AIR INTELLIGENCE DIVISION

CORPORATE CAPABILITY PROFILE

Turning the physics of air into confident decisions

An integrated division approach that connects experimental aerodynamics, computational fluid dynamics, aircraft design and artificial intelligence in one verifiable engineering chain.

SCIENTIFIC LEADERSHIP

Prof. Dr. Dilek Funda Kurtuluş

METU Aerospace Engineering

AUGUST 2026

01 / APPROACH

Why Air Intelligence?

Air-related engineering decisions should not rely on a single simulation. They require traceable data, experiments, physics-based models and independent validation.

01

FRAME THE QUESTION

Mission profile, geometry, atmospheric conditions, performance and safety criteria.

→

02

BUILD THE DATA

Combine experimental, sensor, literature and design data with quality labels.

→

03

MODEL THE PHYSICS

Solve scenarios with CFD, reduced-order models and artificial intelligence.

→

04

VALIDATE

Demonstrate confidence through measurements, uncertainty and cross-comparison.

→

05

ENABLE THE DECISION

Deliver design selection, risk, operating limits and a roadmap.

DIVISION VALUE PROPOSITION

We deliver confidence in the decision, not just a technical output.

Each engagement documents acceptance criteria, data provenance, model assumptions, calibration records, uncertainties and the recommended next step. Results therefore become reproducible, comparable and usable in investment decisions.

EXPERIMENT

MODEL

DECISION

Scientific leadership: Prof. Dr. Dilek Funda Kurtuluş

Scientific direction built on experimental aerodynamics, flow physics, aircraft design and data-driven methods.

Prof. Dr. D. Funda Kurtuluş

SCIENTIFIC LEAD | EKOFLY CO-FOUNDER

Professor, METU Department of Aerospace Engineering

SCIENTIFIC FOCUS

Experiment + computation + design + data intelligence

Linking wind-tunnel testing, measurement, numerical simulation and AI-assisted methods to the same engineering question in aircraft design, unsteady aerodynamics and unmanned aerial vehicles.

Since 2000

Responsibility for METU Aerodynamics Laboratory

Since 2018

Professor at METU

PhD

ENSMA / Université de Poitiers

Multidisciplinary

Master of Laws + Executive MBA

Selected distinctions: Amelia Earhart Fellowship (2005), NATO Scientific Achievement Award (2011), Turkish Academy of Sciences Young Scientist Award (2012/2013) and Zonta Centennial Recognition Award - Türkiye (2019).

Source: Official METU academic profile and CV - ae.metu.edu.tr/~dfunda/ | Portrait: Official METU profile

Capability portfolio

The six capability areas are not isolated services; they are complementary validation layers supporting the same design

01 Experimental aerodynamics

Wind-tunnel test planning, measurement architecture, flow visualisation, pressure and force data, and unsteady behaviour.

02 Computational fluid dynamics

Geometry and mesh strategy, physics models, convergence and sensitivity analysis, including low and unsteady Reynolds regimes.

03 Aircraft and UAV design

Mission-to-requirement translation, wing and configuration selection, preliminary design, performance and multidisciplinary optimisation.

04 Propulsion and flow control

Propeller-motor matching, distributed propulsion, Coanda-based thrust vectoring, and active/passive flow control.

05 AI and surrogate models

Fast predictors from experimental/CFD data, neural networks, fuzzy logic, sensitivity analysis and optimisation support.

06 Atmospheric and environmental flows

Effects of wind and atmospheric conditions on flight, structures and operations through scenario and risk-based assessment.

COMMON OUTPUT Comparable scenarios • validated performance • risk and uncertainty view • actionable design decision

AeroLab: an experimental validation ecosystem

The METU Aerodynamics Laboratory is the reference ecosystem for Prof. Dr. Kurtuluş's academic and experimental work; project access and collaboration remain subject to institutional approvals.

VALIDATION PRINCIPLE

A model alone is not evidence.

Computational results are assessed together with the measurement plan, calibration, data acquisition, uncertainty analysis and suitable experimental conditions. The laboratory step is redesigned for the technical requirements of each project.

