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İTÜ Kontrol ve Aviyonik
Laboratuvarı

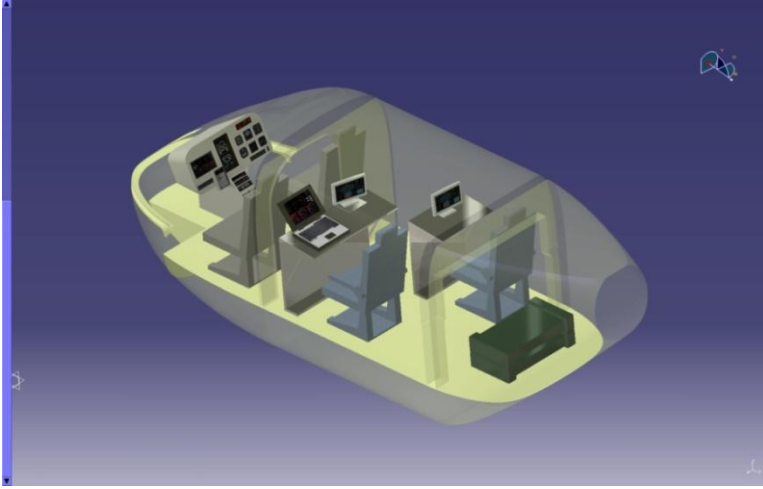
Yeni Hava Trafik Yönetimi Konsepti İle 4- Boyutlu Uçuş Yönetimi İçin Pilot Otomasyon ve Karar-Destek Sistemlerinin Geliştirilmesi

Emre Koyuncu, Gökhan İnalhan

Sunum İçeriği

- İTÜ Kontrol ve Aviyonik Laboratuvarı
- İTÜ KAL Hava Trafik Kontrol Araştırma ve Geliştirme Faaliyetleri
 - ▣ Resilience2050, EU FP7 Projesi
 - ▣ AutoFly-Aid, HALA! SESAR WP-E, Doktora Araştırma Projesi
 - ▣ 111M167 TÜBİTAK Projesi
 - ▣ EGNOS DCN İstasyonu
 - ▣ ADS-B Hava Trafik Gözetleme İstasyonu
 - ▣ Emisyon Gözetleme İstasyonu

İTÜ Kontrol ve Aviyonik Laboratuvarı



İTÜ LCH AVİYONİK
MİMARİSİ

- Temel Endüstri Projeleri
 - DPT
 - ASELSAN
 - SSM, BİLÜZAY

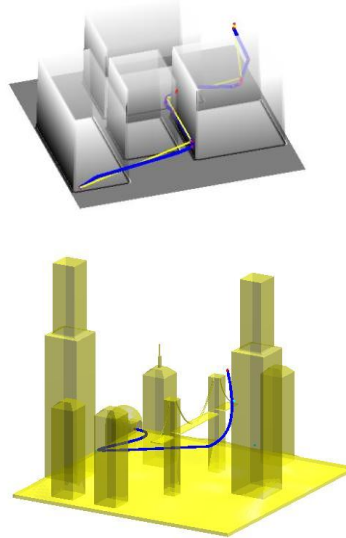
İTÜ Ağ Görev Simülatörü



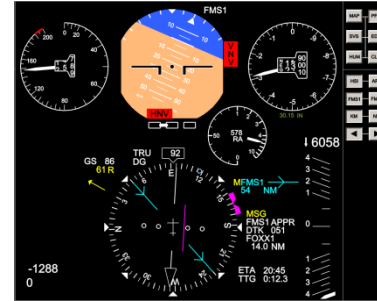
İTÜ ASELSAN HTD

4. SESAR JU Koordinasyon Grubu Toplantısı

Path planning in 3D at realtime

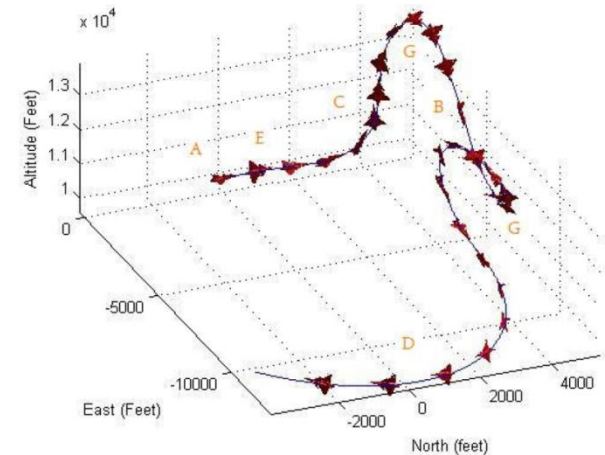
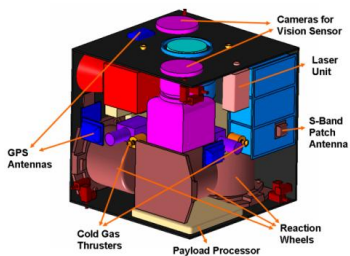


Human-Machine and Fleet Interfaces

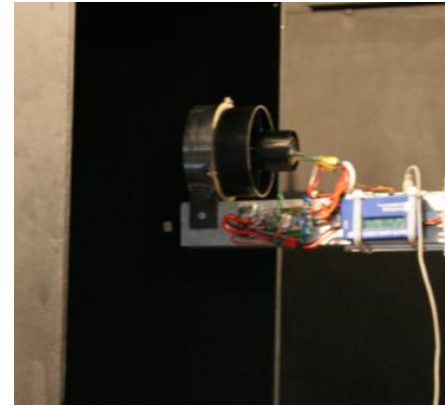
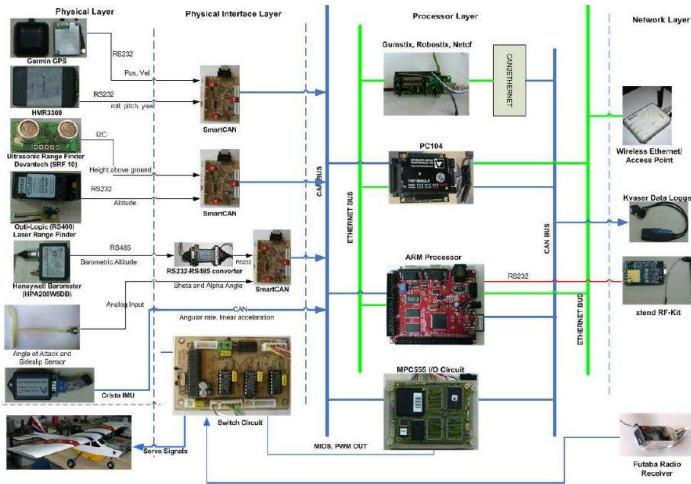


