



**FLANN  
MICROWAVE**

Waveguide solutions for the SATCOM & Space markets



Using our design, manufacturing and calibration expertise we provide Hi-Rel COTS and bespoke Waveguide solutions to solve complex SATCOM & Spaceflight challenges.

## The future of Waveguide is in our hands

Flann Microwave Ltd is a market leading designer and manufacturer of precision RF Waveguide products up to 1.1 THz, providing solutions and services to the Telecom, SATCOM & Space markets since 1956. Flann's workforce, consisting of highly skilled engineers and professionals, continually stretch the limits of possibility with waveguide solutions not available elsewhere on the market.

Our ability to: design, manufacture, and validate on site, gives the advantage of taking new designs through prototype stage and on to deliverable instruments within quick timeframes and is the basis behind Flann's global reputation for delivering high quality, highly repeatable, waveguide components and systems Worldwide.

Flann has been present in the SATCOM market for decades, offering instruments such as antennas, antenna feed systems, waveguide switches and other componentry required by our customers. We're now establishing ourselves as a growing key part of the Space industry since being approached by the Jet Propulsion Laboratory (JPL, NASA) back in 2015 to provide critical waveguide hardware for the Surface Water and Ocean Topography (SWOT) satellite.



## Spaceflight with Flann

As part of the NASA JPL Surface Water and Ocean Topography (SWOT) satellite mission, a requirement was identified for an ability to retain calibration in extreme Space environment. In response Flann designed and built a selection of Spaceflight Fixed Attenuators, Terminations & K-type Adaptors ready for installation into a waveguide channel Ka-band radar instrument.

Methods developed to achieve Spaceflight qualification include, bolted rather than brazed construction, load element dual retention, mechanical encapsulation, secondary bonding, and viewing lids to allow full inspection of bond lines

SWOT, launched on December 16th 2022, has two Spaceflight attenuators installed which enables consistent, high accuracy measurements of Earth's surface water, in the harsh Space environment



## Custom Waveguide, Sub Assemblies and Switching Networks

### Satellite Calibration

Goonhilly Earth Station is one of very few calibrated facilities in the world for very high accuracy measurement of satellite performance. Flann retrofitted componentry including wideband diplexers to an existing collapsible dish antenna feed on location, in Cornwall, UK.

Their capability to operate in both the Southern and Northern hemispheres (horizontal and vertical polarisation) is due to a complex waveguide switching matrix, delivered by Flann, that is calibrated as a single assembly and which enables a high accuracy rugged re-locatable Reference.

# Waveguide Switches

## Lightweight miniaturised spaceflight W-Band switch

Advancing the state of the art in 'waveguide technology for spaceflight' offers a step change in emerging super high-capacity satellite communications links.

The huge demand from individuals and businesses for more high-speed data services, will continue to lead to an explosion in the number of satellites in LEO. Our precision electro-mechanical waveguide switch technology is ready to be tailored to mission-specific specifications with designs spanning 33GHz to 220GHz.

Our continued development has involved combining the switch with diplexers, multiplexers, combiners, and couplers to make a complete light weight switching network for flight at 'High g' launch profiles.



This W-band switch Approx. 17mm x 17mm x 50mm  
Designed & built by Flann.

Features:

- Robust, lightweight and compact construction
- Stable performance at temperature extremes
- Bi-stable latching with non-contacting detent
- Position tell back with non-contacting sensor
- Superior peak power & multipaction immunity
- Low PIM

In developing this switch we have increased the communication frequency to 100 GHz+, setting a new state of the art in 'waveguide technology for spaceflight', and increased data capacity capability from space.

And...

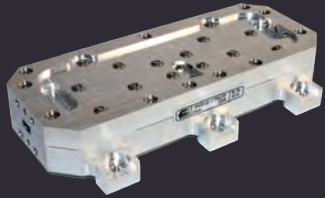


## SATCOM DC-Operated 2-Channel Waveguide Switches

- Models 2.6 GHz to 40.1 GHz
- High isolation & Low insertion Loss
- High reliability (>1,000,000 actuations)
- Sealed, Pressurisable to 15 psi(g) standard

Designed for both Internal and External usage  
Applications include: SATCOM Systems, Switching Networks and SNG  
Available options include: Weatherproofing, custom voltage, and various connector types.

## Couplers & Attenuators



- Retains Calibration in extreme Space Environment
- Aluminium, split-block design with Load Element Dual Retention
- Available from 2.60 GHz to 500 GHz

Fixed level attenuators and high performance couplers enable consistent, high accuracy measurements in the extreme Space environments. Qualified design provides low risk for new bespoke models.

## Diplexers, Polarizers & OMT's



- Diplexers & Polarizers available for custom Rx and Tx frequencies
- OMTs available as narrow band or full band devices
- Innovative compact designs

Bespoke or COTS models available to suit existing E-band and Q/V-band designations. Compact, rugged design ensure suitability for the toughest environments while offering optimal RF performance.

## Antennas



- Linear & circular options available, dual polarization available with antenna feed
- High power phased array antennas & standard gain horns also available
- Additive manufacturing techniques now used for high frequency corrugated horns

Extensive range of antenna options available to suit any application whether terrestrial, airborne or spaceflight. Inherently robust while providing superior sidelobe and cross-polar performance where applicable.

## Waveguide Terminations



- Water cooled, thermal sink plate radiation and convection cooled options available
- Finite Element Analysis (FEA) carried out to confirm compliance
- Non shedding and designed with stress equalisation

High and low power terminations available using various cooling methods to meet the toughest of demands, regardless of the application. Extensive legacy supplying into ground-based TVAC environments.

