CITIES OF THE FUTURE
BRUSSELS 2017

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Department of Aerospace Engineering
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Previous NATO Projects/ Smart Structures

NATO/RTO/Applied Vehicle Technology Panel through the project **T-121** (April 2000 - March 2002), “Application of Smart Materials in the Vibration control of Aeronautical Structures” Turkish-Canadian joint project, METU, Sensortech Canada

NATO/RTO/Applied Vehicle Technology Panel through the project **T-129** (April 2002 - March 2004), “Development of Control Strategies for the Vibration Control of Smart Aeronautical Structures” Turkish-Canadian joint project, METU, Sensortech Canada, NRC Canada

NATO/RTO/Applied Vehicle Technology Panel through the project **T-133** (April 2006 - September 2008), “Development of and Verification of Various Strategies for the Active Vibration Control of Smart Aerospace Structures Subjected to Aerodynamic Loading” Turkish-Canadian joint project, METU, Sensortech Canada, NRC Canada

Previous FP7 Applications/ Smart Structures

FP7 - Collaborative Project Application- May 2010

The project aimed to develop a new system for performing Structural Health Monitoring for Airborne structures.

Participant No.	Participant Organisation Name	Short name	Country
1 (coordinator)	The Technion, Israel Institute of technology	Technion	Israel
2	Mondragon Unibertsitatea	MGEP	Spain
3	Middle East Technical University	METU	Turkey
4	(VZLU)Vyzkumny a Zkusebni Letecky Ustav Aeronautical Research and Test Institute	VZLU	Czech republic
5	Alenia Aeronautica	Alenia	Italy

METU Responsibilities

WP1: Identification and definition of target end cases
WP3: Design and manufacturing of the laboratory test set-up for Composites/Laminates
WP5: Numerical simulations and sensitivity analysis for Composites/Laminates
WP7: Tests in Laboratory for Composites/Laminates
WP8: Target end case verification and fine tuning
WP9: System Implementation
WP10: Dissemination and Exploitation
WP11: Project Management

Previous FP7 Applications/ Morphing

FP7 - Collaborative Project Application- January 2010
The TWIST project aimed to control the wing twist distribution in next generation wings, leading to the manufacturing and testing of a significant scale demonstrator

No.	Participant organisation name	Short name	Type	Country
1 (coordinator)	Centro Italiano Ricerche Aerospaziali	CIRA	RES	ITA
2	Alenia Aeronautica	Alenia	IND	ITA
3	ATARD	ATARD	SME	TUR
4	University of Bristol	UNIBRISTOL	HES	GBR
5	TU Delft	TU Delft	HES	NED
6	EASN	EASN	NOP	BE
7	ENSAIT/GEMTEX	ENSAIT	HES	FRA
8	Fraunhofer Institute	FhG	RES	GER
9	Middle East Technical University	METU	HES	TUR
10	Università di Napoli	UNINA	HES	ITA
11	University of Patras	LTSM-UP	HES	GRE
12	Technion - Israel Institute of Technology	TECHNION	HES	ISR
13	Israel Aerospace Industries	IAI	IND	ISR
14	Marotta	Marotta	SME	ITA

Previous FP7 Project/ Morphing

CHANGE

Envelope data and mission based morphing prototype wing development

İlhan AKDUMAN, Oğuz KALKAN, Hakan NİKAŞ,
İlhan Ozan TUNÇÖZ, Yosheph YANG,
Ercan GÜRSES, Melin ŞAHİN, Serkan ÖZGEN, Yavuz YAMAN

Department of Aerospace Engineering, METU

01.08.2012 - 31.12.2015

Previous FP7 Project/ Morphing/ CHANGE

TEKEVER ASDS - Portugal (Coordinator)

