

AIR TRAFFIC TECHNOLOGY INTERNATIONAL 2020

THE INTERNATIONAL REVIEW OF AIR TRAFFIC TECHNOLOGY AND MANAGEMENT

DOMAIN OF THE DRONES



How unmanned systems can help integrate
drones into air traffic operations

ADS-B OUT

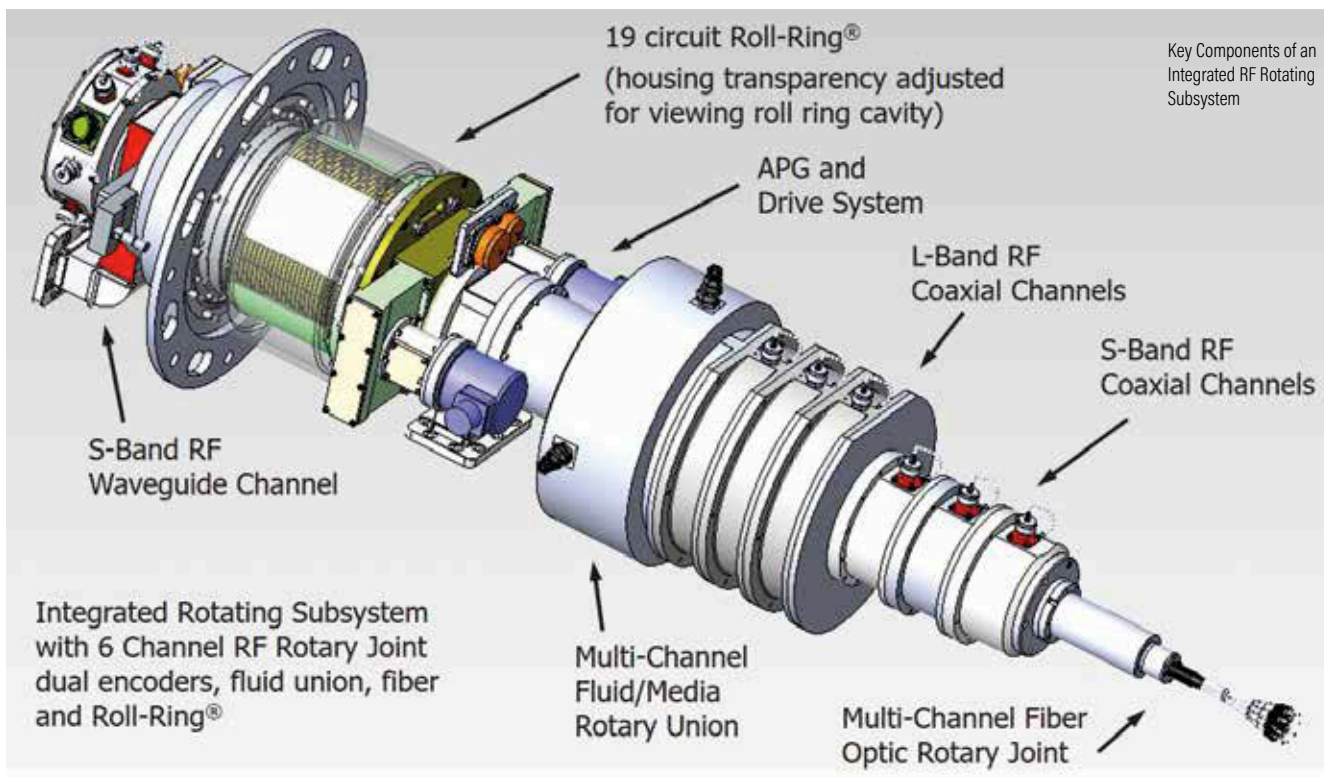
The new surveillance technology is proving
its worth over the North Atlantic

GPS BACKUP

An abandoned ground-based navigation
system could provide security to aviation

HUMAN FACTORS

Why controllers should be wary of the risks
autonomous systems may pose



PROGRESSIVE ROTATING SUBSYSTEMS

How new technology is restoring life to aging ATC and military rotary joints, and integrating innovative components into existing subsystems

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At the heart of an ATC radar is a radio frequency rotary joint subsystem. This subsystem is used to pass power and signals through the rotating interface; separating the antenna above and the radar processing electronics below.

Although complex radio frequency (RF) rotating subsystems represents just a fraction of an entire ATC radar, maintenance and overhaul of these components is key to successful long-term operation of the radar.

ATC Radar Systems which use RF rotary joints include Air Route Surveillance Radar (ARSR), Airport Surveillance Radar (ASR), Secondary Surveillance Radar (SSR), Airport Surface Detection Equipment (ASDE) and Terminal Doppler Weather Radar (TDWR)



Maintenance, overhaul & repair

Replacing or refurbishing RF rotary joint subsystems for aging radars can be a challenge. Often the original OEM may no longer support the older systems. In addition, keeping the RF rotating subsystem operational at an affordable price has become increasingly important. A qualified and reliable resource for proper maintenance is crucial in this market. Diamond Antenna and Microwave, a global supplier of RF rotary joints and rotating subsystems, has responded to these needs by offering affordable worldwide refurbishment, form fit function replacements and upgrades to any rotary joint regardless of the original model and manufacturer.