Nonlinear Autonomous Flight Controls For Agile Maneuvering

Spacecraft Design



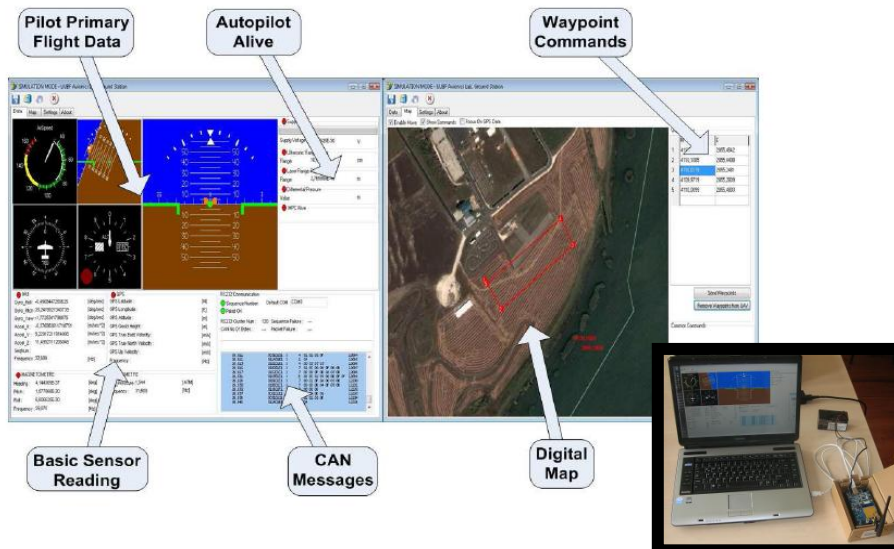
İTÜ Kontrol ve Aviyonik Laboratuvarı



UAS ve UGV



Micro Avionics System



Aricopter



Trainer60

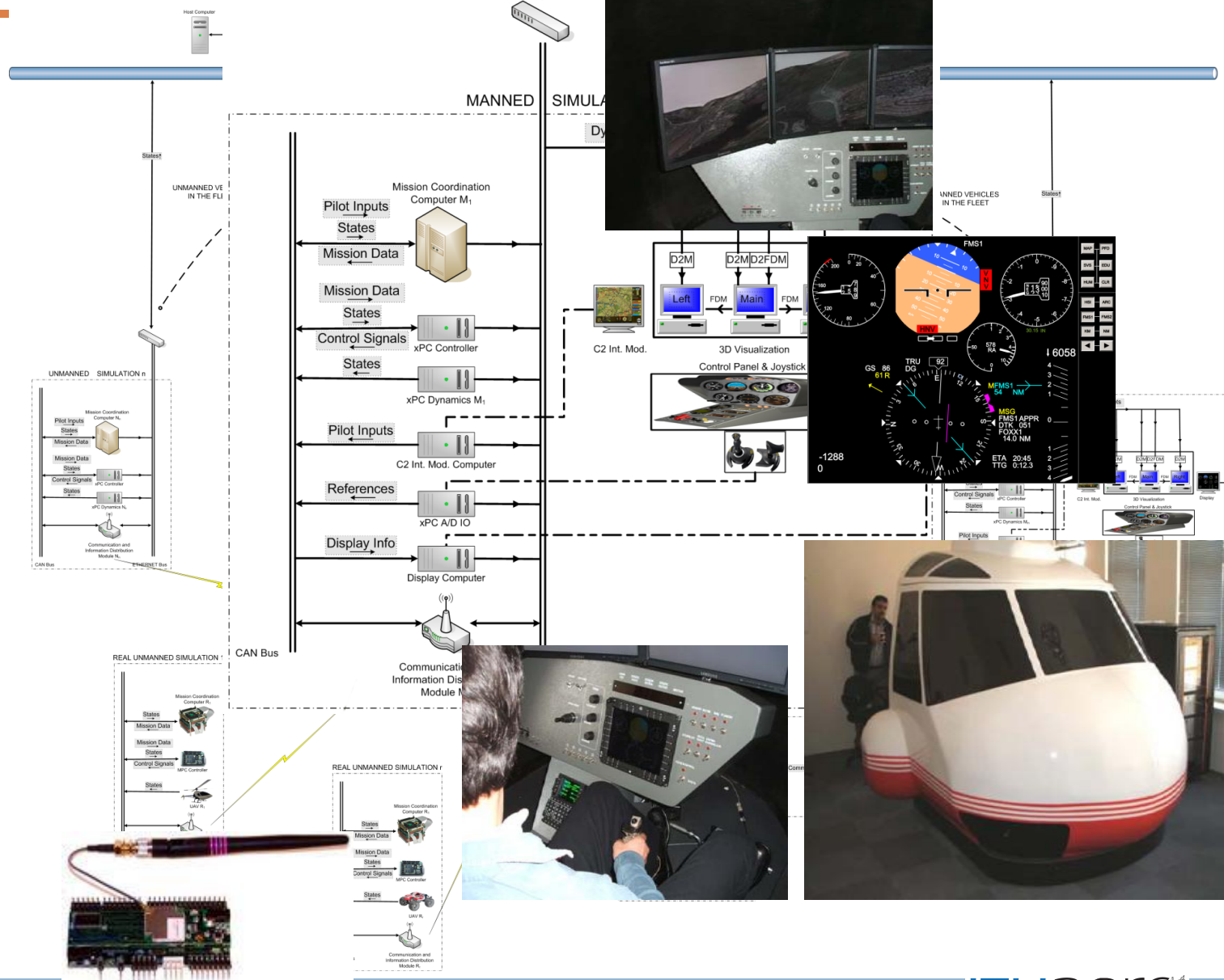


Microbee

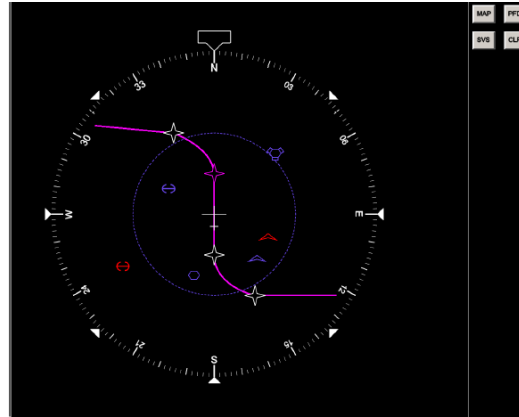


Humvee

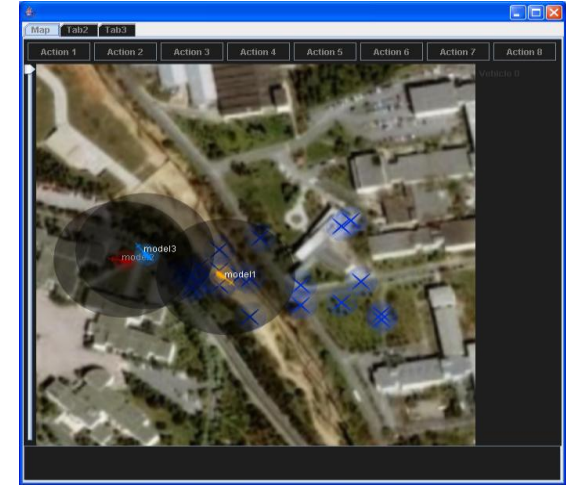
İTÜ Kontrol ve Aviyonik Laboratuvarı



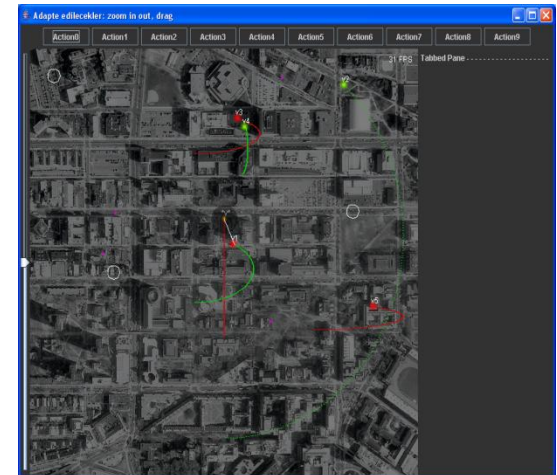
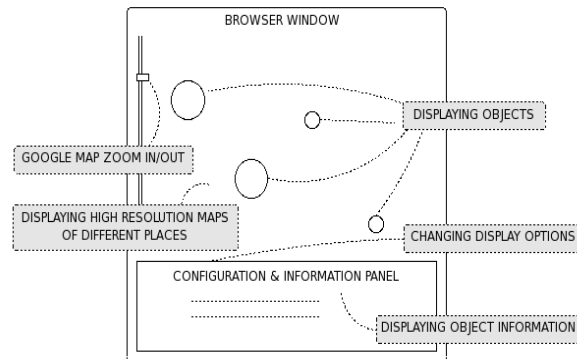
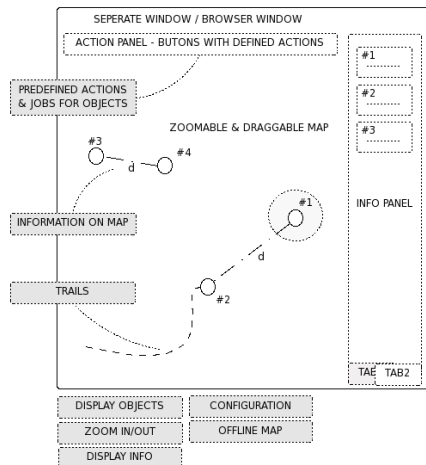
İTÜ Kontrol ve Aviyonik Laboratuvarı



