Noise & Vibration
Testing Solutions
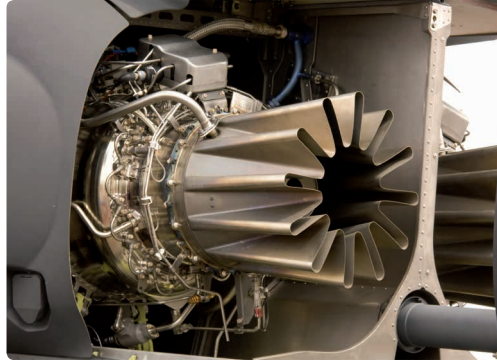
for Aerospace Industries

OROS

Matching your Challenging Tests

Portable, Flexible and Accurate Instruments for your Environment

Laboratory measurement & analyses

> Prototype validation

> Sub-systems tests

> Fatigue tests

Comprehensive application software suite

> Structural dynamics, rotating analysis and acoustics measurement from the same instrument

> Cascadable, up to 1000+ channels

> Universal inputs ranging from ICP and float to strain gauges and thermocouples

> Multiple and synchronous analysis with back-up time signal recording

In-flight data acquisition

> Aircraft/airport validation

> Helicopter/fighter retrofit

> Cabin noise

> Flight clearance

> Data aquisition

Accurate and secured data whatever the conditions

> Light, rugged and real-time instruments

> Secured recording and monitoring

> PC free operations with on board front-panel

> Removable hard drive (SSD)

> Wireless capable, battery powered

> Shock, vibration and temperature reinforced

> IRIG, GPS

> Distributed up to 1000+ channels

> Stand alone long duration recording

Test center

> Satellite & parts tests

> Rockets & jet engine test

> Satellite & antenna transportation survey
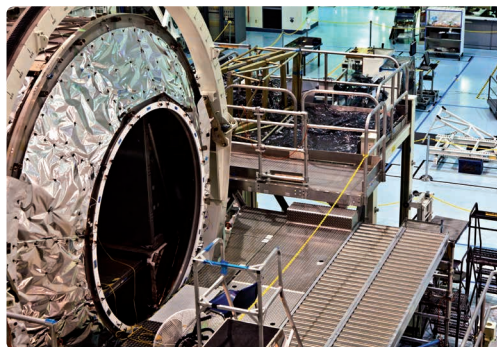
Rack, stand alone or distributed

> Large channel count solution up to 1000+ channels

> Thermocouples/RTDs and strain gauges integrated conditioners

> ICP, float/AC/DC/TEDS inputs

> Easy integration with our complete control/command tool kit (Python)

> Wide range of export formats (Mat, ATFx, UFF, Txt, SDF, Wav…)

www.oros.com

OROS Solutions
Enhance your Efficiency

Based on a range of modular instruments, from 2 to 32 channels, the Teamwork technology enables to cascade or distribute the analyzers to measure up to 1000 channels. Instruments, conditioners and software licenses are exchangeable and flexible. Data are also easy to share thanks to the native technology.

TEAMWORK INSTRUMENTS from 2 to 32 channels, distributed up to 1000+

Flexible Connection

> Mobile Analyzer, Wi-Fi
> Distributed Configuration
> Remote Access
> Large Channel Count Systems

Made For the Field

> Portable
> Rugged
> Real-Time
> Multi-Channel

Multioperations

> PC Free Recorder
> Online & Post Analysis
> Multianalysis
> Handling Any Transducers

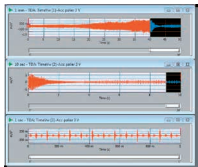### Accurate

> DSP-based
> 24 Bit – 40 kHz – 140 dB
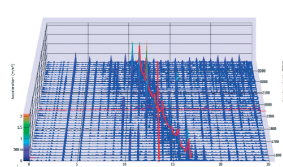> ± 40 V input range
> ±0.02 dB / ±0.02°

SOFTWARE R&D, Acceptance, Diagnostics

Data Acquisition
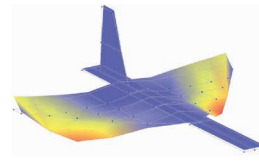
> Recorder
> Time Domain Analysis
> Monitoring
> Temperature
> Strain