While scheduled maintenance is the preferred safeguard against catastrophic rotary joint failures, typically RF rotary joints are a forgotten maintenance item until the radar system fails. Although RF rotary joints channels are typically non-contacting, common breakdowns can be caused by a failure of: the bearing lubrication and bearings, the pressurization seals due to excessive wear, the slip ring circuits due to brush/ring failure or the azimuth positioning generator and drive system

Failure in any of these items indicates that the RF rotary joint subsystem must be serviced. The repair cycle turnaround time can be excessive and expensive. Diamond Antenna works closely with its customers to solve these problems in a cost-effective manner by offering reverse engineering services to guarantee form, fit and function

1 Diamond Series 2920 Primary & Secondary ATC Radar Rotary Joint
 2 Diamond Series 2355 Secondary Surveillance Radar
 3 Diamond technicians reassembling a repaired RF rotary joint
 4 A failed RF rotary joint ready for refurbishment
 5 Diamond Series 26102 Airport Surveillance Radar



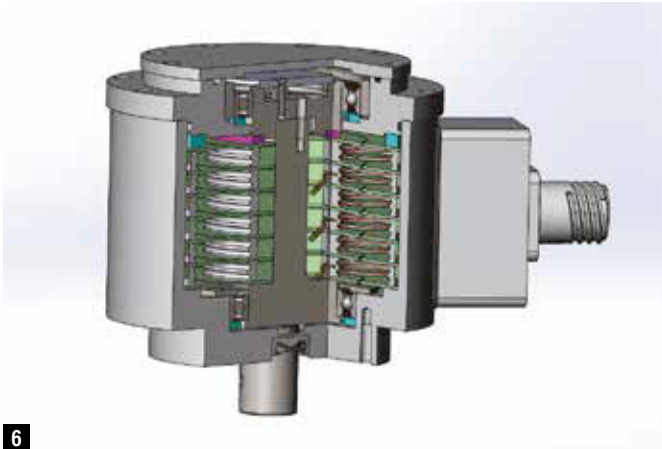
replacement parts including bearings, seals, cables, slip rings, encoders as well as complete replacement units. Diamond Antenna also maintains an inventory to reduce turnaround time of refurbished units with preordered stocked parts kits and for a lower unit refurbishment price.

Integrating additional components

When upgrading and manufacturing new ATC and military radar systems, OEMs and end-users are continuing to incorporate integrated RF rotating subsystems that include additional rotating components beyond the RF rotary joint, slip ring and APG package. As systems become more complex and data transfer requirements increase, many radar manufacturers are requesting to incorporate additional components such as fiber optic rotary joints, fluid/media rotary unions, and low maintenance slip rings.

RF Rotary joint channels: Diamond Antenna's waveguide and coaxial RF microwave transmission channels use a capacitive-coupled, non-contacting approach to ensure RF performance that meets or exceeds the intended life of the product. Diamond Antenna's ATC rotary joints are fully Mode-S compliant.

Roll-Ring: The Diamond Roltran Roll-Ring is an innovative next-generation slip ring that uses a rolling, instead of sliding, electrical contact for transfer of data and power signals. The rolling contact at the electrical interface provides extended



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6 Diamond Roltran Roll-Ring Cross Section, revealing the rolling electrical contact which provides extended operating life without field maintenance

7 Closeup of Diamond Roltran Roll Ring which provides ample shock tolerance with low torque, low resistance, and low noise

8 Upgraded RF rotary joint with fiber optic for increased data transfer



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operating life without field maintenance and allows airports to avoid unscheduled interruptions and downtime for maintenance before the entire rotary joint assembly is removed for scheduled factory service.

Azimuth positioning generator (APG) and drive system: The APG is used to synchronize return data with azimuth position. The typical Diamond Antenna APG drive system includes a large diameter shaft mount to transfer rotation from the main bearings to a precision gear located concentric to the axis of rotation. The main gear then transfers position to one or two smaller gears, precisely located relative to the main gear. All gears are rated AGMA 14 or better in order to ensure accuracy. Solid stainless-steel rods transfer the motion to the encoder shafts.

Fiber optic rotary joints (FORJ): This is the optical equivalent of the electrical slip ring. The FORJ allows uninterrupted transmission of an optical signal while rotating along the fiber axis and provides data rate transfer to 10Gbit/s. Single and multi-mode transmission is available in one or multiple fiber optic channels.

Fluid rotary joints: A fluid/media rotary union allows the transfer of air, gas or liquid through the rotational interface. Liquid transfer is often required for the cooling of components at the antenna. One or more channels can be integrated within the rotating subsystem.