Institutional boundary:
EKOFLY's commercial scope and METU/AeroLab academic and laboratory activities are separate processes. Access, use, data and intellectual-property conditions are defined on a project basis.

01 **Frame the test question**
Measurand, scale and acceptance criterion

02 **Design the setup**
Model, sensor, sampling and calibration plan

03 **Assure the data**
Repetition, traceability, quality flags and uncertainty

04 **Compare with the model**
CFD/surrogate deviation, causal analysis and update

Official AeroLab website aerolab-ae.metu.edu.tr

Source: Official METU AeroLab website provided by the client; official METU CV and teaching pages.

Project packages and deliverables

Each package begins with a business or engineering problem and concludes with a decision-ready technical output set.

A Aerodynamic characterisation

Input: geometry + mission condition
Output: performance map, critical regimes, design recommendations

B UAV / micro air vehicle development

Input: mission + constraints
Output: concept, preliminary design, configuration comparison, test plan

C Hybrid CFD-experiment validation

Input: numerical model + measurement need
Output: validated model, error budget, calibration record

D Propulsion and flow control

Input: thrust target + platform
Output: system matching, efficiency, control envelope, optimisation result

E Wind and atmospheric effects

Input: site/operational scenario
Output: condition set, risk zones, operating/design limits

F AI-assisted rapid model

Input: experimental/CFD database
Output: predictor, confidence bounds, decision-interface requirements

IN EVERY PACKAGE scope matrix • validation plan • versioned data • executive summary • technical report • next step

Delivery model: four stages, four decision gates

To balance speed and confidence, each stage concludes with a measurable acceptance criterion.

1 Diagnosis and scope

Problem, user, mission, data and constraints

GATE 1

Are success criteria clear?

2 Model and test design

Method, mesh, sensors, scenarios and computational budget

GATE 2

Is the method fit for the question?

3 Solution and validation

Analysis, testing, calibration, uncertainty and comparison

GATE 3

Are the results reliable?

4 Decision and handover

Design selection, risk, operating limits and roadmap

GATE 4

Are the results actionable?

TECHNICAL ASSURANCE LAYER

- Data provenance
- Calibration
- Mesh/model sensitivity
- Uncertainty budget
- Independent review
- Version and decision log

07 / EVIDENCE

Selected scientific and applied evidence

The examples below demonstrate the experimental, computational, design and application foundations of the division's research direction.

The official research record includes completed work on micro air vehicle development and testing, an amphibious UAV capable of water take-off and landing, low-Reynolds-number aerodynamics, thrust vectoring, multi-UAV control and model-based aircraft optimisation.

2000+
AeroLab responsibility

2018+
Professor at METU

2021
Micro-UAV test stand patent

Experiment + CFD + AI
Integrated decision approach

01 Bio-inspired micro air vehicle

Development and testing under a TÜBİTAK 1001 project, linking wing, mechanism, aerodynamics and validation.

02 Amphibious UAV - EKOFLY spin-off

Design, manufacture and testing of a platform capable of taking off from and landing on water.

03 Micro-UAV test stand

Patent application for a new test stand, filed by METU and TED University (2021/001999).

04 Current research direction

Flow control, distributed propulsion, low-Reynolds aerodynamics and surrogate-model-based optimisation.

Source: Official METU research and publication pages - ae.metu.edu.tr/~dfunda/research.html and publications.html

Which decision can we make more reliable together?

The initial discussion clarifies the objective, data status and validation need; a concise technical scope and phased work proposal then follow.

SCIENTIFIC LEADERSHIP

Prof. Dr. Dilek Funda Kurtuluş

METU Aerospace Engineering
Experimental aerodynamics • unsteady flows • aircraft and UAV design • AI-assisted modelling

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Verified links

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METU AeroLab

SOURCES | Accessed: 13 August 2026

ae.metu.edu.tr/~dfunda/
ae.metu.edu.tr/~dfunda/CV.html
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aerolab-ae.metu.edu.tr/

TRANSPARENCY NOTE

This document describes the proposed operating model of the EKOFLY Air Intelligence Division. The names METU and AeroLab are used as sources and references to Prof. Dr. Kurtuluş's official academic activities; they do not imply an institutional partnership, laboratory allocation or automatic access commitment.