Integrated Cooperative-Non-cooperative
Friend-Foe Command-Control Screen



Touch-screen Pilot Interface



MCC Operator Interface

İTÜ Kontrol ve Aviyonik Laboratuvarı, Hava Trafik Kontrol Araştırma Faaliyetleri

- Resilience2050, EU FP7 Projesi
- AutoFly-Aid, HALA! SESAR WP-E, Doktora Araştırma Projesi
- 111M167 TÜBİTAK Projesi
- EGNOS DCN İstasyonu
- ADS-B Hava Trafik Gözetleme İstasyonu
- Emisyon Gözetleme İstasyonu

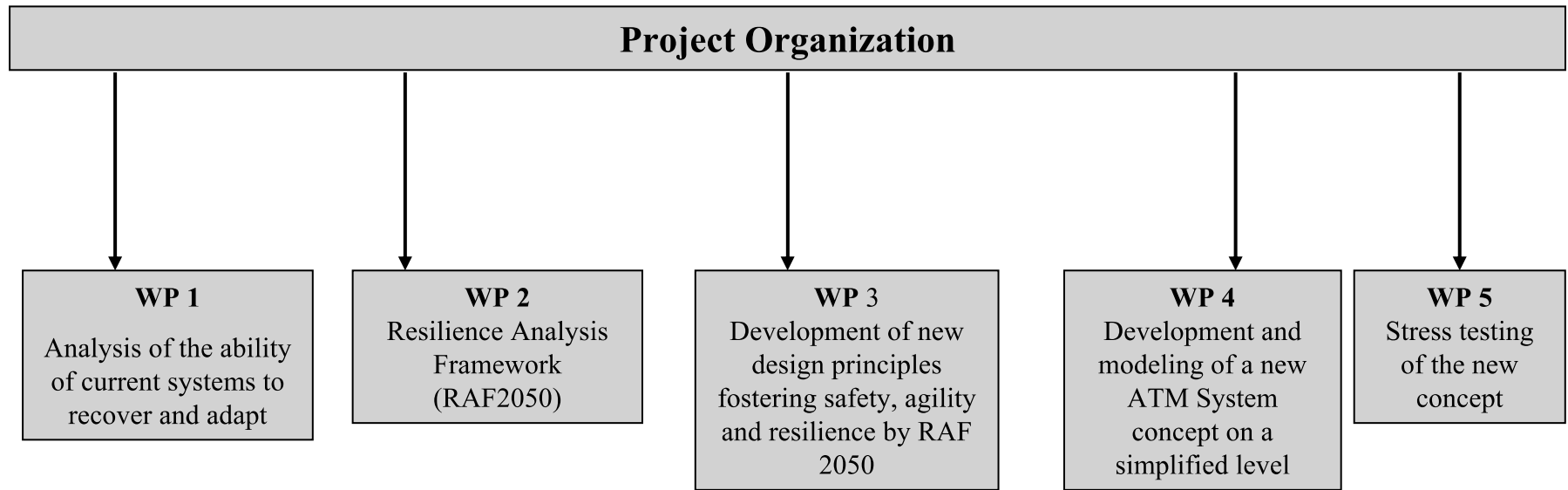
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Resilience 2050