DLR-Deutsches Zentrum für Luft-und Raumfahrt - Almanya

ARA, Aircraft Research Association - İngiltere

Universidade da Beira Interior - Portekiz

Swansea University - Galler

INVENT GmbH - Almanya

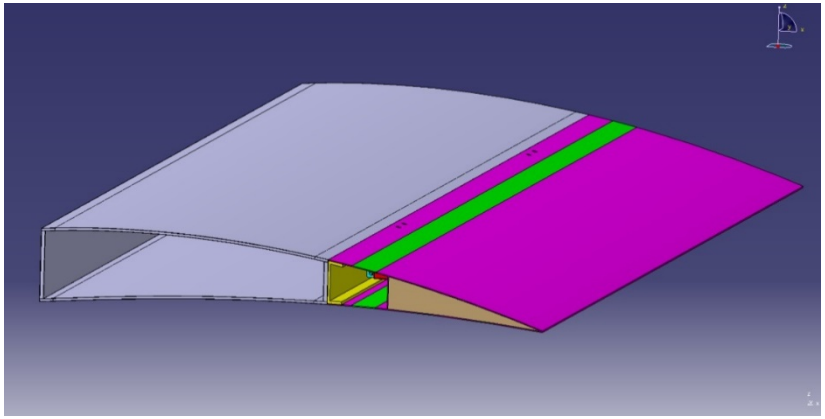
Orta Doğu Teknik Üniversitesi- Türkiye

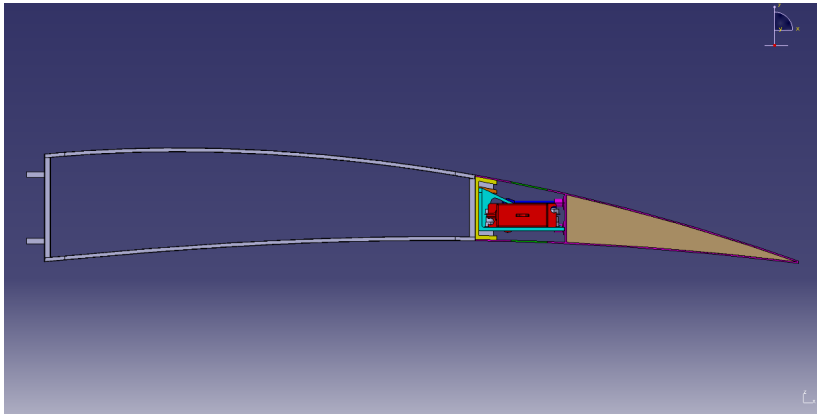
Delft University of Technology - Hollanda

Cranfield University - İngiltere

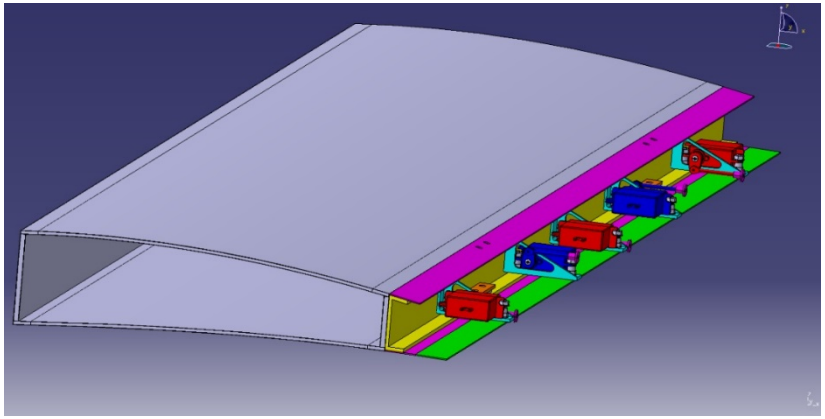
METU has the responsibility of designing an unconventional trailing edge control surface. The design was conducted with CATIA V5-6R2012 package program. Structural analyses were performed with Finite Element Method by using ANSYS® Workbench™ v14.0 package program both under in-vacuo condition and under aerodynamic loading. The aerodynamic loads were calculated by Computational Fluid Dynamics analyses. The required aerodynamic mesh was generated by Pointwise® V17.2 R2 package program. SU2 V3.2.1 open source software was used as the flow solver.

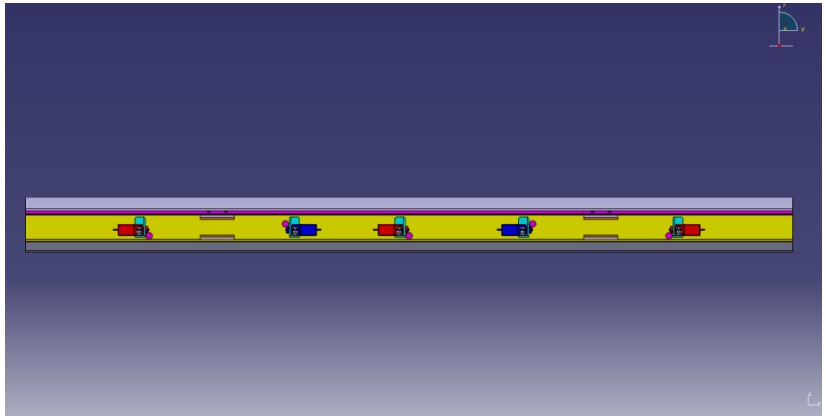
Previous FP7 Project/ Morphing/CHANGE



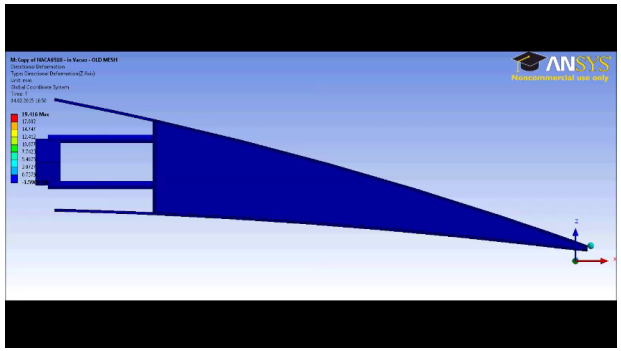


Magenta: Glass-fibre Prepreg EHG250-68-37 Composite
Green: Fully Compliant Silicone Based Material,
Yellow: Aluminum, Brown: Rohacell® 51 RIMA foam material

