

Ndilokelwa F. Luis, PhD

AEROSPACE ENGINEERING · MODELLING, SIMULATION & OPTIMISATION

Lisbon Metropolitan Area, Portugal

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Research Profile

Aerospace Engineering PhD with extensive research experience in multidisciplinary mathematical modelling, computational simulation, optimisation and engineering analysis. Research background spans structural dynamics, smart structures, sensing and actuation, vibration control, fluid-structure interaction and renewable-energy aerospace systems. Experienced in developing numerical models, formulating optimisation problems, validating computational models against analytical solutions and available experimental data, and communicating research through peer-reviewed publications and international conferences. Current research interests include renewable-energy systems, distributed generation and energy storage, resilient energy systems, multidisciplinary optimisation, mobile energy resources and Systems Engineering.

Research Interests

Renewable Energy Systems · Energy Storage Integration · Resilient Energy Systems

Multidisciplinary Design Optimisation · Mathematical Modelling · Computational Simulation

Control Systems · Smart Structures · Distributed and Mobile Energy Resources · Systems Engineering & MBSE

Education

Ph.D. in Aerospace Engineering

INSTITUTO SUPERIOR TÉCNICO, UNIVERSIDADE DE LISBOA

Lisbon, Portugal

Degree awarded: 2016

Thesis: Optimal Design of Piezoelectric Sensors and Actuators for Vibration Attenuation in Multilaminated Structures

Classification: 18/20, Excellent – Pass with Distinction

Supervisors: Prof. Aurélio L. Araújo; Prof. José F. A. Madeira

Doctoral coursework: Adaptive Structures – 18/20 · Computational Methods – 17/20 · Flight Dynamics – 18/20 · Flight Simulation – 20/20 · Structural Materials – 17/20

Pre-Bologna Degree in Aerospace Engineering (integrated long-cycle degree)

INSTITUTO SUPERIOR TÉCNICO, UNIVERSIDADE TÉCNICA DE LISBOA

Lisbon, Portugal

1997-2004

Final Project: Nanoengine – Applied Theoretical Development of a Nanosystem

Classification: 15/20

Supervisors: Prof. Luís Alcácer; Prof. Afzal Suleman

Selected relevant coursework: Electromechanical Systems (18/20), Instrumentation (18/20), Control (18/20), Flight Control (19/20), Microprocessors, Digital Systems, Electromagnetism and Optics, Thermodynamics I–II, Heat and Mass Transfer, Computational Methods.

Academic & Research Experience

Postdoctoral Researcher

LAETA-IDMEC, INSTITUTO SUPERIOR TÉCNICO, UNIVERSIDADE DE LISBOA

Lisbon, Portugal

2016–2019

Research area/project: Vibration and Noise Attenuation

- Developed advanced numerical models for the dynamic and vibro-acoustic analysis of multilayered aerospace structures incorporating piezoelectric and viscoelastic materials.
- Investigated fluid-structure interaction, vibration attenuation and structural response through finite-element modelling, computational simulation and optimisation.
- Evaluated modelling assumptions and numerical results against analytical solutions and available experimental evidence and contributed to peer-reviewed publications and international conference communications.

Doctoral Researcher

LAETA-IDMEC, INSTITUTO SUPERIOR TÉCNICO, UNIVERSIDADE DE LISBOA

Lisbon, Portugal

2013–2016

Focus: Active vibration attenuation and multidisciplinary optimisation

- Developed mathematical and finite-element models for the dynamic analysis of laminated and sandwich structures incorporating piezoelectric sensors and actuators and viscoelastic damping materials.
- Formulated and solved multiobjective optimisation problems for the placement and design of piezoelectric patches, considering vibration attenuation, structural performance and design constraints.
- Performed numerical simulation, sensitivity analysis and model validation using MATLAB and FORTRAN, supporting the doctoral thesis and subsequent peer-reviewed research outputs.