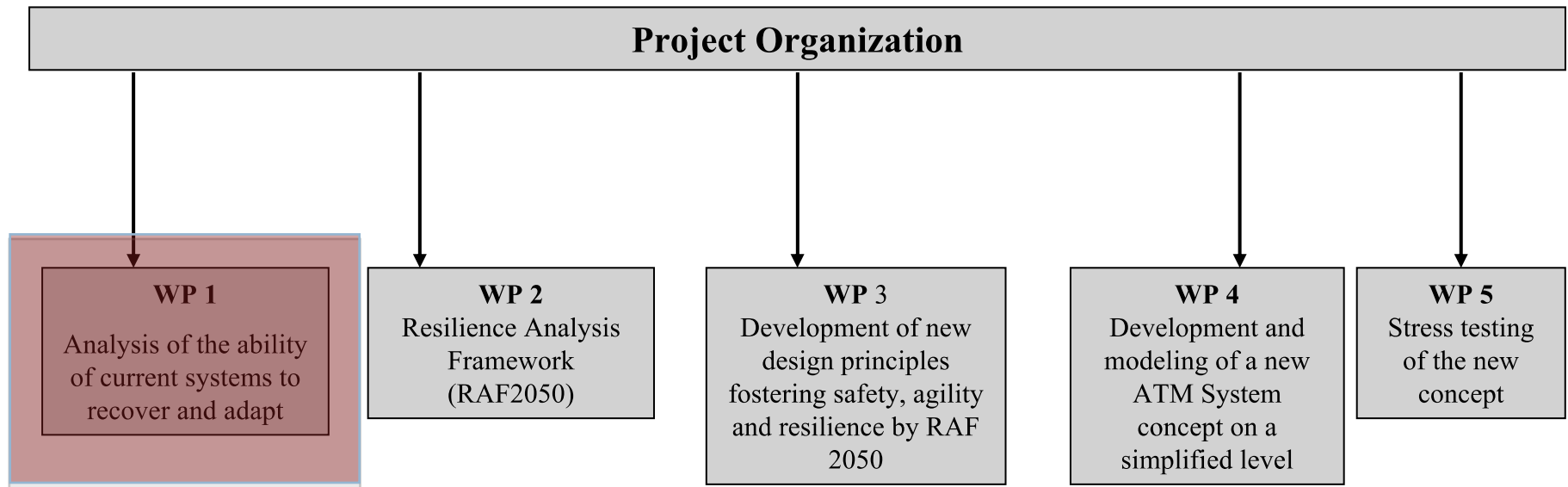


Design concepts for a productive and resilient ATM- System beyond SESAR as part of Europe's transportation system.

Resilience2050, EU FP7



Resilience2050, EU FP7

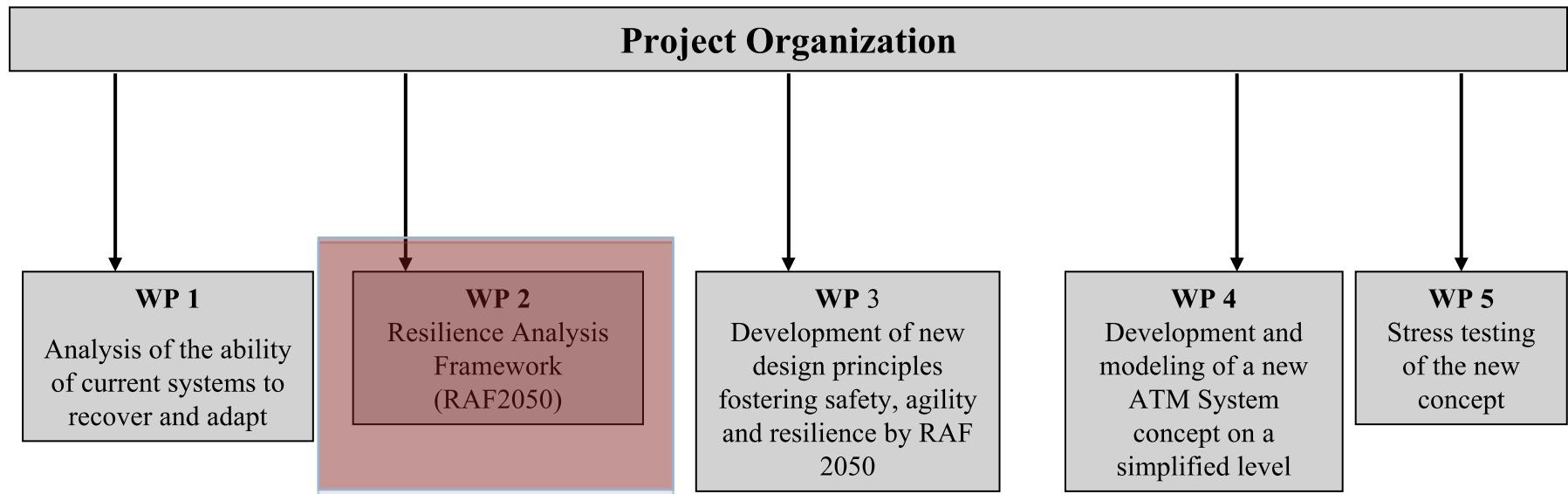


- Investigate the relationship between air and ground transport concerning the reaction on disruptions
- is it possible to substitute parts of the air system by the ground system or will both systems fail under certain conditions like heavy snow?
- What are the “buffers” in biological or socio-economic systems? What other means are used here to achieve resilience? Is it a kind of redundancy?
- Analysis of other systems
- Swarm Intelligence

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- analysis of resilience aspects in manmade and natural systems.
- human role for resilience in ATM with DHMI
- definition of resilience in the context of ATM.

