Best practice in participation in ECSEL Calls.

Recommendations to prospective Bulgarian participants.

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Honeywell Aerospace Advanced Technology

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Honeywell

Outline

- **Introduction of Honeywell,**
- **EU funding vehicles and their alignment to technology maturity,**
- **Examples,**
- **Recommendations**

2015-02-12

Honeywell business

- A diversified technology and manufacturing company with >$40B (2014) in revenue, 50% outside of the U.S.
- Nearly 130,000 employees operating in 100 countries
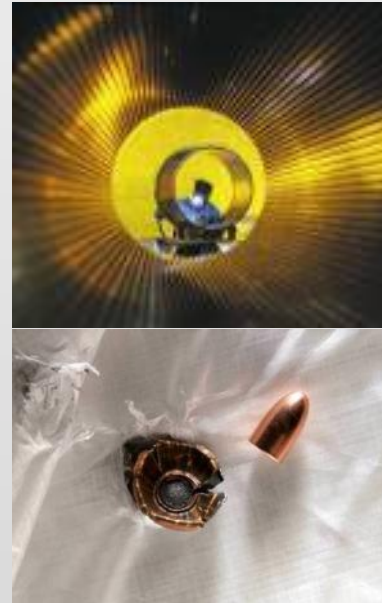- Morristown, NJ global corporate headquarters

Aerospace	Automation & Control Solutions	Performance Materials & Technologies	Transportation Systems
~$12.5B	~$17B	~$6.8B	~$3.9B

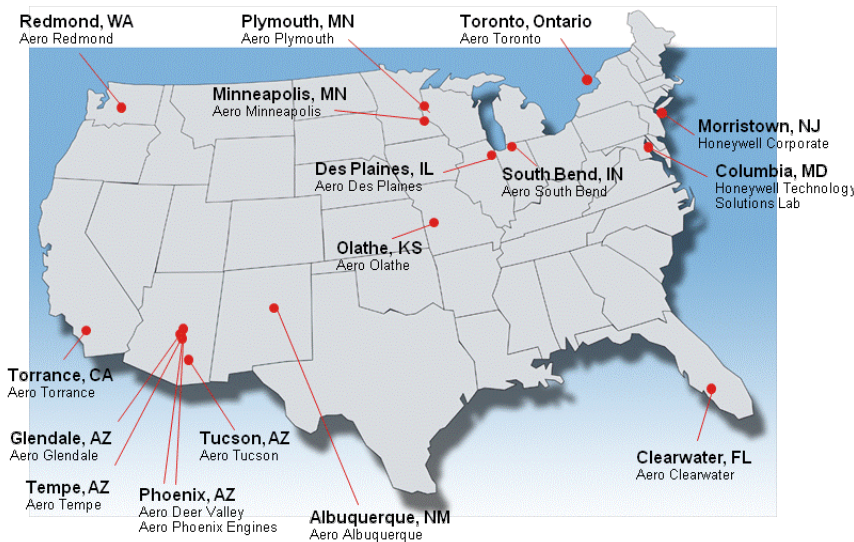2015-02-12

Honeywell Aerospace

Honeywell

ATR

Helicopters

BGA

Space

Defense

Our aerospace business serves markets where **adoption of new technologies**, products and services is a **key towards success**

Honeywell Aero: 40,000 employees
Engineers: ~10,000
R&D Engineers: ~1,200 (Advanced Technology)

Redmond, WA
Aero Redmond

Plymouth, MN
Aero Plymouth

Toronto, Ontario
Aero Toronto

Minneapolis, MN
Aero Minneapolis

Des Plaines, IL
Aero Des Plaines

South Bend, IN
Aero South Bend

Morristown, NJ
Honeywell Corporate

Columbia, MD
Honeywell Technology
Solutions Lab

Olathe, KS
Aero Olathe

Torrance, CA
Aero Torrance

Glendale, AZ
Aero Glendale

Tucson, AZ
Aero Tucson

Tempe, AZ
Aero Tempe

Phoenix, AZ
Aero Deer Valley
Aero Phoenix Engines

Albuquerque, NM
Aero Albuquerque

Clearwater, FL
Aero Clearwater

Toulouse, France

- FMS center of excellence
- Aircraft system architects, ATM

Raunheim, Germany

- APU Lab and test center

Maintal, Germany

- Inertial Guidance & NAV

Yeovil, Boxgrove, Broadstairs, Redditch, UK

- ECS
- Bleed
- Pressurization
- Displays & Helo security
- Turbo Machinery Analysis, CFD, Design & Testing
- Cryogenic cooling

