

The logo for CANEUS, featuring the word "CANEUS" in a bold, white, sans-serif font, with a stylized white swoosh or arc above the letters "E" and "S".

**CANEUS**

***CANEUS Innovation Environment  
and Opportunities for  
Participation  
For Corporations and Individuals  
from Europe***

***Milind Pimprikar, Thomas George,  
Oudea Coumar and Rick Earles***

***October 8-12, 2007***



# Presentation Outline

CANEUS

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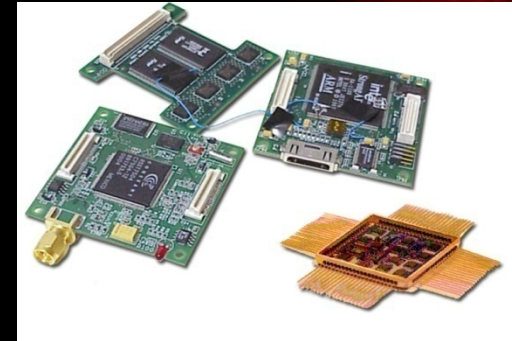
- Benefits of participating in CANEUS at both the corporation and individual levels
- CANEUS Innovation Environment and organizational structure
- CANEUS Projects / Working Groups Background
- CANEUS Project Structure and Forward Planning
  - Opportunities and priorities for collaborative activities
  - International collaborative structure
  - Requirements for participation

# Benefits to Europeans from Joining CANEUS

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1. Cost and risk mitigation: Access to jointly developed **pre-competitive technology** and **proprietary product development**



2. Participation in a **collaborative technology, product and business development environments**



# Benefits to Europeans from Joining CANEUS

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3. Licensing access to a fair and equitable **IP-brokering service**
4. Reduced **time-to-market** and **rapid system-level product** deployment through supply chain collaboration

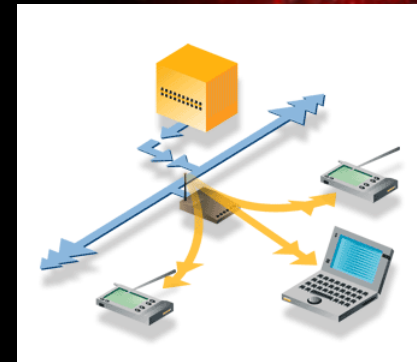


# Benefits to Europeans from Joining CANEUS

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5. Participate in the development of **global standards** in cooperation with leading aerospace corporations and agencies



6. CANEUS will “**harmonize**” various National Policies (ITAR) controlling collaborative international technology development and frequency band allocations



# Benefits to Europeans from Joining CANEUS

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7. Access to CANEUS forums/conferences as key **networking platforms** for members to address the relevant issues
8. Access to CANEUS' global **"technology portal"** that identifies state-of-the-art and the technology developers and suppliers



The logo for CANEUS MNT, featuring the word "CANEUS" in a white, bold, sans-serif font, with "MNT" in a smaller, white, sans-serif font inside a yellow circle below it. The logo is set against a background of a red nebula and a white orbital path.

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# CANEUS Overview

# What is CANEUS?

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- CANEUS is a **worldwide** non-profit organization serving the needs of the **aeronautics, space** and **defense communities** by fostering the **coordinated, international development** of MNT (Micro-Nano- Technologies) for aerospace applications
- As a "hands on" organization, CANEUS is focused on the **practical aspects** of transitioning MNT rapidly and efficiently from the concept to the aerospace system level
- In achieving this goal, CANEUS brings together **technology developers**, aerospace **end-users**, governmental **policy** makers and **investors** from across the world





# Why is overcoming the MNT “Valley of Death” such a big issue for aerospace companies?



Many exciting and new MNT concepts are generated. However, they have to overcome Darwinian Extinction in the “Valley of Death” (**Mid TRL** system development)

CANEUS has led the world in recognizing that the key problem for MNT lies in making the successful **transition across the mid TRL region!**

# CANEUS Mission

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Implement unique End-to-End solution for MNT infusion into Aerospace

- Maximize Return-on-Investment for MNT and laterally **compress the S-Curve**
- Pursue a **coordinated, end-to-end technology development** strategy
- Promote rapid insertion by creating **application pull**