Resilience2050, EU FP7

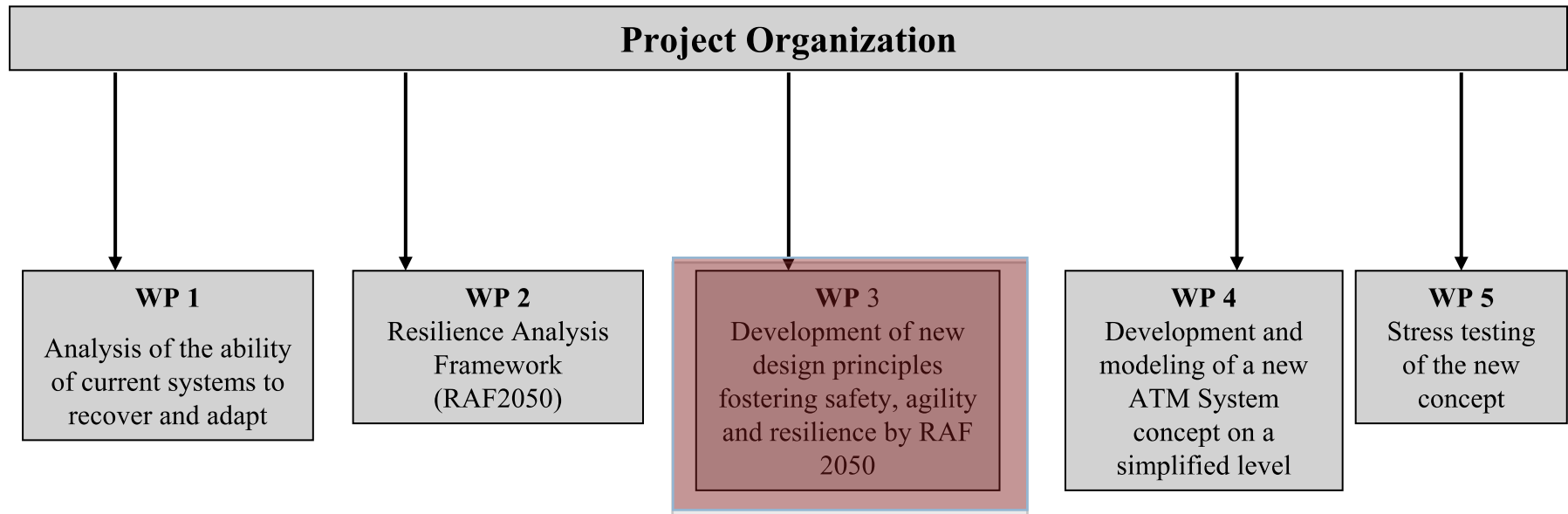


- Data collection (real world data), data annotation, data structuring, data understanding, data preprocessing, filtering
- Definition of key concepts in the context of a new framework of analysis of resilience
- ATM Historical data mining

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- DHMI and ITU are responsible for the provision of the data necessary for analysis and synthesis.
- DHMI and ITU provide expert verification of these resilience patterns.

Resilience2050, EU FP7

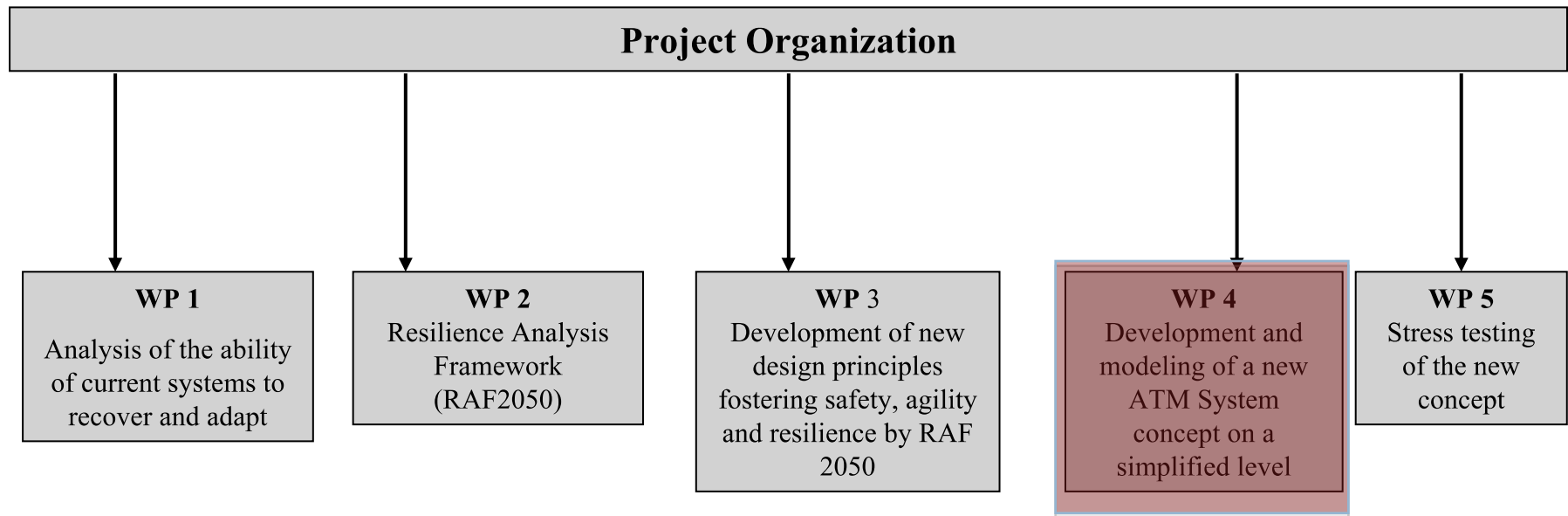


- Formulate new principles concerning resilience
- Optimization of the deficiencies identified - the optimized resilience paradigm
- Assess the application of this principles to design a new ATM System
- Development of resilience analysis tool set
 - Layered model of services definition: the air transport network engine
 - The propagation of performances
 - Weather layer
 - Airspace capacity layer
 - Airport capacity layer
 - Central flow layer
 - other layers... (based on perturbations identified)

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DHMI and ITU would be providing verification of the new design principle from the expert perspective of an ANSP

Resilience2050, EU FP7

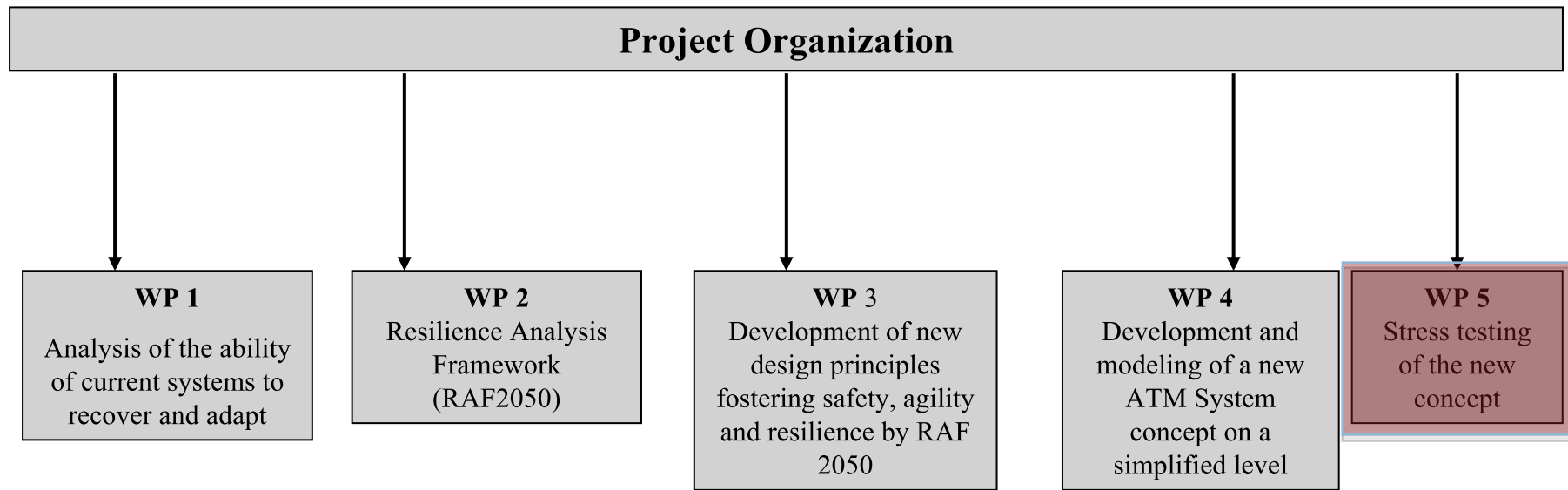


- Expert Judgment: Is it feasible/realistic/..?
 - Describe new possible forms of resources and resource user
 - Describe the connections and relations between resources and their users
 - Describe the possible states of the resources and of the users
 - Describe impact of the states of the resources and of the users on the users and the resources
 - Introduce unavoidable physical limits

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- DHMI imparts the experience of daily ATM operations.
- ITU brings in its modeling expertise and is the interface to DHMI.