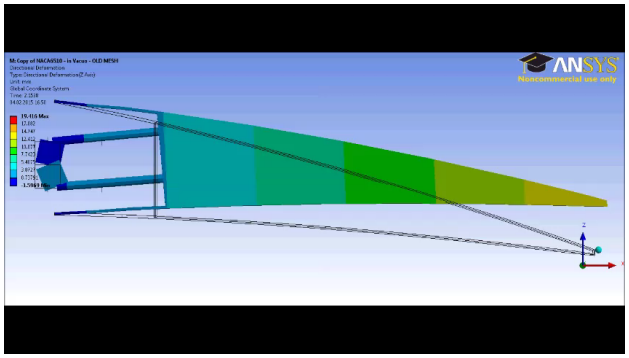




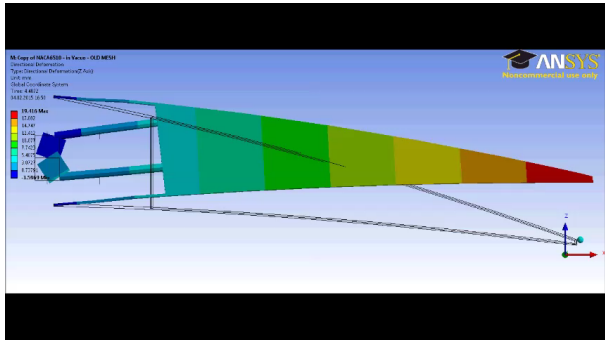
Previous FP7 Project/ Morphing/ CHANGE



METU Developed Trailing Edge Behaviours



NACA6510 → NACA 3510
Take-off



NACA3510 → NACA 2510
Cruise and High Speed Dash

NACA2510 → NACA 6510
Landing

Previous FP7 Applications/ Morphing

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SOCIETAL CHALLENGES, H2020-MG-2016
MG-1.1-2016: Breakthrough innovation for European aviation
Research and Innovation Action

ADAPT,
Software and UAV Aided Morphing Aircraft Wing Design for GA/CA

Participant No.	Participant organisation name	Acronym	Country
1 (Coordinator)	TEKEVER ASDS	TEK	Portugal
2	Deutsches Zentrum für Luft- und Raumfahrt	DLR	Germany
3	Aircraft Research Association Limited	ARA	UK
4	University of Beira Interior	UBI	Portugal
5	Swansea University	SU	UK
6	Middle East Technical University	METU	Turkey
7	Technische Universiteit Delft	TUD	Netherlands
8	Invent Innovative Verbundwerkstofferealisation und Vermarktung Neuertechnologien GMBH	INV	Germany

Previous FP7 Applications/ Morphing

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Innovation Actions, Core Partner(s) Application
JTI-CS2-2015-CPW03-AIR-01-04 - Next Generation Movables for High Speed Aircraft
EMORPHI, Enhanced MORPHIng wing

Participant organisation name	Country	Type
Turkish Aerospace Industries (TAI)	Turkey	Industrial
Middle East Technical University (METU)	Turkey	University
University of Patras (UPATRAS)	Greece	University
University of Bristol (UBRISTOL)	UK	University
Von Karman Institute for Fluid Dynamics (IVKDF)	Belgium	Research Institute
University of Glasgow (UNIGLA)	UK	University

Research Interests

- Active Vibration Suppression of Smart Beam-like and Plate-like Structures
- Studies on Energy Harvesting
- Studies on Structural Health Monitoring of Helicopter Blades
- Fully Morphing Wings and Control Surfaces
- Aerodynamic Efficiency

LC-MG-1-5-2019: Advancements in aerodynamics and innovative propulsion systems for quieter and greener aircrafts

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    - Reducing CO2 and NOx emissions
  - To better understand of the leading/ trailing edge noise generated at landing by high-lift devices and undercarriage, including new acoustic treatments on nacelle and aircraft structures

- **Expected results:**
  - Better aerodynmaic efficiency and performance
  - Reducing CO2 and NOx emissions

MG-3-1-2018: Multidisciplinary and collaborative aircraft design tools and processes

- Advanced multidisciplinary and collaborative capabilities for whole aircraft and optimisation decision tools for overall aircraft along its life cycle
- To advance further and validate Computational Solid and Fluid Dynamics (CSFD), Multidisciplinary Design Optimisation (MDO) and Uncertainty
- Significantly reduced aircraft design cycle and higher complexity decision different levels of fidelity, resolution, and complexity

- **Expected results:**
  - Advanced multidisciplinary and collaborative capabilities for whole aircraft along its life cycle
  - Significantly reduced aircraft design cycle and higher complexity decision trade-offs

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