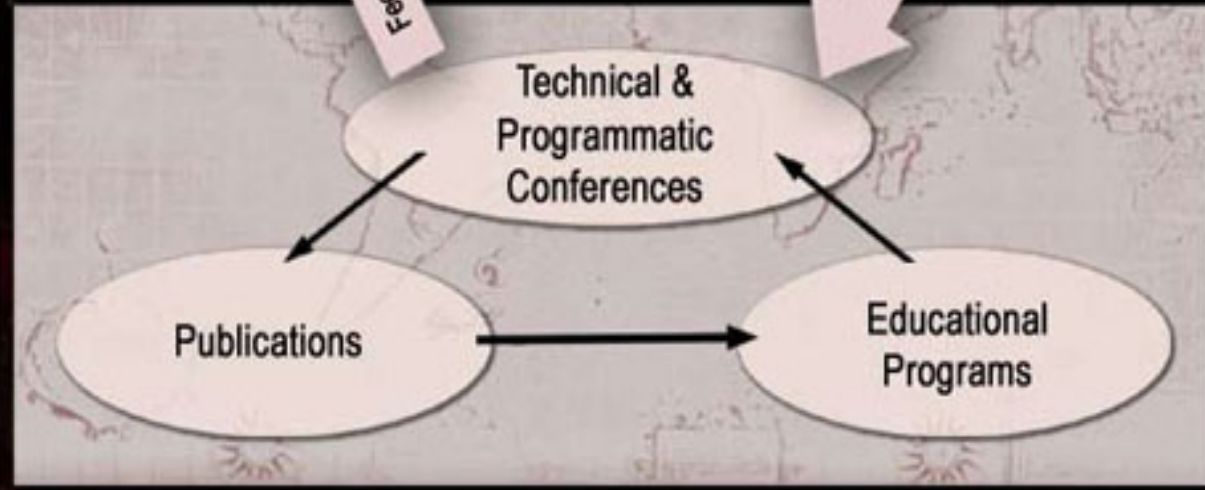
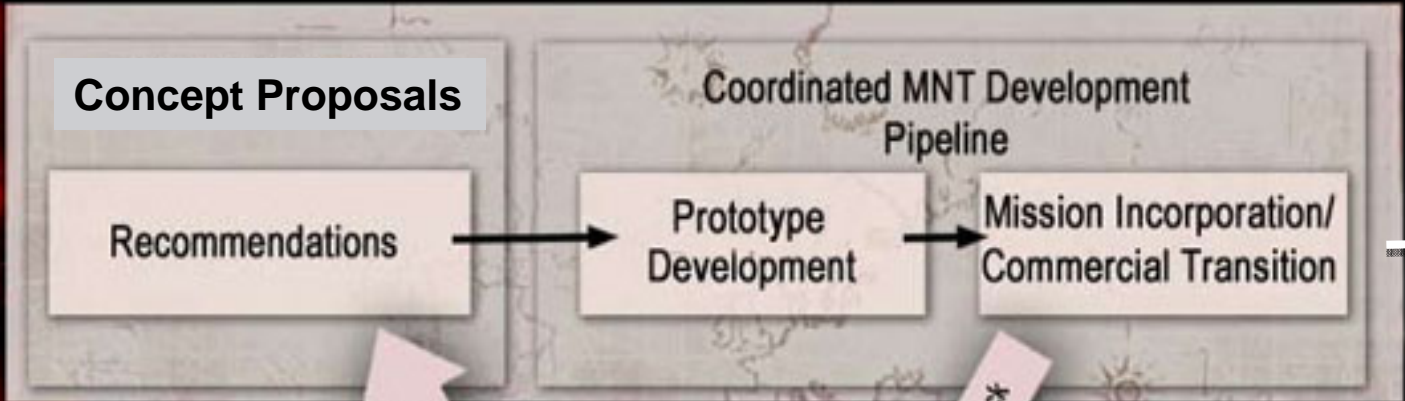
## Bridging the “Valley of Death”(1)

ASTRIUM agrees with CANEUS Analysis

- The technology “**Death’s valley**” is essentially the mid-maturity region of the S-Curve
- Failure to succeed is rarely due to a technical fatal flaw: it is rather due to the **necessary elements not coming together in a coordinated manner** for end-to-end development
  - Pursue a **coordinated, end-to-end technology development strategy**
  - Promote rapid insertion by creating **application pull**