## Complex Waveguide Solutions



- High RF performance using a thin wall, low mass, compact solution
- Optional materials, finishes and interfaces available
- Models available from 2.6 GHz to 1.1 THz

Complex waveguide solutions enable seamless connection between custom positioned ports. Ability to incorporate multiple bends, twists and other features to meet bespoke requirements while withstanding extreme Space environments.

## Waveguide to Coaxial Transitions



- Rugged metal construction with air-line coax for extreme environments
- Various waveguide and coaxial interfaces available
- End launch or alternative profiles also available

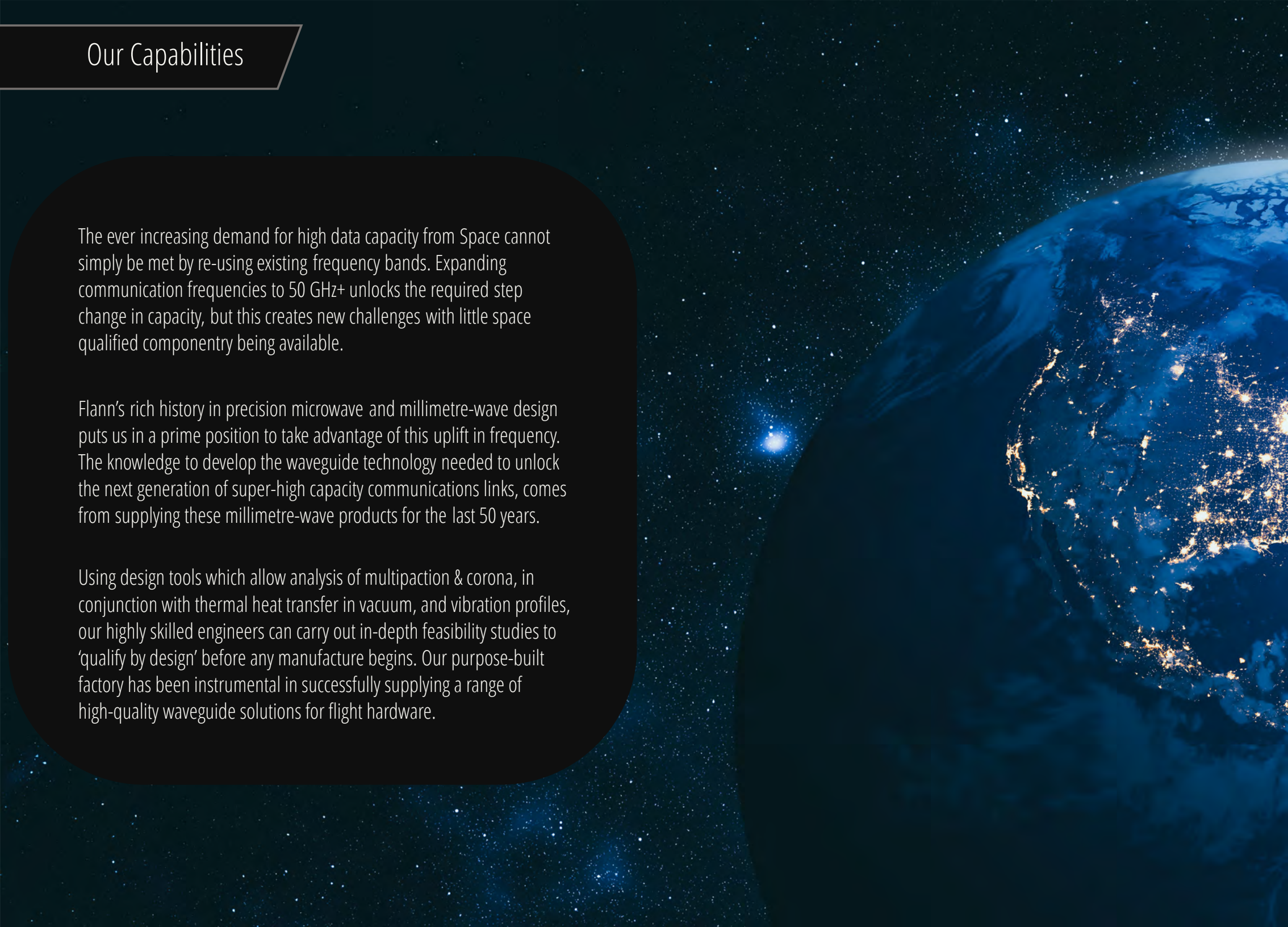
Building upon decades of supply of waveguide to coaxial adapters, spaceflight options are now available as either bespoke or COTS and to suit narrowband or full waveguide band frequencies.

## Our Capabilities

The ever increasing demand for high data capacity from Space cannot simply be met by re-using existing frequency bands. Expanding communication frequencies to 50 GHz+ unlocks the required step change in capacity, but this creates new challenges with little space qualified componentry being available.

Flann's rich history in precision microwave and millimetre-wave design puts us in a prime position to take advantage of this uplift in frequency. The knowledge to develop the waveguide technology needed to unlock the next generation of super-high capacity communications links, comes from supplying these millimetre-wave products for the last 50 years.

Using design tools which allow analysis of multipaction & corona, in conjunction with thermal heat transfer in vacuum, and vibration profiles, our highly skilled engineers can carry out in-depth feasibility studies to 'qualify by design' before any manufacture begins. Our purpose-built factory has been instrumental in successfully supplying a range of high-quality waveguide solutions for flight hardware.







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