Graduate Researcher

LAETA-IDMEC, INSTITUTO SUPERIOR TÉCNICO, UNIVERSIDADE DE LISBOA

Lisbon, Portugal

2009–2012

Focus: Multidisciplinary Design Optimisation of Renewable Energy Systems

- Conducted preliminary multidisciplinary design and optimisation studies for unmanned airborne systems intended to generate solar and wind energy and deliver electrical energy to ground-based users.
- Modelled interactions and trade-offs between aircraft configuration, aerodynamics, structures, renewable-energy generation, energy storage, flight operation and power distribution.
- Contributed to the development and communication of solar- and wind-energy UPA concepts through international aerospace and airborne-wind-energy conferences.

Graduate Researcher

LASEF-IDMEC, INSTITUTO SUPERIOR TÉCNICO, UNIVERSIDADE DE LISBOA

Lisbon, Portugal

2004–2005

Focus: Computational Fluid Dynamics

- Performed computational aerodynamic analysis of an Airbus A320 wing section under critical flight conditions using STAR-CD.
- Improved computational performance through mesh-quality refinement, reducing analysis time by approximately 18% while maintaining the required aerodynamic representation.

Current / Independent Research & Engineering Projects

EGraB – Energy Generating Blimp

ndilokelwa.tech | [GitHub](#)

INDEPENDENT SYSTEMS ENGINEERING AND RESEARCH PROJECT

2026–Present

- Redeveloping the earlier UPA airborne renewable-energy concept as a structured Systems Engineering and multidisciplinary research case study.
- Defining stakeholder needs, operational scenarios, system requirements, functional and logical architectures, interfaces and verification strategies using MBSE and SysML.
- Establishing traceability between engineering needs, requirements, architectural decisions, analytical models and verification evidence.
- Preparing the system architecture for subsequent multidisciplinary investigation of renewable-energy generation, energy storage, energy transfer, flight performance and system-level trade-offs.

Publications

PEER-REVIEWED JOURNAL ARTICLES

Luis, N. F., Madeira, J. F. A., Araújo, A. L., Ferreira, A. J. M. (2017). *Active vibration attenuation in viscoelastic laminated composite panels using multiobjective optimization*. **Composites Part B: Engineering**, 128, 53–66. DOI: 10.1016/j.compositesb.2017.07.002

CONFERENCE PAPERS / PROCEEDINGS

Luis, N. F., Gomes, M. A., Cardoso, P. (2011). *Unmanned Power Airship for Airborne Solar Power Generation and Distribution*. **52nd AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference**. DOI: 10.2514/6.2011-2149

CONFERENCE PRESENTATIONS / COMMUNICATIONS

Luis, N. F., Madeira, J. F. A., Araújo, A. L., Ferreira, A. J. M. (2019). *A vibro-acoustic model for the dynamic analysis of viscoelastic sandwich plates with piezoelectric patches*. **MECHCOMP 2019 - 5th International Conference on Mechanics of Composites**.

Luis, N. F., Madeira, J. F. A., Araújo, A. L., Ferreira, A. J. M. (2017). *Multiobjective optimization for active vibration attenuation in laminated composite panels*. **DeMEASS VIII**.

Luis, N. F., Madeira, J. F. A., Araújo, A. L., Ferreira, A. J. M. (2016). *Multiobjective optimization of piezoelectric patch distribution for vibration attenuation in sandwich plates*. **5th International Conference on Engineering Optimisation**.

Luis, N. F., Cardoso, P., Gomes, M. A. (2011). *Unmanned power airship for wind energy generation and ground distribution*. **Airborne Wind Energy Conference**.

Research Projects

Vibration and Noise Attenuation Using Smart and Viscoelastic Materials

Lisbon

LAETA-IDMEC, INSTITUTO SUPERIOR TÉCNICO, UNIVERSIDADE DE LISBOA

2013–2019

Research programme investigating passive and active vibration and noise attenuation in multilayered aerospace structures using piezoelectric sensing and actuation, viscoelastic damping materials, advanced finite-element modelling and multidisciplinary optimisation.