# CANEUS Concept to Product Strategy





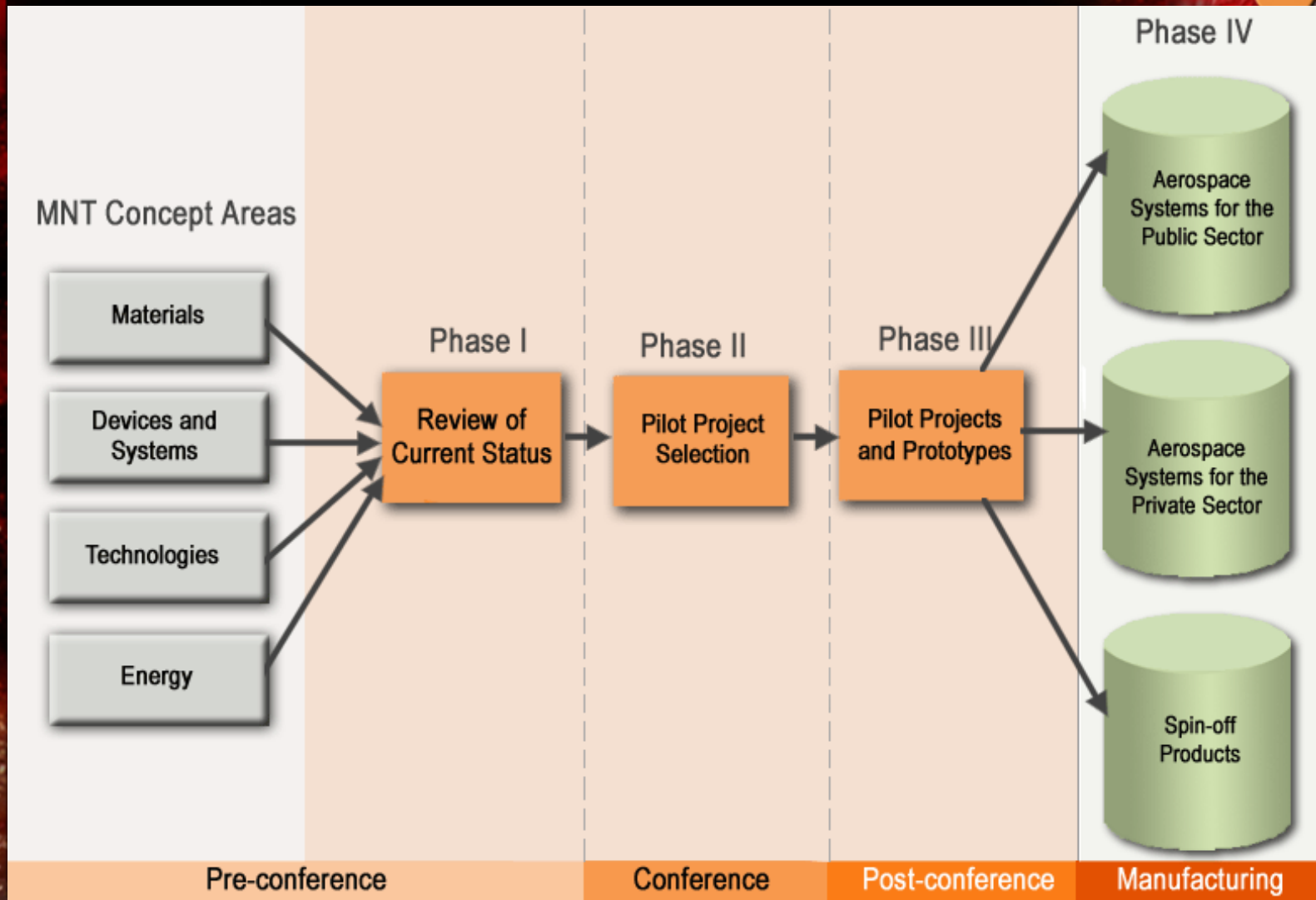
In order to effectively implement its charter, CANEUS is organized into the following three primary components

1. An **administrative role** in generating worldwide membership, and **setting up committees to facilitate the formation of international consortia**
2. The biennial CANEUS conferences to provide a unique **global forum** to identify promising MNT concepts.
3. The CANEUS **working groups** execute the CANEUS strategy and comprise the consortia.

# CANEUS Concept to Product Transition Mechanism:

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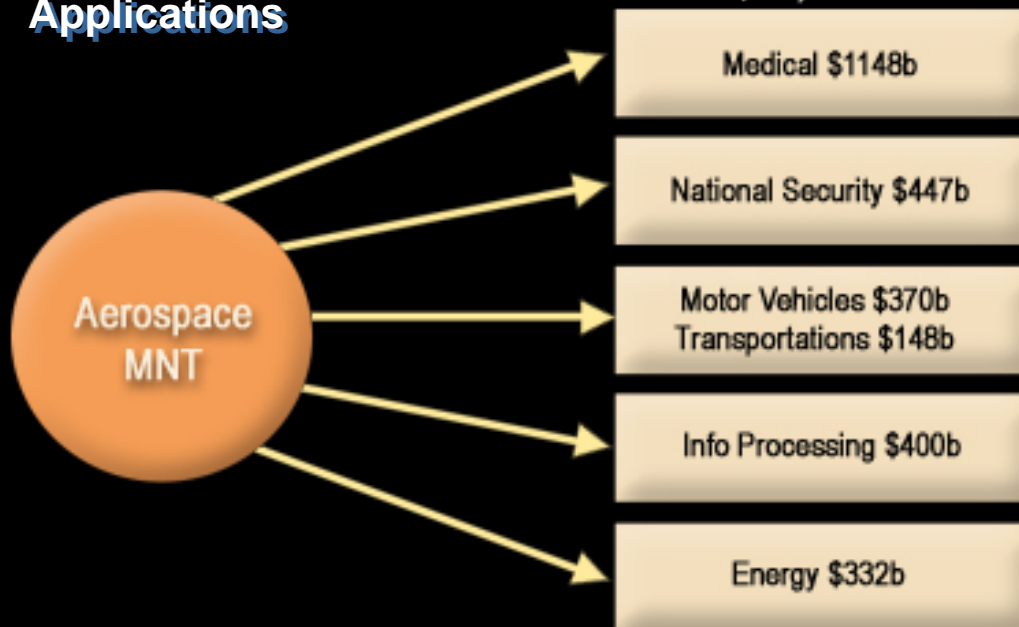
# Spin off Benefits for CANEUS Programs:

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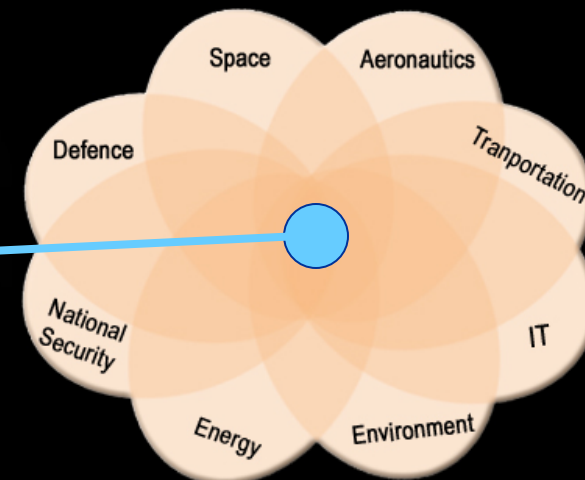
## Potential for Non-Aerospace Applications