Rotating Analysis
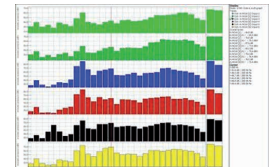
> Dual Synchronous Order Analysis
> Shaft torsion
> Balancing
> Balancing
> Orbit

Structural Dynamics

> FFT
> Modal analysis
> Normal Modes Testing

Noise Analysis

> Sound Power
> 1/3rd octave
> Sound Intensity
> Sound Quality
> TPA
> Holography

SERVICES Anywhere Close to You

Training

> Initial
> Advanced
> Webinar

Coaching

> Measurement efficiency
> Software customization
> Tools for automation

Expertise

> Applicative classes
> Diagnostics / Troubleshooting
> Consulting services
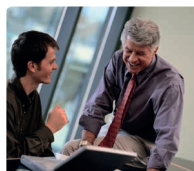
A Dedicated Team

> Dynamic and responsive Services department
> Worldwide hotline
> Global Accredited Maintenance Centers (worldwide coverage)
> Renting
> Ready-to-go systems at any time

Maintenance and Contracts

> Premium contracts
> Software updates
> Hardware upgrades
> Calibration

OROS
MEASURING NOISE & VIBRATION

Rotating Analysis

Multiple Shaft Engine Tests

Propulsion safety is critical for the aero industry. **The OROS analyzers record raw data** and display the information you need for proper jet engine test. Thanks to the **Double Synchronous Order Analysis,** they compute the orders of **shafts** jet engines during hours of tests required by the **propulsion tests centers** or flight/taxi tests. The **integrated conditioners** offer a wide range of transducer interface (ICP, Float, ±40 V, Strain gauges, Thermocouples, PT100, Oversampled tachs). With the data and control/command tool kit (NVDrive®) the analyzer is **easy to integrate in the test benches.**
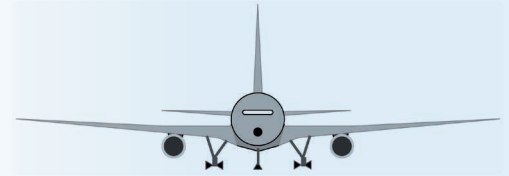
Helicopter Transmissions

Multi-shaft order analysis provides **synchronous order extraction** from the rotor and the turbine. Vibrations related to **gears** are extracted with the **FFT-Diagnostics tool. Absolute and relative torsional motions** are acquired and analyzed with the **integrated high speed torsional inputs.**
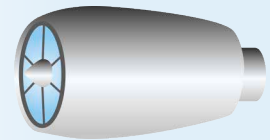
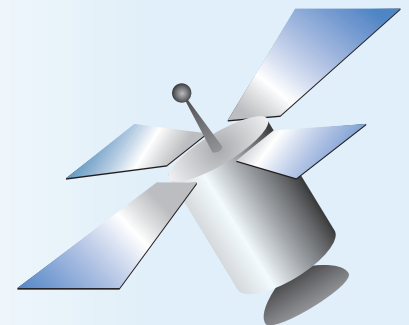## Data Acquisition

In-Flight Recording

The different components installed in a aircraft are tested in-flight to validate their integration. It requires a **portable, rugged and easy recording system.** **PC free recording** is especially very useful for the toughest conditions (direct recording, distributed systems)

Fatigue Test

The XPod plug and play bridge conditioner measures dynamic **strain** and temperatures for life duration analysis of critical parts such as the **aircraft body, engine blades or wings fixtures. The removable conditioner** can remain connected to the strain/thermocouples, reducing cabling time.
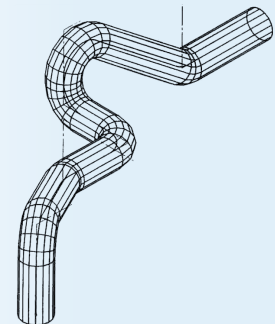
On-Site Measurements & Applied Trainings

