



The 12th Swedish  
semi-international  
Aerospace Technology Congress  
**FT2025** in Stockholm  
October 14-16, 2025

## Smart Technology Roadmapping applied in Defense Aviation.



- Aeronautics Institute of Technology – ITA,  
Brazil.  
- KTH Royal Institute of Technology,  
Sweden.

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**Mauro Caetano**








This study was supported by:

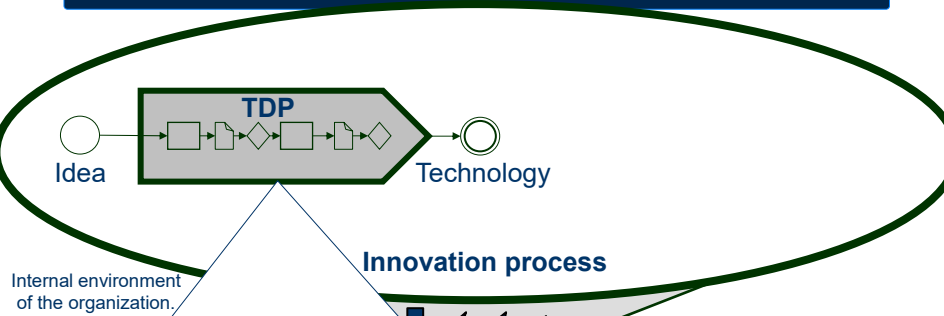




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## The Proposal Context



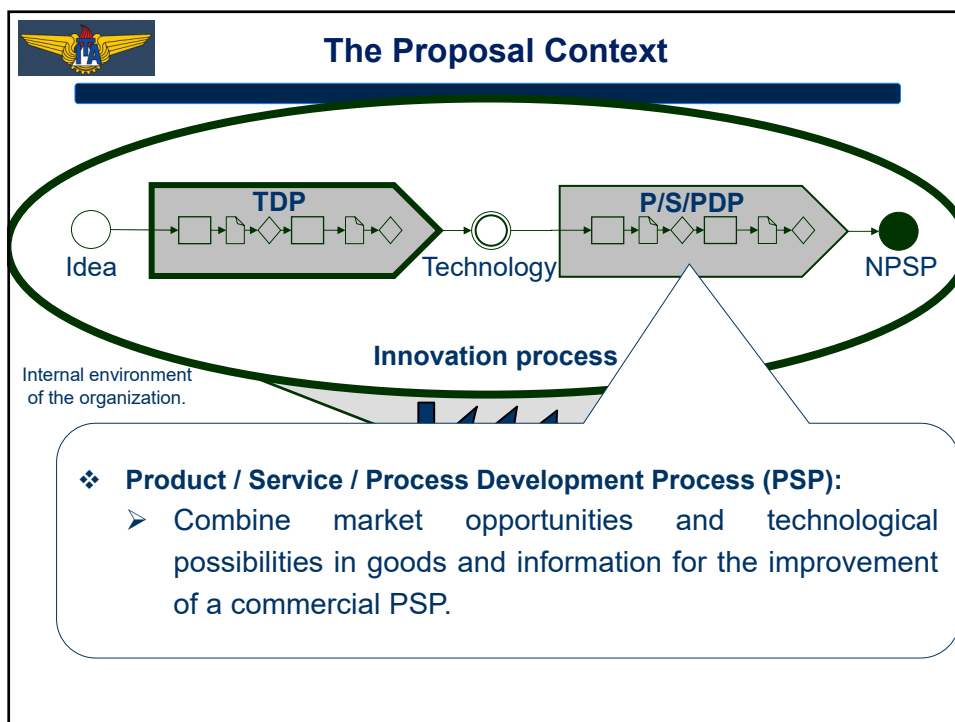
Internal environment of the organization.