US GDP 2002  
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CANEUS has identified the following common MNT needs for a wide range of industry sectors. These needs include:

- Materials
- Sensors
- Devices / Systems
- Energy



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# CANEUS Project Development Process

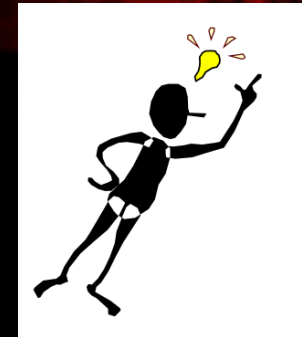


# Step 1: Technology Concept Proposals solicited from CANEUS Members



The Concept proposals submitted by members / end-users make the case for development of MNT concepts leading to projects by addressing:

- **Key technology elements** that need to be developed
- **Organizations** that can provide the necessary expertise and Infrastructural support
- Potential sources of **funding** from governmental, industrial, and other sources
- Challenges related to **intellectual property management**
- Relevant Governmental **Policies** such as **ITAR**



# CANEUS Pilot Project Concept Topics

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RFP Number	Pilot Projects Concept Topics
2004-A01	Development of Micro Attitude & Orbit Control Systems ( $\mu$ AOCS)
2004-A02	Reliability Testing of Micro-Sensors, Micro-Actuators and Micro-Switches
2004-A03	Effects of Space Radiation on MNT Devices
2004-A04	Nano/Pico-Satellite constellations for earth orbit or space exploration
2004-A05	Nano-composite Materials for Thermal Protection and Radiation Shielding Systems (
2004-A06	Nanofiber Composite Materials for Load Bearing Structural Applications
2004-A07	Multifunctional Composite Materials with MNT Embedded Sensors
2004-A08	MNT based Space Transportation & Re-entry Technologies
2004-A09	Nanosensors and Devices
2004-A10	Nano-Optoelectronic Detectors and Lasers
2004-A11	MNT-based Sensors for Aircraft/Spacecraft Structural Health Monitoring
2004-A12	MNT-based Sensors for Astronaut Health Monitoring and Environmental Control
2004-A13	MNT for Miniaturized Scientific Instruments for Planetary Exploration
2004-A14	MNT Based Harsh Environment Sensors
2004-A15	Power Requirements for Future Space Missions

# Proposed New Concepts

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RFP Number	Pilot Project Concept Topics for 2008
2008-A1	Nanocomposites for Aerospace
2008-A2	Molecular / Nano Electronics for Harsh Environments
2008-A3	Nanometrology for Aerospace
2008-A4	Nano Photonics / Opto-Electronics
2008-A5	Nanomaterial (excluding composites) coatings
2008-A6	Nano-micro-macro integration
2008-A7	Micro- nano-enabled smart systems
2008-A8	Micro / Nano Robotics for Space Applications
2008-A9	Energetic Materials
2008-A10	Sensors Network
2008-A11	Nanosensors (physical and chemical)

## Step 2: Concept Proposals Are Shepherded By CANEUS Pilot Projects



- **Recommendations** and Implications to CANEUS membership
- **Justification** for a pilot project aimed at developing MNT based aerospace systems
- **Step-by-step approach** to advancing the maturity of the promising MNT concepts