Experts from OROS come on-site for applied trainings. They will help you using your OROS system. They can provide assistance in your measurement. They are also able to recommend optimization in your measurement process depending on your application and field requirements.
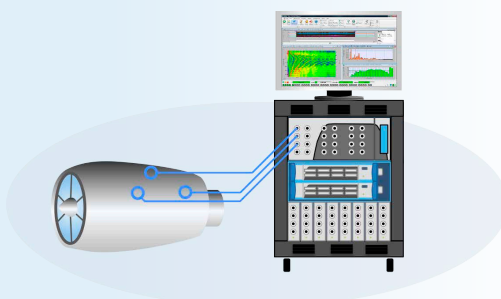
ur Aerospace Applications

Aircraft - Helicopter

> Fighter

> Commercial

> Rescue

> Simulator

Aero Engines

> Jet

> Turbines

> Turbo propellers

Satellite - Defense

> Drone

> Radar / Antenna

> Satellite

> Rocket

Sub-systems

> HVAC

> Coupling parts

> Transmission

> Power Generation

Structural Dynamics

Modal Analysis

Modal Analysis is one of the key steps when testing **component prototypes:** it determines their structural characteristics and so, de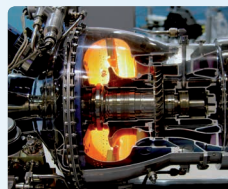fines how they reacts to operating excitations. **Shaker or impact hammer** excitations can be used to capture the experimental datasets: the final stage is the actual **OROS Modal analysis.**

Structures Test

Spacecraft structures are checked with the large **channel count distributed systems**. It measures simultaneously **up to 1 000+ channels** for one shot tests. From **shaker or loudspeaker** excitation the **FFT, 1/n Octave swept-sine, and normal modes** offer real-time monitoring and provide immediate results and raw data making the test conclusions faster.

Noise Analysis

Cabin Noise

Distributed systems allow recording **hundreds of microphones** located in aircraft passenger cabin, like identifying HVAC noises. Thanks to the swappable Mobi-Disks, the next test can be launched immediately. **The real-time acoustic computation** (Leq, **1/n Octave**) monitors the measurements quality, while the **recorder** provides secured data. Locations with restricted area can be controlled wireless. On top of this, **Sound Quality** emitted in particular from the various components functioning in passenger cabins is an other key challenge.
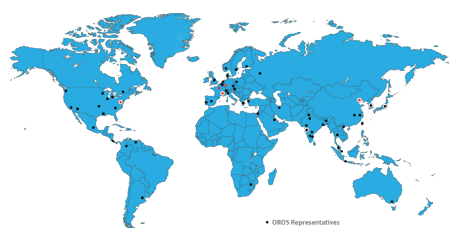
Jet Engine Sound Power

The OROS Sound Power software module simultaneously acquires up to **21 microphone's locations signals,** reducing dramatically the measurement time of aircraft and helicopter **jet engines.** With a **Class 1 type results,** it fulfills acoustics **test benches requirements.** OROS Sound Power offers a **repeatable and standards compliant** solution for testing noise emitted by aircraft sub-systems such as air conditioning, fans and electric motors.

Source Localization

Locating sources and their transfer paths is one of the great challenges in the aerospace industry. **Nearfield Acoustic Holography (NAH)** based on a microphone array can be for example undertaken to evaluate noise transmission through helicopter windows. Acquisition based on a **Sound Intensity** probe can be alternatively achieved in such cases. These techniques will lead to **sound maps** and **sound power ranking** evaluation. With a more global approach over the structure, the **Transfer Path Analysis (TPA)** allows to treat the problem at the source, during transmission or at the radiation level.

OROS

MEASURING NOISE & VIBRATION

Ordering Information

- OROS Representatives
- OROS Offices
- OROS Maintenance Centers

OROS is a global manufacturer and solution provider of noise and vibration measurement systems.

OROS designs and manufactures noise and vibration testing systems (instruments and software) for more than 30 years, meeting the requirements and expectations of automotive, aerospace, marine energy & process, manufacturing and automation industries.

French company with worldwide scope (80% of turnover with 2 subsidiaries, 6 offices, 8 maintenance centers and representatives in more than 35 countries), OROS is a dynamic company where innovation is at the heart of its strategy to offer a range of high-tech products and solutions.