❖ **Technology Development Process:**

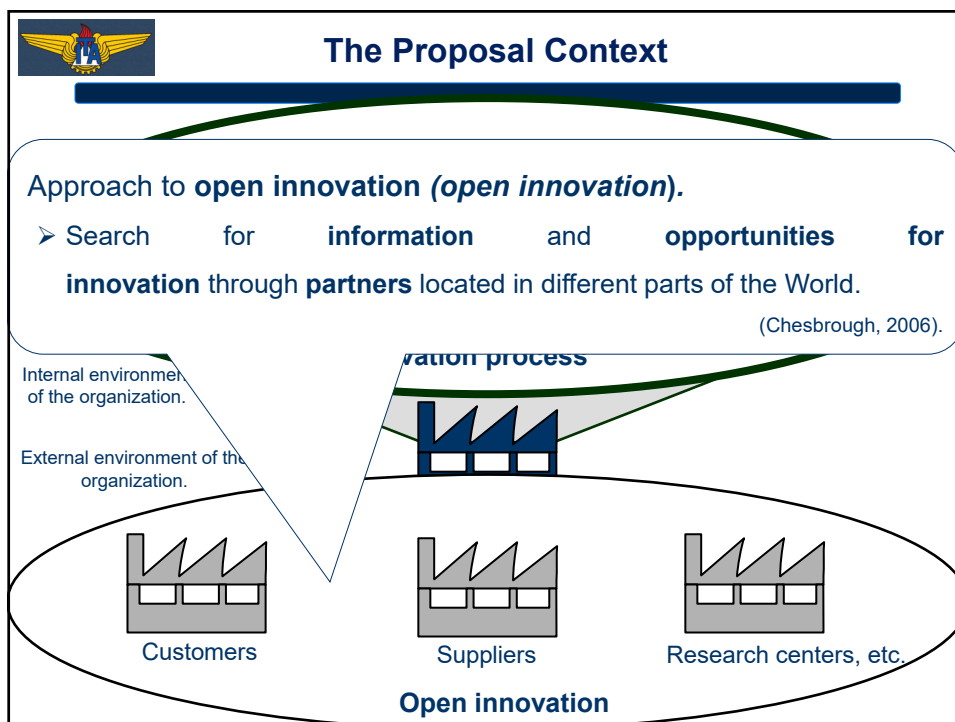
- Set of activities and decisions for converting ideas into technologies that will serve as a **basis for the development of a new product, service or process.**

(Cooper, 2006; Sheasley, 2000).