## Step 3: Formulation of the Pilot Projects

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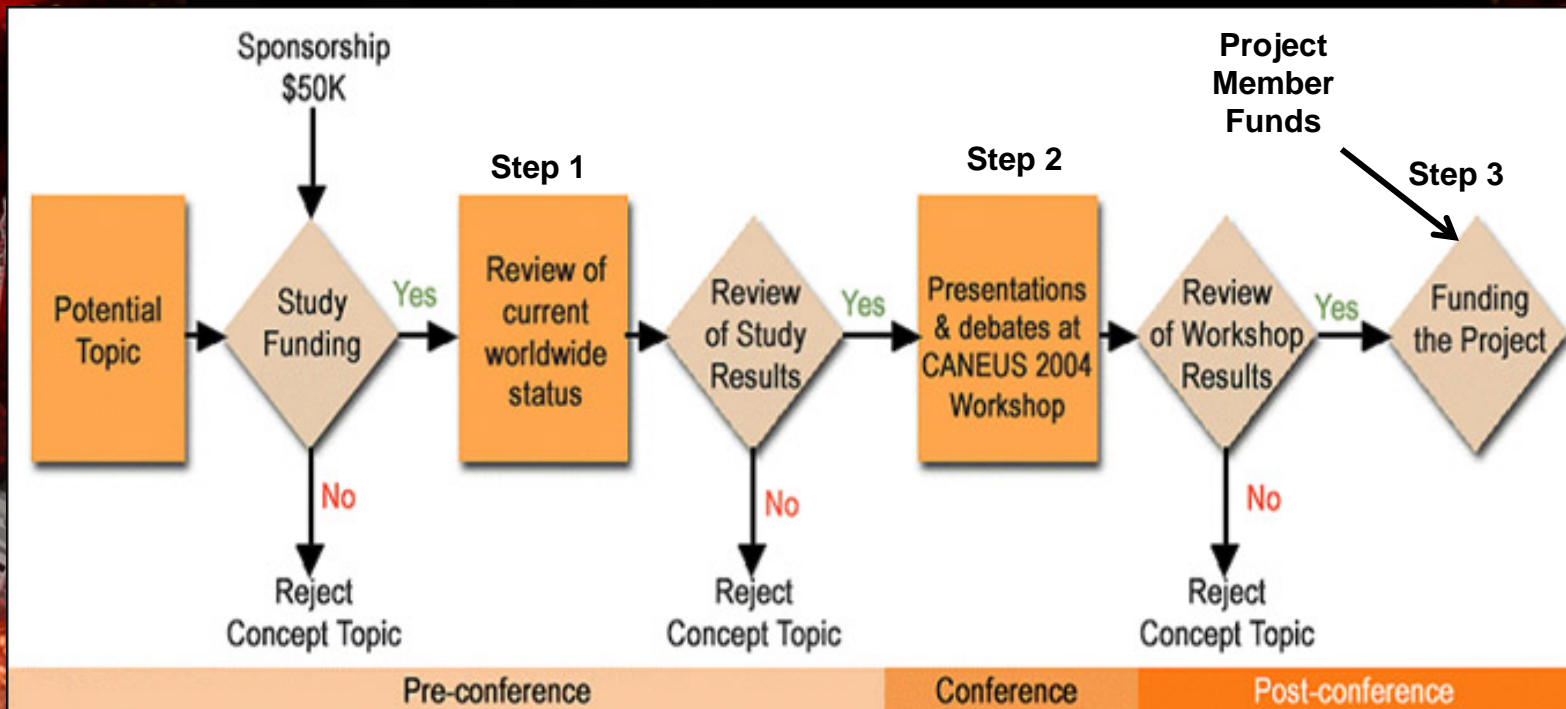
- Define the **scope, opportunities** and **priorities** for the proposed collaborative activities.
- **Teaming** arrangements and complementary expertise and infrastructure
- Framework for **implementation** and progress **evaluation**
- **Funding** from governmental and industries
- Strategy for **Intellectual Property** management
- Plan for the project leading to **commercialization**



# CANEUS Concept to Pilot Project Process

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# Current Pilot Projects

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1. Nano-composite Materials: Load Bearing and Thermal Protection Applications
2. MNT Based Harsh Environment Sensors
3. Nano/Pico/Micro-Satellites for Civilian and Defence Applications
4. Reliability Testing of Micro-Sensors, Micro-Actuators and Micro-Switches
5. Micro-energetic: micro and nanotechnology for power generation, energy conversion, and micro-rockets
6. Aircraft / Spacecraft Structural Health Monitoring  
– Fly By Wireless Working Group
7. Bio-Astronautics: MNT-based Sensors and materials for Astronaut Health Monitoring and Environmental Control



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# ***Working Group Structure and Administration***

**Marion “Rick” Earles**  
Executive Director  
**CANEUS Working Groups  
and Pilot Projects**



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# Need for Industry Working Group

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- Some Pilot Projects are so far reaching they require a **broad program** of initiatives, developments and Industry coordination.
- When such a Pilot Project is proposed and accepted by the CANEUS Membership Committee, a **industry Working Group** is created.
- An industry Working Group can become incorporated (non — profit) If income is generated by the Group, **assets warrant separate ownership, and an additional layer of liability protection** is required by the membership

# CANEUS Working Groups

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CANEUS is currently organizing Industry Working Groups

- **Small Satellite** Working Group: President Dr. Fredrik Bruhn, AAC
- **Harsh Environment Sensor** Working Group: Co-President Dr. Jan Suski and Walt Merrill, GMI
- **Fly by Wireless** Working Group: President George Studor, NASA-JSC
- **Reliability** Working Group: President Phillipe Perdu, CNES
- **Nano-Composite Materials** Working Group: President Dr. Safa-Baksh, Boeing
- **Microenergy Working** Group: President Dr. Ed Schaffer, US Army
- **The Industry** Working Group Model used by CANEUS is derived from a \$40 million Public / Private partnership created by NASA and its partners to develop and deploy into the market place harsh environment sensors

# Working Group Model

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- A global public / private membership organization of **Industry stake holders**
- Steward of the Industry's **strategic and technology roadmap**
- A collaborative environment where the membership's resources are pooled to focus on **high risk, high cost** initiatives
- Manage an **industry portal** for member's technologies
- Organize services to accelerate the **infusion of technology into the market place**
- Be the **IP broker** for the developed technology
- **Collaborate with Industry** support organizations and initiatives.