Prague and Brno, Czech Republic

- Advanced Systems
  - Analysis
  - Modeling
  - Simulation
- ATM
- CNS
- Crew Interface & Platform Systems

20 Technology Locations Worldwide

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Honeywell in the Czech Republic

HON Aero Olomouc
- **OEM: Components for turbine**
- **engines**
- **R&O: Repairs of static**
- **engine components**

- **ACS laboratories**
- **Aero R&D center**
- **Aero EMEA Business Support**
  - **Sales B&GA, D&S, ATR**
  - **Customer Quality**
  - **Customer & Product Support**
- **Aero EMEA Functional Support**
  - **Law & Contracts**
  - **Communication**
  - **IT Administration**
  - **Finance**

POLAND

Prague

Plzen

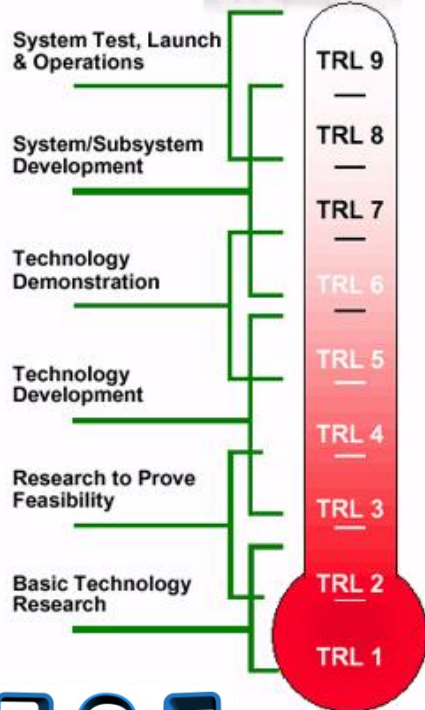CZECH REPUBLIC

Olomouc

Brno

GERMANY

AUSTRIA   SLOVAKIA

- **R&D centre supporting ACS, AERO, TS engineering, ITSS applications**
- **ECC manufacturing site**
- **ADI Olympo (SS)**
- **Sensing & Control**
- **Corp – Shared services -**
- **HRS Payroll, Finance,...**

Almost 4,000 employees across CZ

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Honeywell Aerospace

Product Development (TRL 7-9)

Engine Controls	Flight Controls	Electronic Hardware
Controller Design, modification Software Design & Certification (FAA)	System Design & Development Software Tools Low level board support package Maintenance & Fault Diagnostics	Electrical/EMC Design Mech Design Therm./Struct. Analysis PCB Layout Component Eng ASIC/FPGA Design

Engineering Test Services	Guidance & Navigation	Advanced Technology
Test Automation, Modeling & Simulation S/w, H/w & Mech Design Sys Eng & Project Mgmt	System Engineering, Software Design & Certification	Technology Development

ATR , BGA and D&S Segments

- ❑ Major contribution to B787, A350 and ARJ21 programs
- ❑ Electronic hardware, ASIC design, software, simulation, modeling and prototyping skills
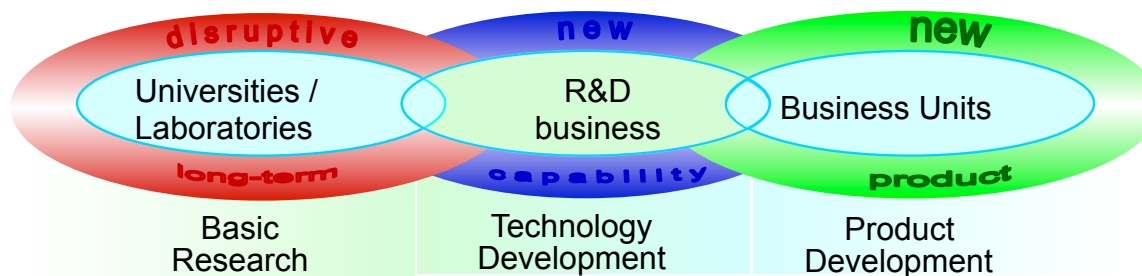
Impact