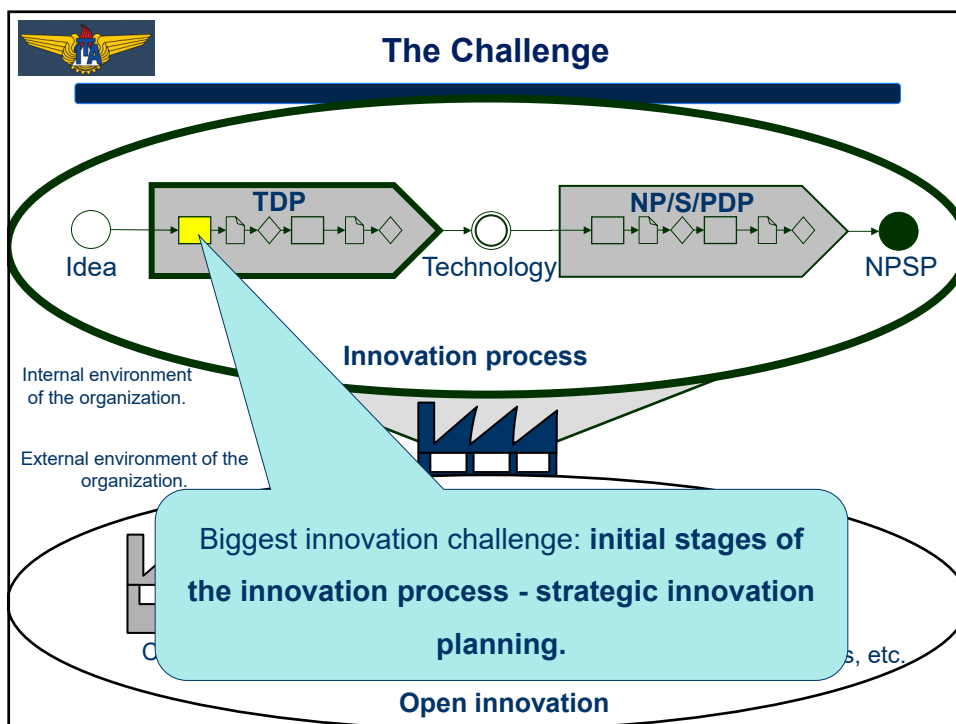
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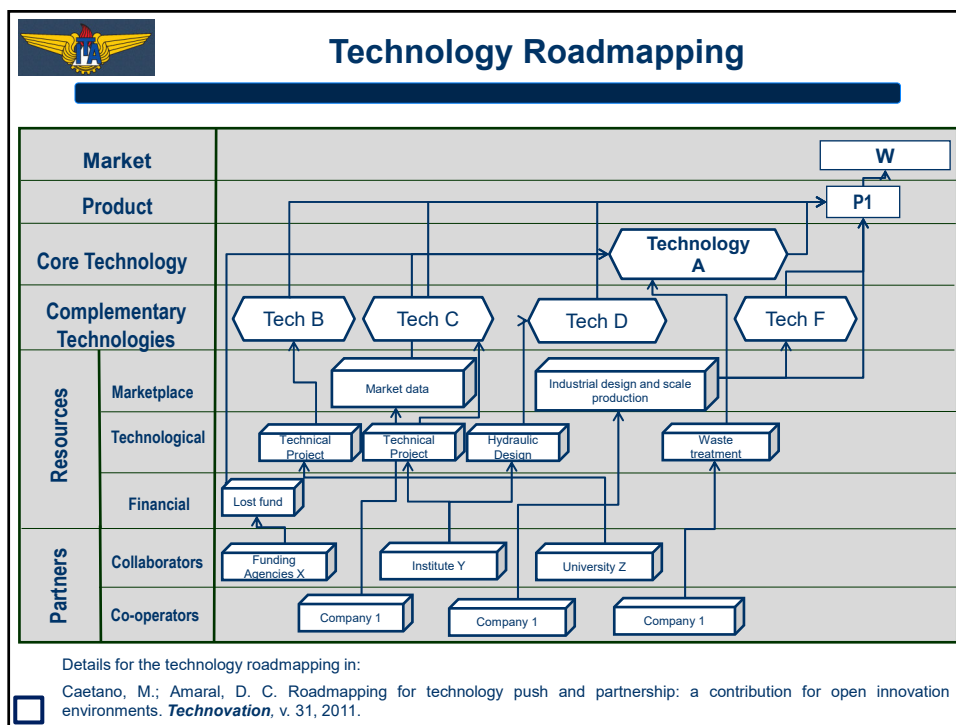
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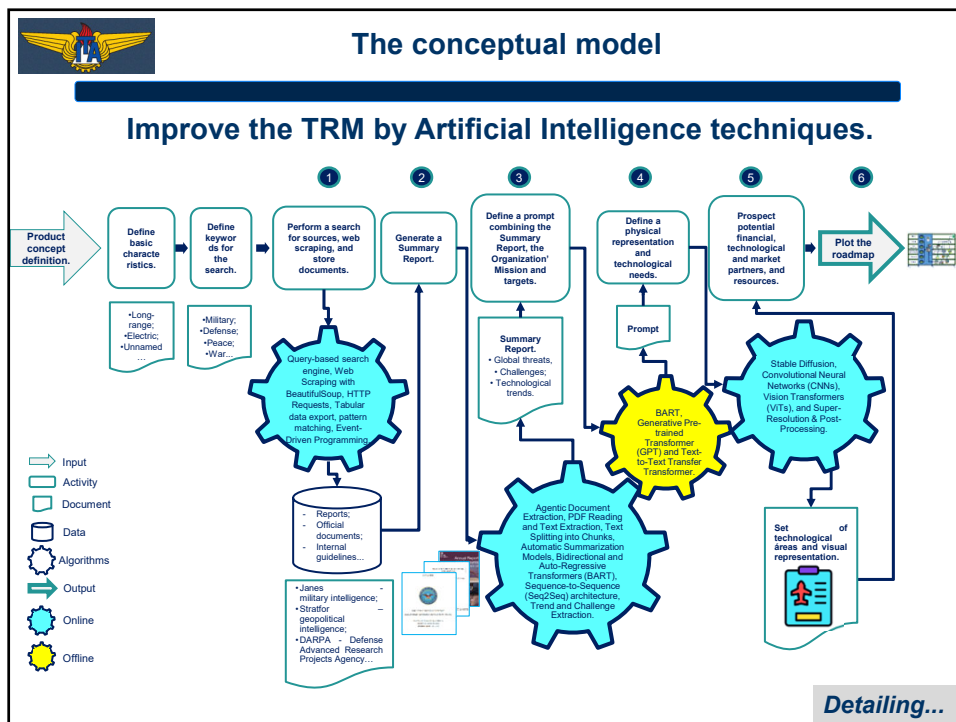