# Working Group Structure

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- Industry **Stake Holders** define the Working Group's programs and initiatives.
- The Stake Holders are derived from the **Industry supply chain** end users, market lead system Integrator, technical leads, sub-system suppliers
- Stake Holder Committee Chairman provide input directly to **Operational Boards** that are responsible for the execution of the Group tasks
- **CANEUS Staff** supports the committee activity and directly staffs the operational boards along with Working Group members
- An **Executive Board** elected by Working Group members has oversight responsibility for the Group's activities

# Program Hierarchy (partial)

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- **Pilot Project**
  - └ **Working Group**
    - └ Committees
    - └ Boards
      - └ **Development Program**
        - └ Application/Product Development Projects
        - └ Pre-competitive Technology Development

# Committees & Boards

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## Operational Boards

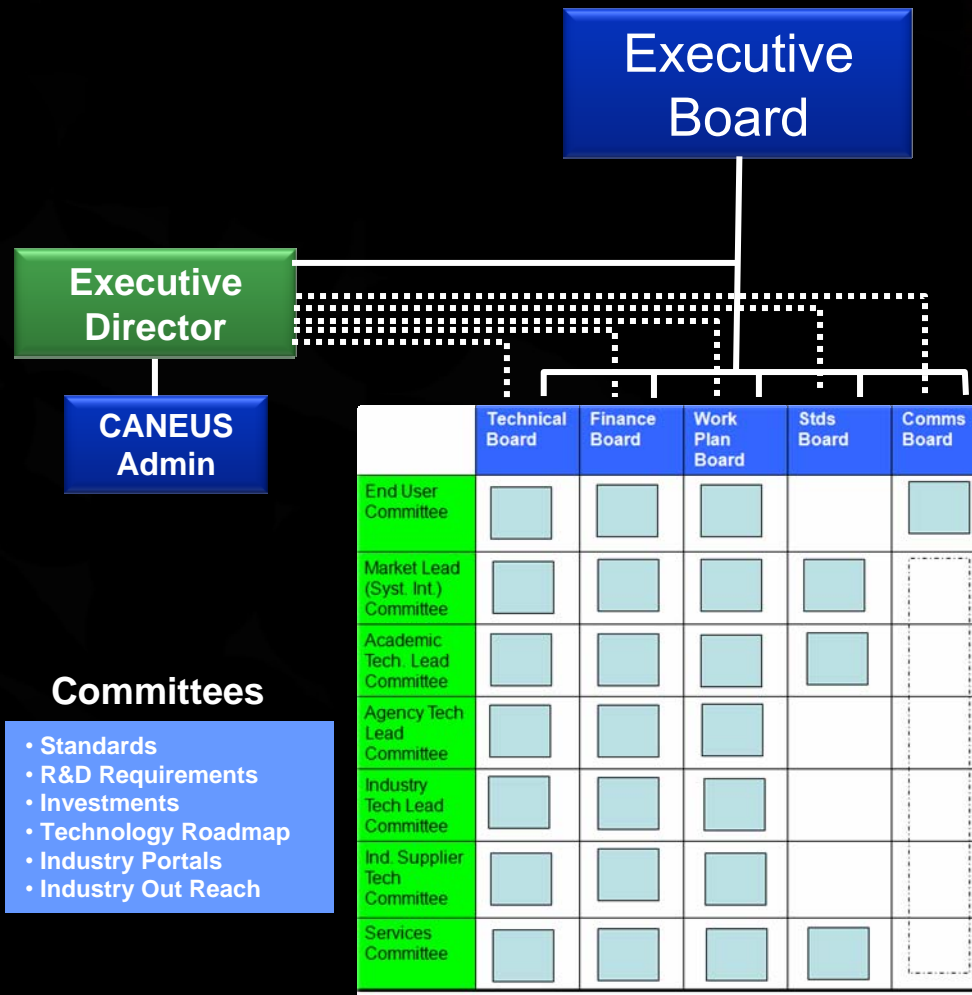
Working Group Committees

	Technical Board	Finance Board	Work Plan Board	Stds Board	Comms Board
End User Committee	Input to Board	Input to Board	Input to Board		Input to Board
Market Lead (Syst. Int.) Committee	Input to Board	Input to Board	Input to Board	Input to Board	
Academic Tech. Lead Committee	Input to Board	Input to Board	Input to Board	Input to Board	
Agency Tech Lead Committee	Input to Board	Input to Board	Input to Board		
Industry Tech Lead Committee	Input to Board	Input to Board	Input to Board		
Ind. Supplier Tech Committee	Input to Board	Input to Board	Input to Board		
Services Committee	Input to Board	Input to Board	Input to Board	Input to Board	

# Organizational Structure

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## Boards

Implement programs as directed from the Committees and approved by the Exec. Board

# Operational Board Activity

Operational Boards tasks and initiatives:

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## Technical Board

- Technology Road Map
- Working Group Development Program
  - Application/Product Development Projects
  - Pre-competitive Cross Cutting Technology Development Projects

## Finance Board

- Working Group Budget Management
- Project Financial Oversight
- Contracting
- Investments



# Operational Board Activity

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## Operational Boards tasks and initiatives:

### Work Plan

- Each Boards **Annual Plan and Budget**
- **Strategic** Planning Process
- **Tactical** Planning Process
- Member and Executive Board **Approval** Process
- Other

