRACKER is capable of horizon-to-horizon travel with speeds up over 16 deg/sec, retrace at up to 30 deg/sec and an acceleration rate of up to 10 deg/s². These speeds and acceleration rates are achieved using high-torque motors driving through compensated gearboxes.

There are three primary electronic components that make up the ICU:

- The antenna control processor
- The Inertial Measurement Unit (IMU) is used to indicate to the control system the movement the antenna is experiencing
- The tracking receiver, which can be utilized for initial site calibration when the carrier detect or signal level is not available from the modem, using sources such as the sun or known GEO satellites.

The TACTICAL TRACKER Series use Cobham Satcom's trusted Antenna Control Software (ACS), which performs the ICU's configuration, control, management, and monitoring.

ACS provides multiple user interfaces to the ICU, which include serial, USB, and IP via Ethernet.



Tactical Tracker Series X over Y motor drive placement

Cobham Satcom's pointing and tracking algorithms are industry-leading, refined, and perfected over three decades. When operating in NGSO, the ICU can process TLE or ephemeris data for a selected satellite, well in advance of a pass, receiving this directly from the constellation, simplifying user operation and ensuring tracking accuracy.



Build the Antenna, Switch it On, and Walk Away.



ANY ORBIT, ANY BAND, ANY NETWORK

- Three sizes, one user interface, seamless experience
- Multi-orbit – LEO/MEO/GEO/HEO
- Gateways & user terminals
- ISMS/ISO270001 compliant

TRACKER™
COBHAM SATCOM

THE FUTURE DELIVERED NOW

TRACKER™
COBHAM SATCOM

Cobham Satcom has been designing, building and fielding satellite terminals since 1978. Drawing from our heritage of serving demanding customer segments, we continue to innovate and iterate our products to meet the challenges of the future.

We are expanding the capabilities of our TACTICAL TRACKERS, from adding features to our interface, to enhancing retrace speeds and developing additional RF feeds and switching options. We build modular systems today with an eye towards the future.

Future Advanced SATCOM (FAST) was conceptualized over a decade ago with CERDEC and has now these features are commercially available. A significant benefit of the FAST architecture is enabling Digital RF/IF processing such that software-defined platforms and/or software-defined modems (SDM) that can be utilized to meet evolving mission requirements. Secondary benefits include improved channel topology management for the next generation of satellites with advanced DSP payload architectures.

UPGRADES AND OPTIONS:

- A range of LNAs, LNBs and BUCs, Feeds and Switching configurations
 - Full coverage Ka-Band BUCs
 - Wide Band Programable LNB's
- FAST, Digital IF ready
- Standard coaxial IFL
- QD Transportable radome (environmental protection)
- Anchoring Kits
- Grounding Kits
- Spare Parts Kits
- Additional colors and patterns upon request

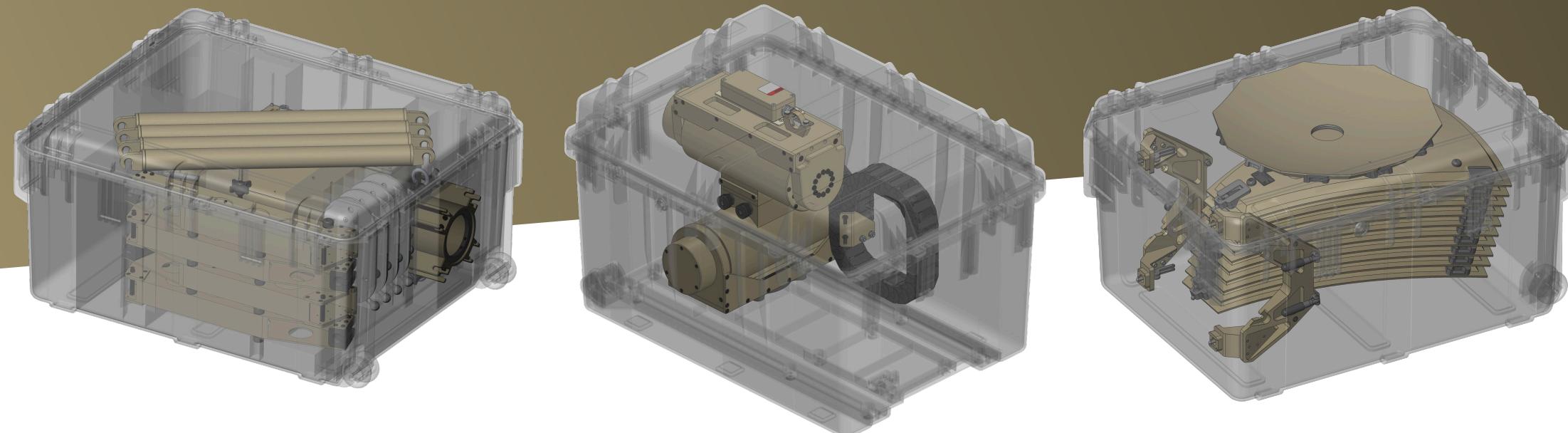
TIME TO RETRACE

The TACTICAL TRACKER Series has the added design feature of a *break-before-make* capability giving the customer the operational topology options to reduce the number of terminals required at any location for NGSO, and NGSO to GEO. Rigorously tested using SES's mPower constellation, the retrace is fast enough to maintain encryption. Below results are typical.

No. Satellites	11	MEO
Separation	32.73	degrees
1/2 Separation	16.36	
Accel	10	deg/sec/sec
Time	5	sec
Velocity	16.1	deg/sec
Distance	32.72	deg
Goal Distance	54	deg
Time	4.65	sec
Velocity	23.24	deg/sec

Retrace is calculated at the equator but improves with latitude positioning. Demodulator lock, IP Layer setup latencies are not included.

TACTICAL TRACKER SERIES PACKING CONFIGURATION





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