Effective long-term operation of an ATC radar depends partially on the reliability of the rotary joint channels. New technology and capabilities are permitting old radar

subsystems to be overhauled at a fraction of the cost of replacement. Similarly, ATC and military radar manufacturers seeking upgrades can incorporate integrated RF rotating subsystems and components such as fiber optic rotary joints, fluid/media rotary unions, and low maintenance slip rings.

Dependable & affordable

For over 60 years, Diamond Antenna and Microwave has been a global supplier, designer and manufacturer of RF rotary joints and rotating subsystems. It is the leader in maintenance, overhaul, repair, upgrades and new installation of integrated RF rotating subsystems for ATC and military radar. The company provides dependable and affordable service, without sacrificing the quality needed to ensure reliable performance. ❖

Diamond Antenna Air Traffic Control RF Rotary Joints and Rotating Sub-Systems

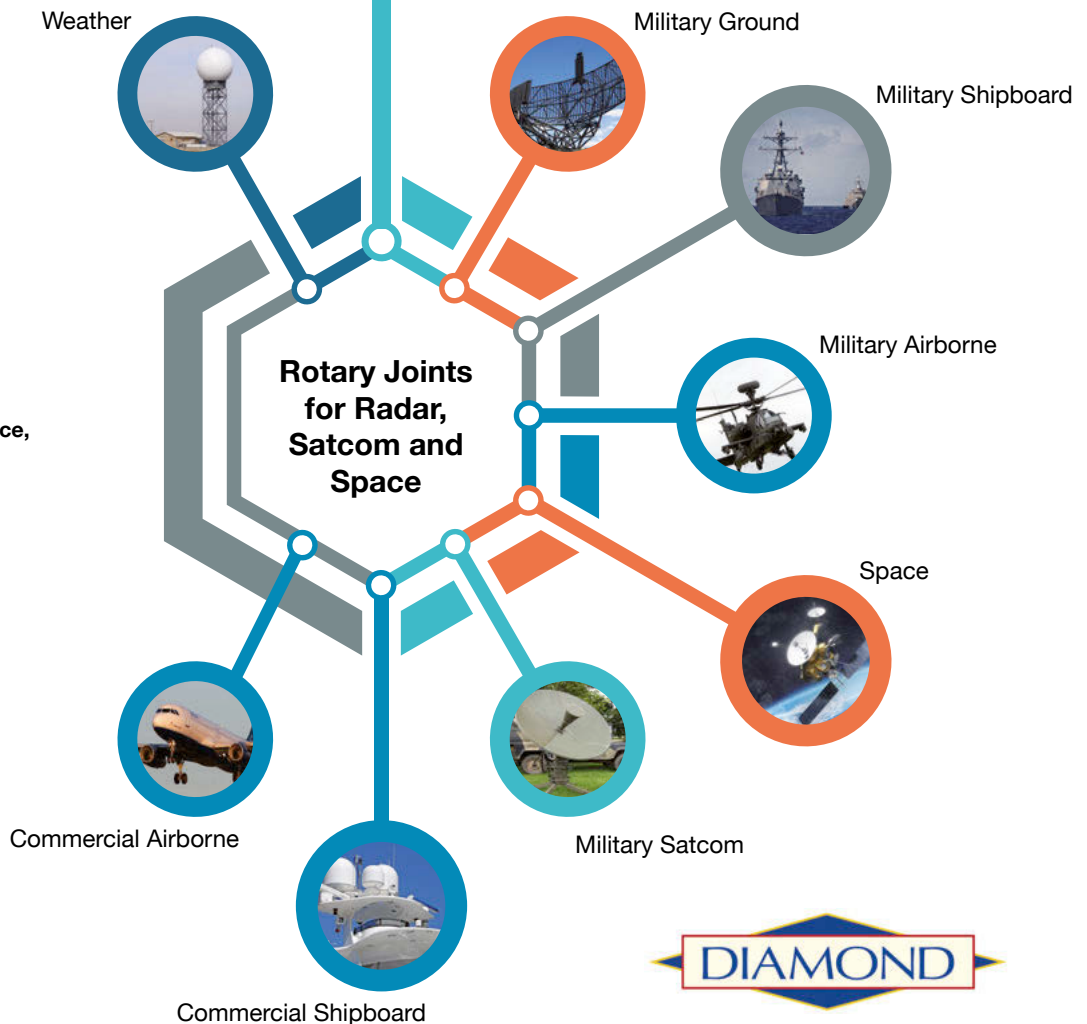
For over 60 years, Diamond Antenna and Microwave has been a leading global supplier, designer and manufacturer of RF rotary joints and rotating subsystems. Diamond offers overhaul and repair, form fit function replacements, and upgrades to any rotary joint regardless of the original manufacturer.



Qualified, reliable, and affordable maintenance, overhaul and repair of RF rotary joints and rotating subsystems.



ATC



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