# Working Group Development

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- Working Group Development Program is organized by niche **market /application** focus areas
- Each application focus area is comprised of:
  - **Application/Product** Development Projects
  - **Pre-competitive Cross Cutting Technology** Development Projects
- Each Application/Product Development Project requires :
  - A detailed **description of the proposed product or system development**, including the Pre-competitive Technology development needs
  - **IP ownership terms**
  - **Program Management Terms**
  - **Teaming Agreement**

# Program Hierarchy (partial)

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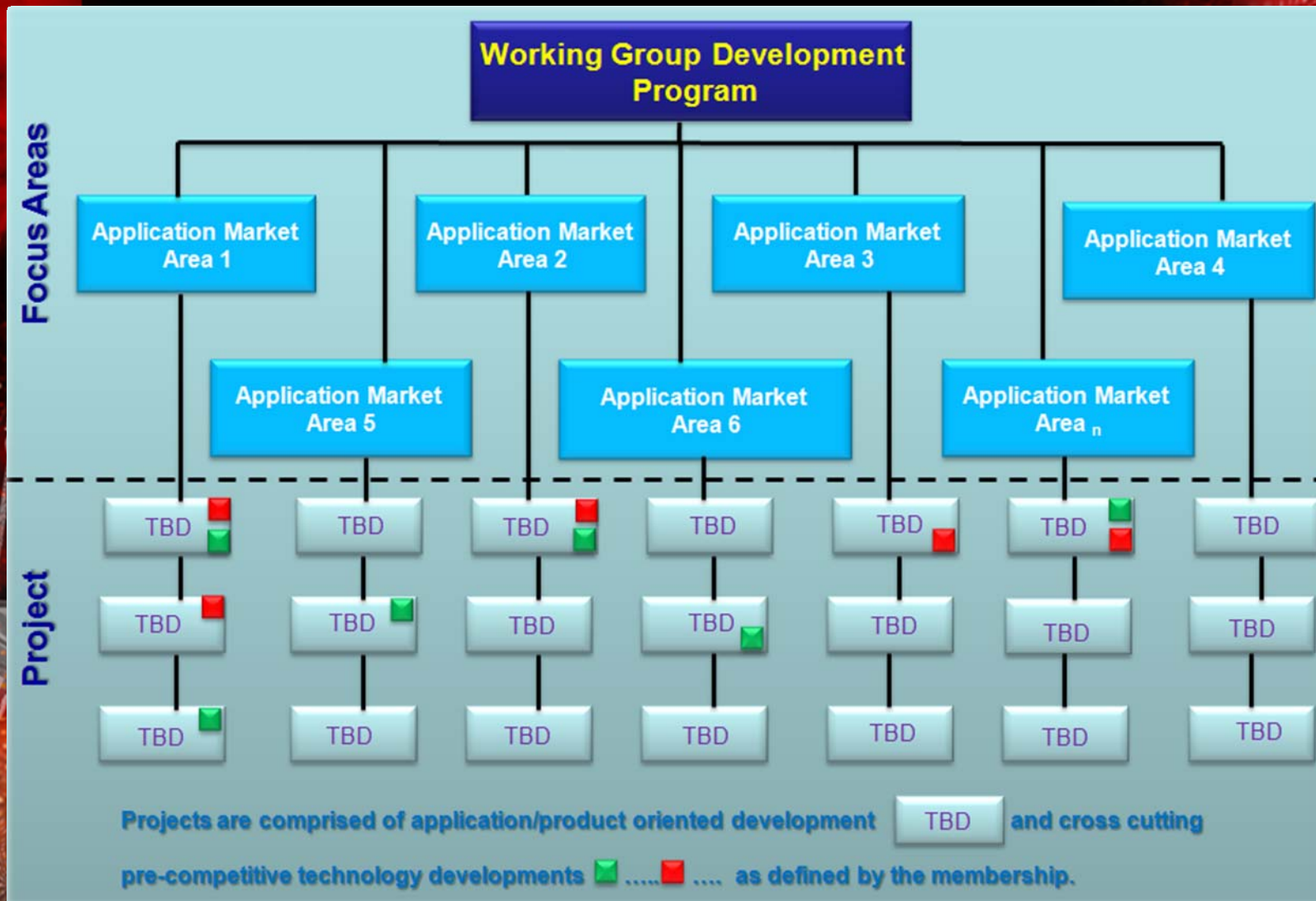
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- **Pilot Project**
  - └ **Working Group**
    - └ Committees
    - └ Boards
      - └ **Development Program**
        - └ Application/Product Development Projects
        - └ Pre-competitive Technology Development

# Working Group Technical Development

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# Intellectual Property

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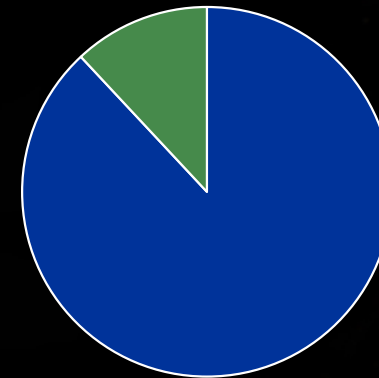
- IP organized along supply chain relationship
- They who create own – However title of jointly developed IP is strongly encouraged to be assigned to the single party with greatest market presence
- Market leads must have enough control of IP to protect the resulting product from competitive encroachment
- Valuation of IP (background and new) and licensing terms are determined before project start
  - Total royalties are capped at 5%
  - System Breakdown Structure then used to determine component IP value/royalties
- All Terms of IP are contained in a Project Teaming Agreement signed before project start

# Funding and Dispersment

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- The funds for Pilot Project and Working Group creation and start-up comes from CANEUS Membership Dues (including the start-up of new development projects)
- Revenues for Development Projects come from:
  - Agencies
  - Commercial Services Businesses
  - Investments
  - Procurement Awards
- Project funds allocation:
  - 88 percent to Pilot Project/Working Group defined programs
  - 12 percent of each project goes to CANEUS administration and operations.



