



# Technology Consultancies

## *Naval Systems & Maritime Security Solutions*

## Vibrations, Acoustics, Shocks, Design for Silence



### Our Offer:

#### At design stage:

Elaboration of Acoustic Signature Management Plan

Low Noise Design guidance

Design for severe environments

High Pointing accuracy systems

Active noise & vibration control

Modelling strategies

Components selection criteria

#### At prototype stage:

Acceptance trials facilitation - Trouble-shooting and design optimisation

#### Through-life support:

Diagnosis and trouble-shooting – Reliability audits – Assistance to litigation resolution

### Credentials:

Bernard Garnier has a record of about 30 yrs in technical consulting, first as Senior Consultant then Technical & Scientific Director at Metravib in Lyon (a vibro-acoustics specialist engineering and contract research organisation), then Manager Industry, Science & Technology at Pacific Noise & Vibration in Canberra, and most recently Technical Director Operations and Customer Support in Thales Underwater Systems

Bernard Garnier has authored or co-authored more than 50 technical papers in the domain, including several monographs in a Technical Encyclopaedia for engineers (“les Techniques de l’Ingenieur”)

### Contact:

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# References :

## **Design for Silence**

Naval Platforms: DCNS (SSBN Le Triomphant Class, ASW Frigates), Fincantieri (SSK Sauro Class, S2000 concept), ASC (SSK Collins class), ADI (Minhunters), Navantia (Norwegian Frigates)

Naval Systems: winches for mine hunting sonar (Thales/ Abeking & Rasmussen, Lürssen), silent Sonar domes (composites, coatings, damping), acoustic tiles for submarines and surface ships

Aerospace: Aircraft engines and cabins quieting by passive & active noise control (Safran, Pratt & Whitney, MTU, Airbus, Eurocopter, Agusta, Cessna), silencing of electric equipment

Automotive: significant contribution to silent Diesel engines design for cars and trucks (PSA, RVI..)

Components suppliers: Low vibration machinery (pumps, centrifugal uranium enrichment plants..), vibration control of supra-conductor magnets (synchrotron)

## **Design for extreme environment**

Aerospace: Ariane launcher fairing and launch noise characterisation (Dornier, Contraves), Pyrotechnic shocks attenuation and absorption (CNES, ESA, EADS, Dassault, MMS, TAS), re-entry environment (ballistic missiles and spacecrafts) (DGA-DAM, EADS), structural design in cryogenic environments (Ariane turbo-pump shaft design)

Armoured vehicles: Mobility of all-terrain armoured vehicles, track pads and suspensions (ETAS, Diehl, Messier)

## **High Pointing accuracy**

Aerospace: EO systems in severe environments (helos...), cryocooler vibration reduction, innovative suspensions for micro-vibration decoupling (inertial wheels...), piezo-damping and active control

Industry: micro-machining, optic benches decoupling...

## **Modelling**

Sub-structuring, dynamic synthesis, strong coupling, launcher and satellite interaction (notching), FEM/BEM modelling, Statistic Energy Analysis

Non-linear behaviour - Acoustic Nearfield Imaging – use of scaled models

## **Advanced Materials Applications**

Piezopolymers (cooperation with ISL) - Electro-rheological fluids - giant magnetostrictive materials - shape memory alloys - Anechoics and decoupling coatings

## **Independent Verification and Validation**

Proposals assessment for various European RT&D Calls for Proposals - Legal expertises ("sapiteur" role) - Reviewer for technical publications - Assistance to the Australian DMO for the Hydrographic Ship acceptance

## **Diagnosis and Trouble-shooting**

Naval vessels and onboard systems of all sorts - Armoured vehicles and embarked systems - Nuclear reactors and power plants - electric transformers - Automotive industry - railways (TGV in particular) - space launchers (from Diamant to Ariane) - off shore oil rigs and plants - Petrochemical plants - general industry

## **Conditional maintenance from vibro-acoustic information**

Broad range of industry, as above - conditional maintenance of radar bearings - vibration monitoring for safety critical applications (nuclear, transports)

## **Vibro-acoustic detection and localisation**

Battlefield acoustics and seismic - Low altitude aircraft detection - Security systems for unattended areas - Localisation of people in buildings etc - Ultrasound sensing for counting, levels metering and process monitoring

## **Robotics and special machinery**

Acoustics and structural dynamics of complex test bench engineering (for naval, aeronautic, automotive applications) - dynamics of special production lines - closed loop dynamic vibration control (adaptative and/or active systems)