OROS covers data acquisition, structural dynamics, acoustics and rotating applications as well as a range of related services.

Find out more on the OROS offer in the Range brochure.

Downloadable on www.oros.com

Instruments
Examples of configurations

OR35-FREQ-10	8 ch 20 kHz real-time frequency analyzer, universal inputs
OR36-FREQ-16	16 ch 20 kHz real-time frequency analyzer, universal inputs
OR38-FREQ-32	32 ch 20 kHz real-time frequency analyzer, universal inputs
ORMP-REC-16	Mobi-Pack™-16 Ch. 40 kHz recorder, 60 GB removable HDD
OR38-REC-24	40 kHz recorder, 60 GB removable HDD, PC or PC free operations

Inputs Conditioners

OR36/8-XPOD-B	8 ch. strain gauge bridge conditioner for OR36 & OR38
OR36/8-XPOD-T	8 ch. PT100 and thermocouple conditioner for OR36 & OR38

Data Acquisition

ORNV-TDA	Time Domain analysis plug-in
ORNV-FFT	Real-Time FFT analysis plug-in

Rotating Analysis Software Modules

ORNV-ORD	Real-time synchronous order analysis plug-in
ORNV-IVC	Instantaneous angular velocity converter for torsion acquisition
ORNVS-BAL	Single Dual Plane Balancing module
ORNVS-BAL-MP	Multiplane Balancing module

Structural Dynamics Software Modules

ORNVS-MOD330	ODS + EMA SIMO
ORNVS-MOD350	ODS + EMA SIMO + EMA MIMO
ORNVS-MOD380	ODS + EMA SIMO + EMA MIMO + OMA

Noise Analysis Software Modules

ORNV-OCT	Real-time filter based 1/n Octave analysis plug-in
ORNVS-SI-POW, ORNVS-SP	Sound Power
ORNVS-SQ	Sound Quality
ORNVS-TPA	Transfer Path Analysis
ORNVS-HOL	Acoustical Holography

Specifications

Channels count	**2 to hundreds of channels**
Universal Inputs	
Sampling	2 kS/s to 102.4 kS/s - 24 bits synchronous sampling
Accuracy	Phase ±0.02° - amplitude ±0.02 dB - Dynamic > 140 dB
Conditioning	AC/DC/ICP/Float/TEDS, ±100 mV to ±40 V
Parametric channels	10 S/s - 50 Hz/60 Hz rejection - reproducibility < 1 mV
Optional conditioners	Wheatstone bridge (strain, force and pressure)
Thermocouples	PT1000
Analysis	
Spectral (FFT) x 4	25601 lines, FRFs, time or spectral averaging
Acoustics (OCT)	1 to 1/24th octave, filter based, A,C, etc weighting, fast/slow/impulse
Time fomain (TDA)	300 ms to 110 hours time view, DC/RMS/Pk/Pk-Pk/Crest-factor/kurtosis
Sync Order (ORD) x 2	1/32 to 1 order res., up to order 800, Phase/amplitude, 8 tracked order/ch
System	
Hard disk	128 to 512 GB SSD
Internal battery	up to 2 h
Link to PC	1 Gb/s Ethernet
Weight	from 1.4 kg/3 lb to 10 kg/22 lb

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OROS
MEASURING NOISE & VIBRATION

ISO 9001 BUREAU VERITAS Certification

OROS
23 chemin des pres
Inovallee 4403
F-38944 Meylan Cedex

Tel: +33.476.90.62.36
Fax: +33.476.90.51.37
Mail: info@oros.com
Web: www.oros.com

OROS China - TStech
Tel: +86.10.59892134
Fax: +86.10.59892135
Mail: info@oroschina.com
Web: www.oroschina.com

French Sales Office
Tel: +33.169.91.43.00
Fax: +33.169.91.29.40
Mail: info@oros.fr
Web: www.oros.fr

OROS GmbH
Tel: +49.261.133.96.50
Fax : +49.261.133.96.49
Mail: info@oros-deutschland.com
Web: www.oros-deutschland.com

OROS Inc.
Tel: +1.616.617.2566
Mail: info@oros.com
Web: www.oros.com