OROS

# Noise & Vibration

## Testing Solutions

for Aerospace Industries

# 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

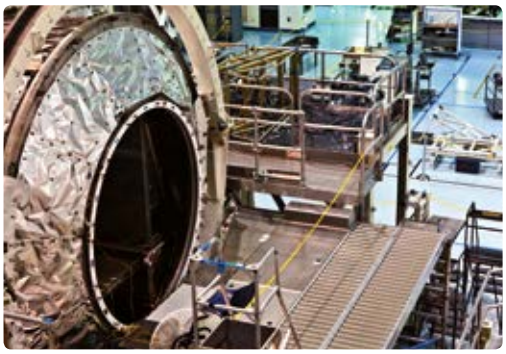
- Aircraft/airport validation
- Helicopter/fighter retrofit
- Cabin noise
- Flight clearance
- Data aquisition

### 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…)

### They trust OROS

- *"My team's job is to provide reliable and accurate data from various aircrafts and conditions. The OROS Teamwork instruments serve our tests and analysis needs perfectly. Their exchangeable conditioners & disks, cascadable units and flexible software licensing make our every day job simpler and faster."*

Adam IRVINE, 39

**Vibration Program Manager, Rotor & Fixed Wing / In-flight Test Center.**

# 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+

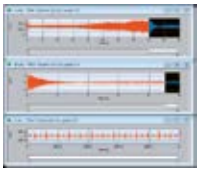
### Flexible Connection
> Mobile Analyzer, Wi-Fi
> Distributed Configuration
> Remote Access
> Large Channel Count Systems

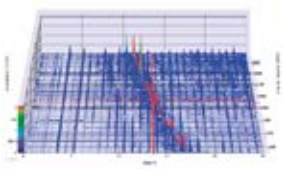
### Multioperations
> PC Free Recorder
> Online & Post Analysis
> Multianalysis
> Handling Any Transducers

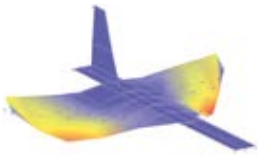
### Made For the Field
> Portable
> Rugged
> Real-Time
> Multi-Channel

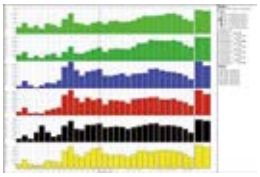
### Accurate
> DSP-based
> 24 Bit – 40 kHz – 140 dB
> ± 40 V input range
> ±0.02 dB / ±0.02°

## 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

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MEASURING NOISE & VIBRATION

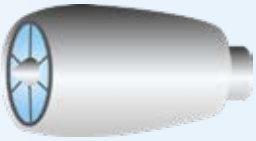
# Noise and Vibration Tests for yo

## 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.**

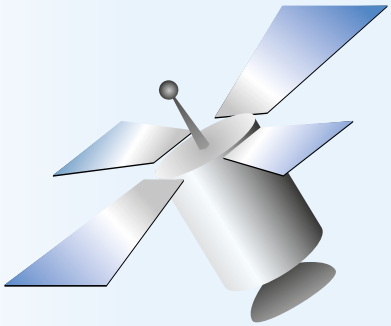
### Helicopter Transmissions



**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.**

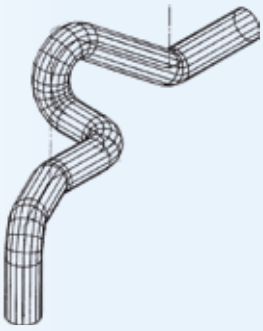
## Data Acquisition

### 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

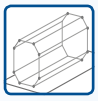
> Drone
> Radar / Antenna
> Satellite
> Rocket

## 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, defines 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

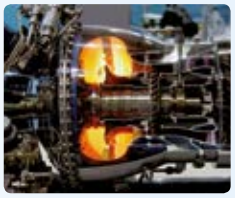
Distributed systems allow recording **hundreds of microphones** located in aircraft passenger cabin, like identifying HVAC noises. Thanks to the swappable Mobi-Disks, the next test can be launched immediately. **The real-time acoustic computation** (Leq, **1/n Octave**) monitors the measurements quality, 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.



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MEASURING NOISE & VIBRATION

# Ordering Information

**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 |

specifications not binding - **pample**mousse.com | Design: designvisuel.com | Sara Baumgartner - Photo credits: No Comment, nb nota bene, gettysimage, Jorg Hackemann - Shutterstock.com

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