- ❑ Supported & delivered flight controls for B787 & ARJ21 platforms with high level of quality & on time schedule
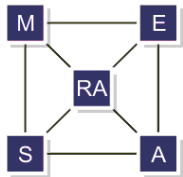- ❑ Building systems engineering & domain knowledge

System Test, Launch & Operations — TRL 9
System/Subsystem Development — TRL 8
— TRL 7
Technology Demonstration — TRL 6
Technology Development — TRL 5 / TRL 4
Research to Prove Feasibility — TRL 3
Basic Technology Research — TRL 2
TRL 1

Technology Development (TRL 3-6)

Systems Engineering & Applications	Electronic Technologies	Mechanical Technologies	Modeling & Mock up & Simulation
Power Management Avionics Platforms Human Centered Systems Datalink & Flight Operations Services Precision guidance Trajectory Management Surveillance Applications	Satellite Navigation Navigation & Sensors Communication Cooperative Surveillance Platforms Systems Displays & Graphics Power Distribution	Condition Based Maintenance Material & Process Turbo Machine Electrical generation/drive	Software prototypes of mockups and prototypes of future Honeywell products

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Public Subsidies for R&D and their alignment with TRLs

SEVENTH FRAMEWORK PROGRAMME

SESAR
JOINT UNDERTAKING

Technology Agency
of the Czech Republic
... from ideas to applications

EU

ARTEMIS

National

esa

MINISTRY OF
INDUSTRY AND TRADE

Clean Sky

disruptive | new | new

| Universities / Laboratories | R&D business | Business Units |

long-term | capability | product

| Basic Research | Technology Development | Product Development |

7

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Examples

MERASA: aims at developing a **multi-core** (2-16 cores) **processor** design intended for hard real-time applications supporting **WCET** (Worst-Case Execution Time) **analysability**.

REFLECT: development, implementation and evaluation of a novel **compilation and synthesis system approach** for FPGA-based **reconfigurable multi-core heterogeneous platforms**

iFEST: aims at specifying and developing an **integration framework for HW/SW co-design** of heterogeneous and multi-core embedded systems.

RECOMP: aims at establishment of **methods, tools and platforms** for enabling **cost-efficient certification and re-certification of safety-critical systems** and ones with mixed-level of criticality, i.e. systems containing safety-critical and non safety-critical components.

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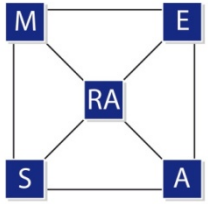
MERASA Project Partners

▶ **University of Augsburg**
  ◦ Project Coordinator

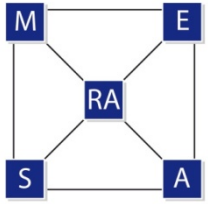▶ **Barcelona Supercomputing Center**

▶ **Université Paul Sabatier**

▶ **Rapita Ltd.**

▶ **Honeywell international s.r.o.**

Industry Advisory Board

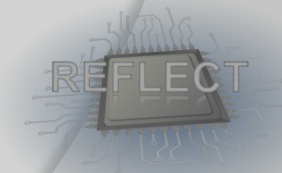# Principal REFLECT Research Goals

- ◉ **Make Reconfigurable Technology Accessible**
  - Lower barrier of technology adoption
  - Enable programmer and program portability to new architectures

- ◉ **Improve Productivity**

> The REFLECT project aims to **develop, validate and evaluate a novel compilation and synthesis system approach that relies on Aspect-Oriented Specifications to convey critical domain knowledge to all development steps,** and help designers build efficient FPGA-based heterogeneous multi-core computing systems.