Resilience2050, EU FP7



- Implementation of the new ATM model into a simulation environments to test and enhance the development according to optimum condition operation and according to react to crisis, to adapt and to evolve
 - Develop the uses case for the tests
- Testing and enhancement of the development
 - Create scenarios fitting to the identified use cases
 - Determine evaluation criteria
 - Analysis of the results

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DHMI and ITU provide technical and operational expertise (performance and acceptability)

Resilience 2050

Dimension one: Development of a **radical new productive ATM concept ignoring the operational limits** from today and only addressing foreseeable physical limits.

Dimension two: Interweave the ATM concept with a future concept for the ground transportation system to a **single system relying on the same design principles**

Dimension three: Development of design principles which **enables resilient system behavior for the future ATM-system**



AUTOFLY-Aid, HALA! SESAR WP-E



HALA! SESAR Research Network

- HALA! SESAR WP-E tarafından 4 ana temada PhD projesi çağrısı
 - 4D Trajectory Management
 - Advanced DSTs
 - Network Centric ATM Services
 - UAS in controlled airspace
- 13 Adet PhD Projesi destek aldı, ikinci çağrı yapıldı (6 + 7)
- “AUTOFLY-Aid : Flight Deck Automation Support with Dynamic 4D Trajectory Management for Responsive and Adaptive Airborne Collision Avoidance” (2012-2015)

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POLITÉCNICA

“Ingeniamos el futuro”



AUTOFLY-Aid, HALA! SESAR WP-E

“AUTOFLY-Aid : Flight Deck Automation Support with Dynamic 4D Trajectory Management for Responsive and Adaptive Airborne Collision Avoidance” (2012-2015)

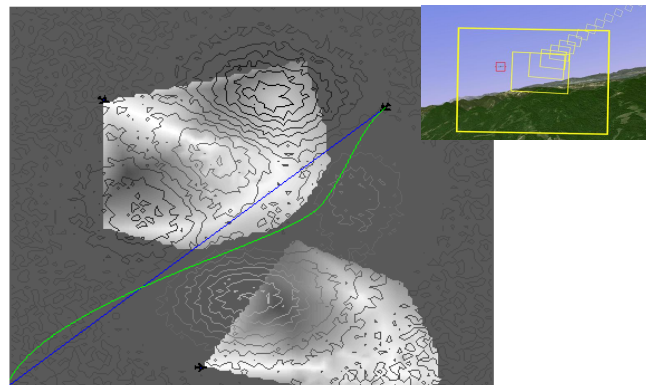
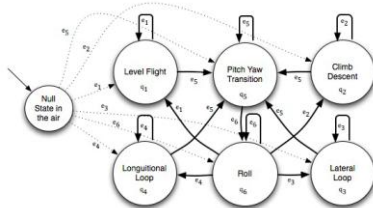
- Modeling and Collision Detection within a dynamic airspace picture with uncertainty - The New Flight Deck Perspective.
- Novel Dynamic Flight Trajectory Planning for Collision Avoidance under Uncertainty.
- New Methods and Metrics for Ensuring Quantified Understanding of Risks and Uncertainty
- Synthesis for enhancing the existing TCAS, on-board avionics and the SESAR Infrastructure with decision-aiding
- Development and Testing of the Collision Avoidance Automation Support System on a Boeing 737-NG FNPT II Flight Simulator

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POLİTÉCNICA

“Ingeniamos el futuro”



4. SESAR JU Koordinasyon Grubu Toplantısı

111M167, TÜBİTAK



TÜBİTAK 1001 Projesi, 111M167

Yeni Hava Trafik Yönetimi Konsepti İçin Gerçek Zamanlı Çalışan ATC
Operatör ve Pilot Otomasyon ve Karar-Destek Sistemlerinin
Geliştirilmesi

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 **ANADOLU ÜNİVERSİTESİ**
Sivil Havacılık Yüksekokulu

111M167, TÜBİTAK

Yeni Hava Trafik Yönetimi Konsepti İçin Gerçek Zamanlı Çalışan ATC Operatör ve Pilot Otomasyon ve Karar-Destek Sistemlerinin Geliştirilmesi

□ Yer Segmenti - AÜ Sivil Havacılık Yüksekokulu

- Hava Trafik Akış Optimizasyonu : (Onlu dakikalar mertebesinde)
- Otomatik Hava Trafik Kontrol (Rota ve Ayrışma Yönetimi) - dakika mertebesinde ayrışma prosedürleri

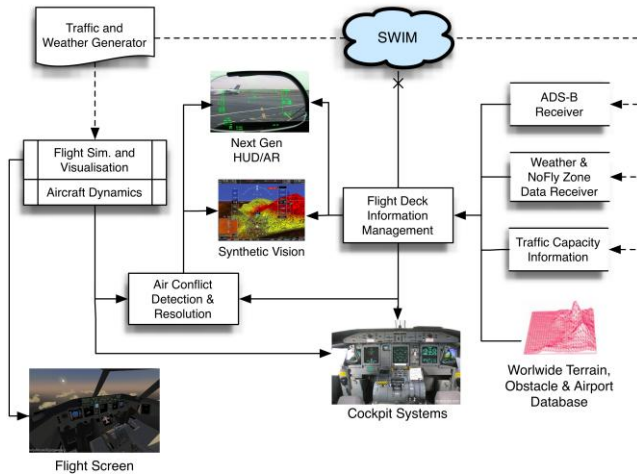


111M167, TÜBİTAK

Yeni Hava Trafik Yönetimi Konsepti İçin Gerçek Zamanlı Çalışan ATC Operatör ve Pilot Otomasyon ve Karar-Destek Sistemlerinin Geliştirilmesi