UPA – Unmanned Power Airship for Solar and Wind Energy Generation

Lisbon

LAETA-IDMEC, INSTITUTO SUPERIOR TÉCNICO, UNIVERSIDADE DE LISBOA

2009-2012

Research concept investigating unmanned lighter-than-air platforms capable of harvesting renewable energy during flight, storing energy onboard and transferring generated electrical energy to ground-based users. The project considered both solar- and wind-energy configurations and required multidisciplinary integration of aerodynamics, structures, energy generation, storage, flight operation and power distribution

A320 Computational Aerodynamics / CFD Investigation

Lisbon

LASEF-IDMEC, INSTITUTO SUPERIOR TÉCNICO, UNIVERSIDADE DE LISBOA

2004-2005

Computational aerodynamics research investigating airflow around an Airbus A320 wing profile under critical flight conditions, with emphasis on numerical modelling, computational-mesh quality and efficient CFD analysis.

Research Funding & Scholarships

Fundação para a Ciência e Tecnologia (FCT) – *PhD Studentship*, 2012-2015

Instituto Nacional de Atribuição e Gestão de Bolsas de Estudo (INAGBE) – *PhD Studentship*, 2013-2016

Instituto Português de Apoio ao Desenvolvimento (IPAD) – *PhD Studentship*, 2013-2016

Instituto Nacional de Atribuição de Bolsas de Estudo (INABE) – *Undergraduate Scholarship*, 2000-2004

Academic Service

PEER REVIEW

Journal of Sound and Vibration – Manuscript reviewer, 2020

Reviewed manuscript on nonlinear energy sinks for torsional vibration suppression in rotor systems.

CONFERENCE SERVICE

MECHCOMP 2019 - 5th International Conference on Mechanics of Composites – *Conference organisation, Lisbon, Portugal, 2019*

Selected Professional Engineering Experience

Technical Product & Solutions Lead | Co-Founder

Portugal and Angola

SKIMA

2024–Present

- Contributed to the early concept and initial development of Kumya Boss, including definition of business needs, user workflows and initial product functionality during the exploratory phase.
- Participated in digital transformation consulting activities, including organisational and technology gap analysis.

Solutions Architect & Tech Leader

The Netherlands

NovioQ

2022–2024

- Progressed from Software Developer to Senior Developer, Tech Leader and Solutions Architect across international enterprise-software projects.
- Translated operational and business needs into system functionality, workflows, data models, integrations and technical architectures.
- Led technical teams, reviewed engineering work, resolved functional and technical issues and supported testing, deployment and production operation.

Software Developer & Junior Tech Lead

Portugal

OSQUAY | RUPTION

2020–2022

- Developed MVPs for multidisciplinary international projects, contributing to the clarification of user needs, functional scope, workflows and implementation priorities.
- Began leading a small development team by coordinating tasks, supporting technical decisions and reviewing delivery progress and quality.

Research & Technical Competencies

Modelling & Simulation

Mathematical Modelling · Finite Element Methods · Multidisciplinary Simulation · Numerical Methods · Sensitivity Analysis · Model Validation

Optimisation & Engineering Analysis

Multidisciplinary Design Optimisation · Multiobjective Optimisation · Trade Studies · Data Analysis

Energy & Physical Systems

Renewable-Energy Systems · Energy Generation Concepts · Energy Storage Concepts · Electromechanical Systems · Control · Instrumentation · Structural Dynamics · Smart Structures

Systems Engineering

Requirements Engineering · Functional Architecture · Interface Analysis · MBSE · SysML · Verification & Validation

Computational Tools

LaTeX · MATLAB · Python · FORTRAN · ANSYS · Abaqus · STAR-CD · CATIA Magic / SysML

Certifications

- INCOSE ASEP Certified – 2026
- Systems Engineering Specialization, University of Colorado Boulder – 2026
- PCAP™ – Certified Associate Python Programmer – 2026
- Machine Learning Specialization, Stanford University & DeepLearning.AI – 2025

Selected Award

ANA/Inocrowd Lisbon Airport Hangar Optimisation Challenge

Lisbon, Portugal

1ST PLACE

2017

Designed a MATLAB optimisation algorithm that increased aircraft hangar-allocation efficiency by approximately 7%, winning first prize in an industry challenge sponsored by ANA/Inocrowd.

Professional Memberships

- *Ordem dos Engenheiros (Portugal)* - Member 82425
- *INCOSE* – ID 439308

Languages

- **Portuguese** – Native
- **English** – C2, Cambridge English: Proficiency (CPE) – 2016
- **Spanish** – B2
- **French** – B1