  - User's knowledge about the algorithm
  - Flexibility to define properties of target FPGA and memory organization
  - Best design practices represented by design patterns

REFLECT Consortium

Honeywell

inesc id lisboa

Universidade do Porto
FEUP Faculdade de Engenharia

TUDelft
Technische Universiteit Delft

KIT
Karlsruhe Institute of Technology

Imperial College London

ACE

coreworks

EADS

msc

TEXAS INSTRUMENTS

Fraunhofer IOSB

- ⊙ Experience on:
  - Application customization and architecture exploration for FPGAs
  - Retargetable compilers for Embedded Systems and FPGAs from high-level languages
  - Digital IP cores
  - Dynamically reconfigurable System-On-a-Chip systems

- ⊙ Strong Track Record of
  - Building advanced compilation prototypes
  - Developing, maintaining and deploying industrial compilers

- ⊙ Market leaders in Embedded Heterogeneous HPC
  - Avionics
  - Safety- and Mixed-Critical real-time systems
  - Consumer and broadcasting electronics

REFLECT partners & IAB members collectively constitute a consortium of high quality with all the expertise, skills, and know-how that is required to meet project expectations

RECOMP

Total budget: 9,4M€
Total effort: 1460,5 PMs
Duration: 04/2010 - 03/2013

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iFEST

Total budget: 16M€
Total effort: 1460,5 PMs
Duration: 04/2010 - 03/2013

ABB	ABB AS	Norway
ABB	ABB AB	Sweden
@-portunity	@-portunity	The Netherlands
atego	Atego Systems Ltd	UK
TUDelft	Delft University of Technology	The Netherlands
ENEA	ENEA	Sweden
ENSIETA	ENSIETA – École nationale supérieur d'ingénieurs	France
tecnalia Inspiring Business	TECNALIA Research & Innovation	Spain
Honeywell	Honeywell	Czech Republic

KTH	KTH – Royal Institute of Technology	Sweden
Loughborough University	Loughborough University	UK
Masaryk University	Masaryk University	Czech Republic
SELEX GALILEO	SELEX Galileo	UK
SIEMENS	Siemens	Germany
SODIUS	SODIUS	France
systonomy	SYSTONOMY	UK
tcp	TCP Sistemas e Ingeniería	Spain

THALES	Thales Research and Technology	France
UNIVERSITY OF OSLO	University of Oslo	Norway
visure	Visure Solutions	Spain
THALES	Thales Systèmes Aéroportés	France

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Recommendations

- **Attend brokerage events – excellent place to share ideas and form consortia**

- **Need to write excellent proposal – success rate significantly lower compared to earlier**

  FP6/7 programs

- **Start proposal with a clear business plan – do NOT join a consortium just to get some funding – get a detailed analysis of market:**
  - **Market size,**
  - **Current major showstoppers,**
  - **End-user problems addressed,**
  - **Market trends and evolution,**
  - **In order to <u>determine impact and innovation potential</u>**
  - **Write down a solid exploitation plan, possibly a detailed roadmap in order to convince reviewers that you have a   consistent story**
  - **Clearly articulate any expected improvement in competitiveness as a project outcome**

- **Objectives – once a business plan exists one gets high-level objectives/challenges to be addressed.**
  - **Develop next level of objectives that would drive your work-packages and for each objectives go down to a set of sub-objectives to drive each task.**
  - **Show a clear traceability challenge → objective → sub-objectives → tasks → deliverables – this helps also to get an effective work plan**

- **Present your approach/concept for technology development in detail, incl. picture/s**

- **Present detailed state-of-the-art and beyond it, incl. article and project analysis**
  - **What has been analysed/resolved so far and how we will use build on top of it and not reinvent the wheel. Provide references. Make sure everything is covered.**
  - **Clear articulate your contribution towards progress beyond state of the art**

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Recommendations

- **In work plan:**
  - focus also on demonstrators, make sure critical infrastructure is described;
  - involve end-user; get as many stakeholders as you can
  - Determine your critical path and build milestone, risk and contingency plan to be consistent with the critical path

- **Do not forget you request public money:**
  - State your contribution to open source or alternative forms of know-how sharing
  - Make sure an adequate dissemination plan is in place
  - Do contribute to relevant standards

- **Find partners that can demonstrate excellence, have critical IP and/or are stakeholder in an eco-system. Do not get somebody aboard just because you have done a lot of work together – it is about open innovation environment**

- **Balance your consortia – get industry to drive project + research institutes to work on lower TRL and tasks.**

- **Work, work and work – it is a tough competition but very rewarding**

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