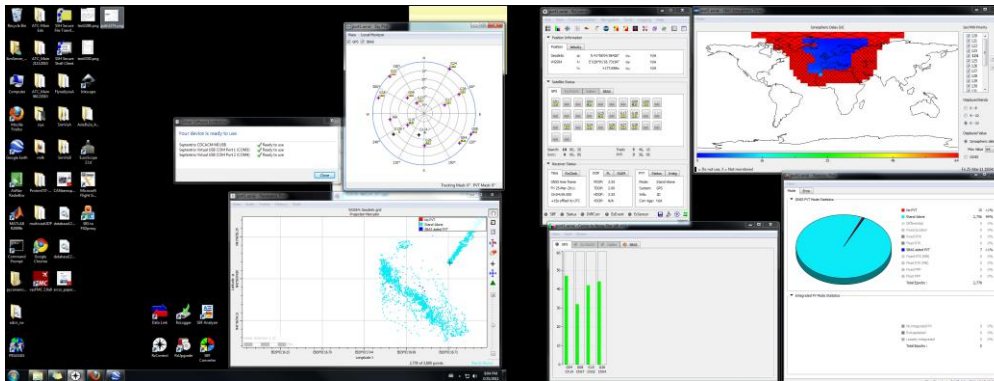
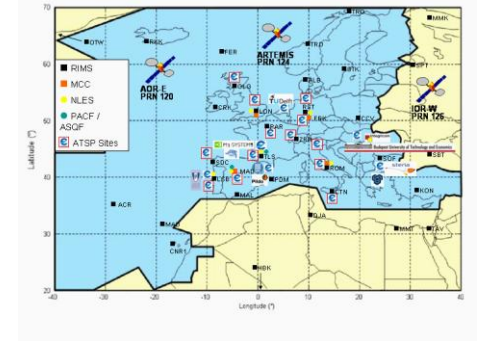
■ Hava Segmenti - İTÜ Kontrol ve Aviyonik Laboratuvarı

- İTÜ B737-NG FNTF II Flight Deck Simulatörü
- Uçuş rota yönetimi - saniye mertebesinde
- Karar-Destek Sistemleri Geliştirme



EGNOS DCN, EUROCONTROL

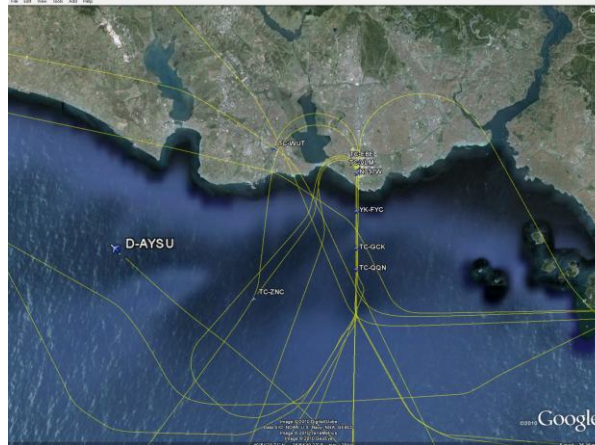
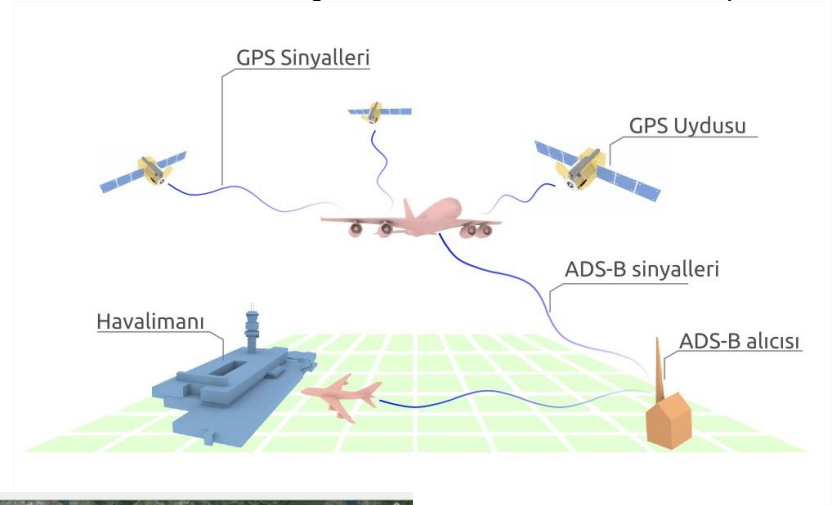
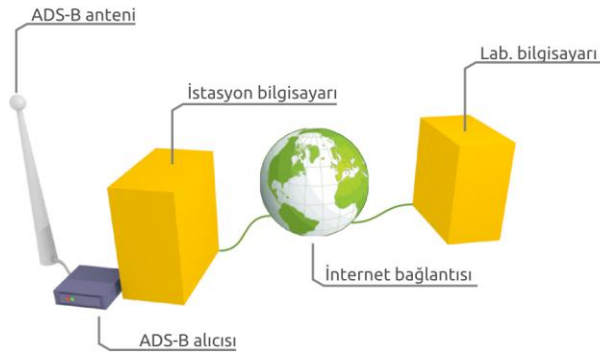
- The EGNOS Signal-in-Space (SIS) Validation (ESV) Task Force grubuna bağlı olarak
 - EUROCONTROL tarafından EGNOS performance gözetleme amacıyla standart data toplama ağı içinde
 - İTÜ KAL bu veri toplama istasyonlarından birini yönetiyor (Atatürk Hava Limanı yakınlarında kurulu)