■ Pilot Project / Working Group  
■ Administration

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# ***Fly by Wireless Working Group***

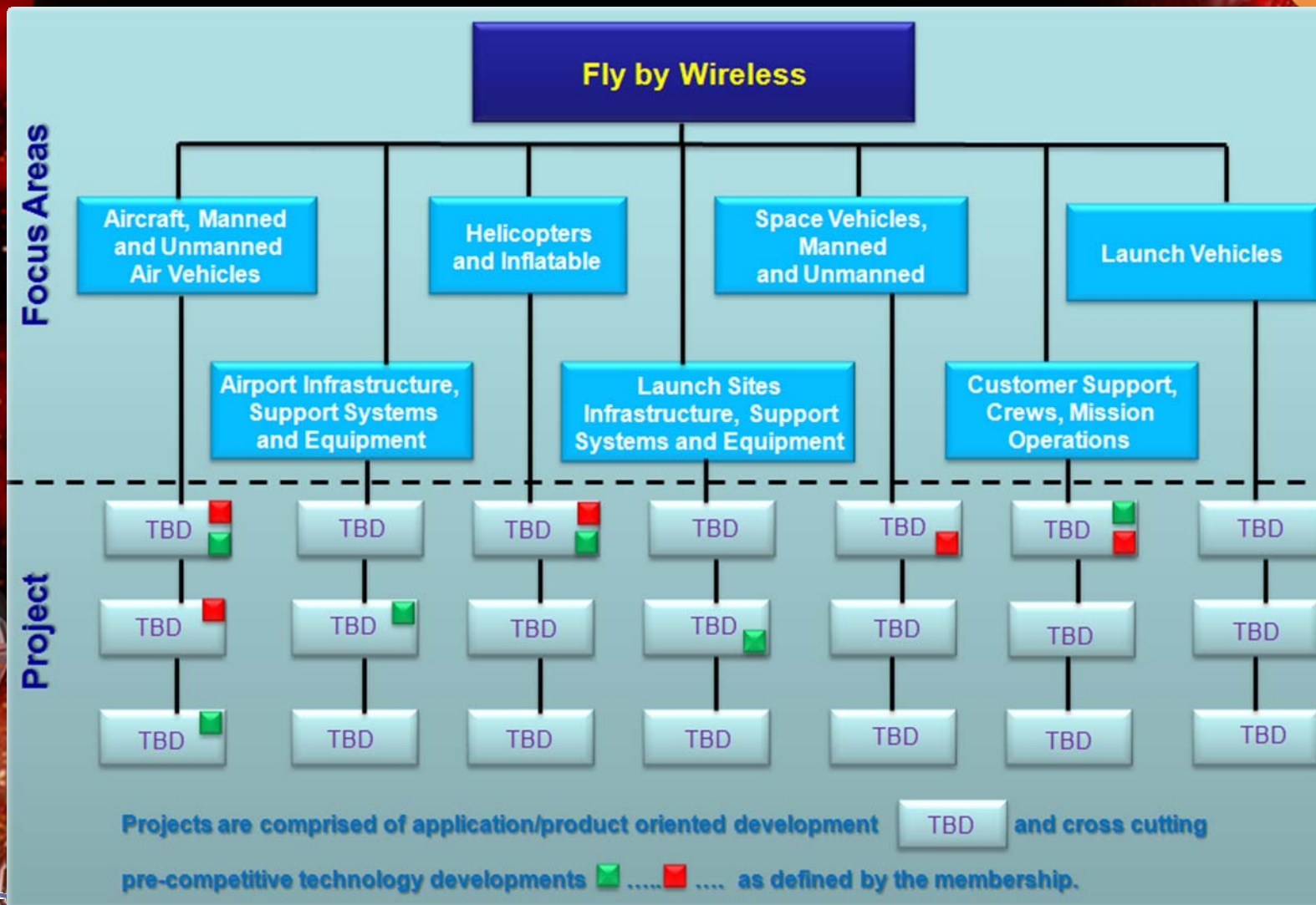


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# Fly by Wire Working Group

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# Membership: How can a member participate in CANEUS and in the CANEUS Working Groups?



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**CANEUS Membership:  
Levels of Membership-  
Individual: 100 Euros to  
Corporate such as EADS, NASA,  
Boeing, Industry Canada: 50K Euros**

**Benefit: Participation in CANEUS  
organization activities and  
Discounted membership in various  
CANEUS working Groups**



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**Direct CANEUS FBW Project /  
Working Group Membership:  
50K Euros**

**Benefit: Participation in CANEUS  
FBW consortium and joint system-  
development projects**

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Thank you!

[www.caneus.org](http://www.caneus.org)