

REVIEW REPORT ON RESEARCH ACTIVITIES OF LAETA ASSOCIATE LABORATORY

by

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FOREWORD

Professors S.A. Meguid and J.N. Reddy visited LAETA Associate Laboratory on July 20, 2009 to review the research activities, research output and research directions of the entity. Two presentations were given, the first by Professor Joaquim Silva Gomes and the second by Professor António Augusto Fernandes. This was followed by extensive and in depth discussions about the structure and governance, research activities, and industry relations. Following this first part of the proceedings, we proceeded with the laboratory visits. We were accompanied by A/Professor Antonio Ferreira and Professor Joaquim Silva Gomes of the University of Porto. In the following we outline our findings and make recommendations on the three groups: **Experimental Mechanics and New Materials** (INEGI), led by Prof. J. Silva Gomes, **New Technologies and Advanced Manufacturing Processes** (INEGI), led by Prof. A. Barbedo Magalhães and **Design and Experimental Validation** (IDMEC, FEUP), led by Profs. Augusto Fernandes and Renato Natal Jorge

1. MISSION AND OBJECTIVES

The mission of LAETA is to set-up a research and development network with engineering know-how in all fields contributing to transport, energy, aeronautics, space and fires that will promote partnerships with SME's, European consortiums, national and international entities involved in regulation and standardization and public and private institutions involved in R&D in order to:

- transfer new technologies,
- implement new engineering procedures of project,
- develop highly innovative designs,
- manufacture and test products,
- promote the dissemination of knowledge and the education and training of technicians and engineers, and
- acquire new competences.

The objectives of the three groups visited were identified as being in tune with the main objectives of LAETA for the much needed research lines of transport and aeronautics. These are summarised as follows:

- Develop critical technologies to extend and improve the technology base for well identified critical needs,
- Integrate and validate complex systems and technologies in advanced industrial and operational environments,

- Enhance attractiveness - clean, efficient, safe and comfortable - of the different transport modes and increase performance of the various transport subsystems, namely the different vehicles - new materials, structures, aerodynamics, mechatronics, intelligent systems, design and simulation tools, products optimization and design for manufacturing;
- Develop advanced experimental and analysis models and modelling tools for composite materials and functionally graded materials in structural applications, such as land transport and aeronautics;
- Expand the design envelope of composite materials and structures by introducing new concepts such as variable stiffness composites, hybrid composites and smart structures.

2. STRUCTURE AND GOVERNANCE

In addition to the research groups from Lisbon and Coimbra, the TRANSPORT and AERONAUTICS/SPACE research activities encompass the following research groups of LAETA at INEGI and IDMEC/FEUP in Porto:

Experimental Mechanics and New Materials (INEGI), Prof. J. Silva Gomes – Light weight material and experimental testing, design and manufacturing of composite structures, vibrations, biomechanics and tribology.

New Technologies and Advanced Manufacturing Processes (INEGI), Prof. A. Barbedo Magalhães – Manufacturing and industrial processes.

Design and Experimental Validation (IDMEC, FEUP), Profs. Augusto Fernandes and Renato Natal Jorge– Light weight structures for vehicles, experimental testing, fatigue and structural design, biomechanics.

The research staff of the above three groups from Porto includes **63** Postdoctoral fellows as well as 54 PhD and MSc students.

3. RESEARCH ACCOMPLISHMENTS

The above research groups have an outstanding record in participation and leadership in European and National projects in the transport and aeronautics areas. The funding of their research activity is around 6 million euros (2003-2008) came directly from European Framework Programs (30%), National Science Foundation-FCT (35%), Innovation Agency and Industry (35%).

Furthermore, these Research groups play a very active role and are in direct collaboration with the relevant major ground, maritime and aeronautics in Portugal and Europe.

4. RESEARCH OUTPUT – PUBLICATIONS AND DEGREES

INDICATORS for the period 2003 – 2007 (2008)

Books - 66 (**19**)

Papers in peer review international journals - 431 (**103**)

International conference proceedings - 526 (**82**)

PhD completed – 53 (**15**)
Masters completed - 112 (**33**)
Patents - 11 (**5**)
Prototypes -22 (**6**)
Organization of Conferences/seminars -68 (**19**)
Editorial Boards - 33 (**14**)

5. CONCLUSIONS AND RECOMMENDATIONS

The research groups under assessment have an **excellent** record of publications in prestigious journals in the general areas of Composite Materials, Applied and Computational Mechanics, Experimental Mechanics, Tribology, Mechanical Design and Manufacturing, both in fundamental and applied research.

Several members in this research line are internationally known and leaders in their research areas; namely, by participating in the editorial boards of major journals and organizing highly visible and sought after international scientific conferences.

They are conducting high calibre research in close collaboration with industry at both the national and international levels, and they have been successful in attracting considerable funds to their institutions in support of their research.

The seven full-time researchers contracted under the Science Program are well integrated in the research plans and activities of these three groups, the two institutions involved and LAETA.

The three groups are making **excellent** progress, they are complementary in their activities in the research lines of Aeronautics and Transports of the Associate Laboratory LAETA. In particular, the two groups from INEGI are involved in a considerable number of national and international projects and they have an intensive interaction with industry, which is vital to the mission of LAETA, and to the development of the Portuguese economy. The same applies to the interaction with their host university, as reflected by the enormous number of PhD and MSc theses developed at INEGI's and IDMEC's laboratories.

We wish to make the following recommendations regarding the structure and governance of the LAETA:

- (1) In view of the complementarity of their research activities and productivity, the two research units of INEGI:

Experimental Mechanics and New Materials, and

New Technologies and Advanced Manufacturing Processes

should be unified in a single research group to pursue their **excellent** work in the above mentioned areas.

- (2) There appears to be some overlap between

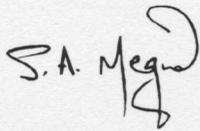
“Experimental Mechanics and New Materials” group from INEGI, and
“Design and Experimental Validation group from IDMEC(FEUP).

We believe this was the result of the complex of co-existence issue involving two different Interface Institutes (INEGI and IDMEC) with comparable missions

and objectives and both attached to the same Department of Mechanical Engineering of the Faculty of Engineering, University of Porto. We believe it would be advantageous to all concerned if these two institutes are merged in a single Institute. The benefits of that merger are considerable.

CLOSURE

We have reviewed and evaluated many institutions compared to LAETA, we believe LAETA is carrying out excellent research in support of industry. It has trained a large number of highly qualified personnel ready to contribute to the Portuguese economy. Many of the professors in LAETA are internationally recognised and well-respected in their fields and have made considerable contributions to the scientific literature and have supported the community by running first class international conferences and training courses.



Professor S.A. Meguid
Signed
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Professor J.N. Reddy
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