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PildoLabs

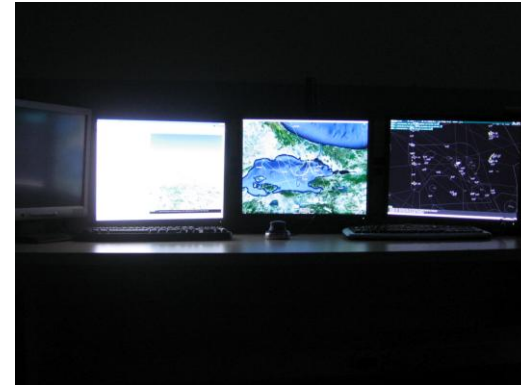
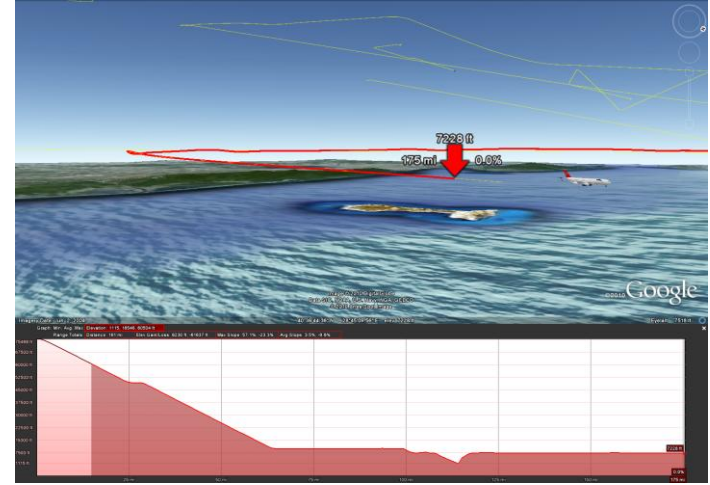
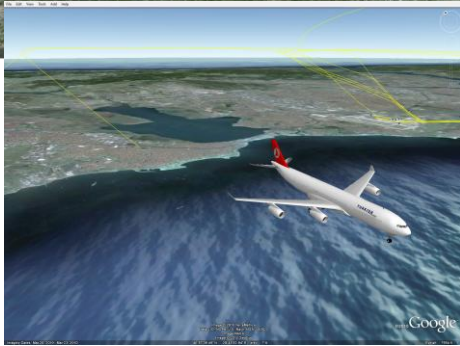
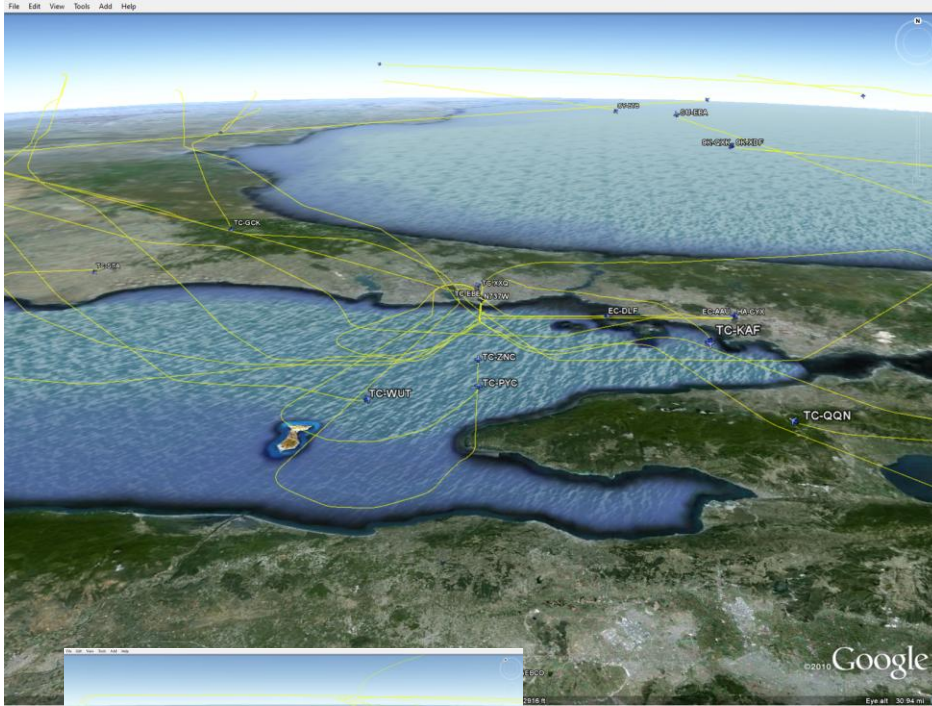
İTÜ KAL AIR TRAFFIC DCN

- İTÜ KAL Canlı Hava Trafiği Gözetleme İstasyonu
 - ADS-B veri toplama sistemi (Atatürk Hava Limanı yakınlarında kurulu)



İTÜ KAL AIR TRAFFIC DCN

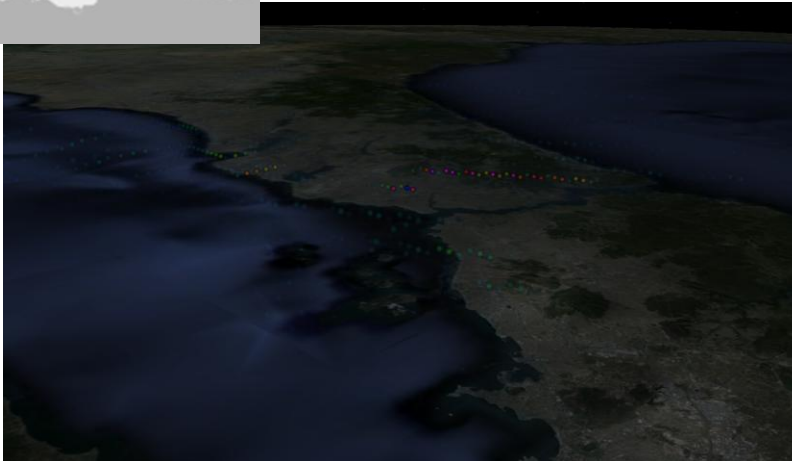
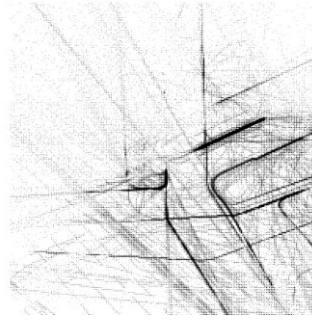
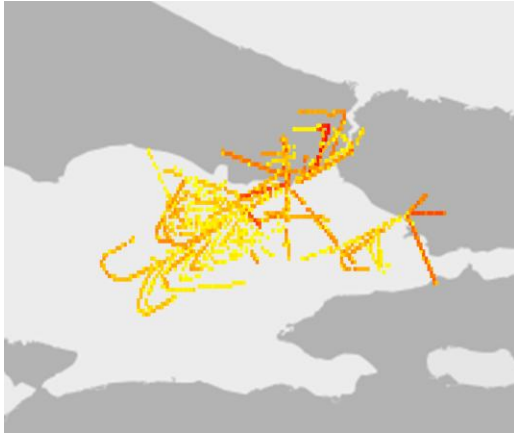
□ İTÜ KAL Canlı Hava Trafiği Gözetleme İstasyonu



4. SESAR JU Koordinasyon Grubu Toplantısı

İTÜ KAL AIR TRAFFIC DCN - Emisyon Ölçüm

- İTÜ KAL Canlı Hava Trafiği Gözetleme İstasyonu ile Emisyon Ölçümü



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İTÜ Avrasya Yer Bilimleri Enstitüsü
ITU Eurasia Institute of Earth Sciences



4. SESAR JU Koordinasyon Grubu Toplantısı

İTÜ Kontrol ve Aviyonik Laboratuvarı, Hava Trafik Kontrol Araştırma Faaliyetleri

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Laboratuvarı



Teşekkür ederim...