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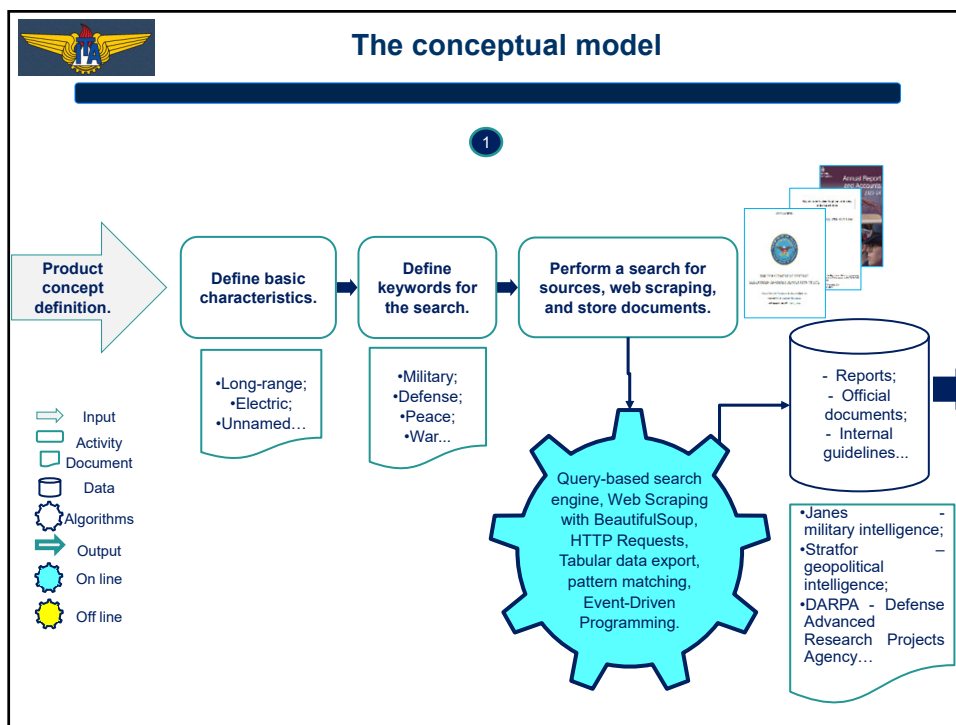
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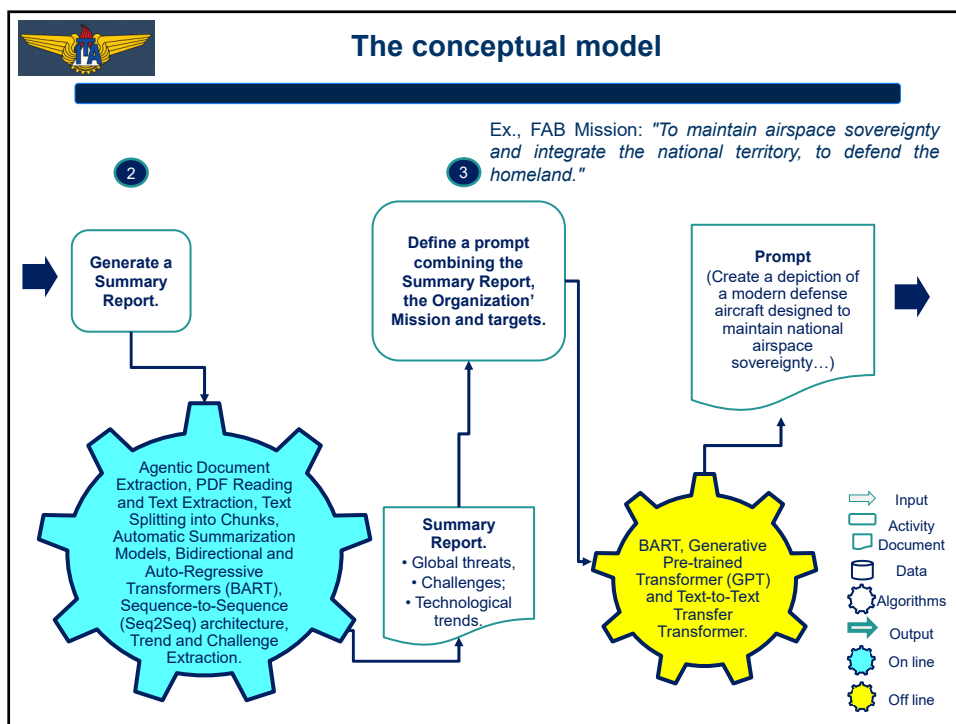
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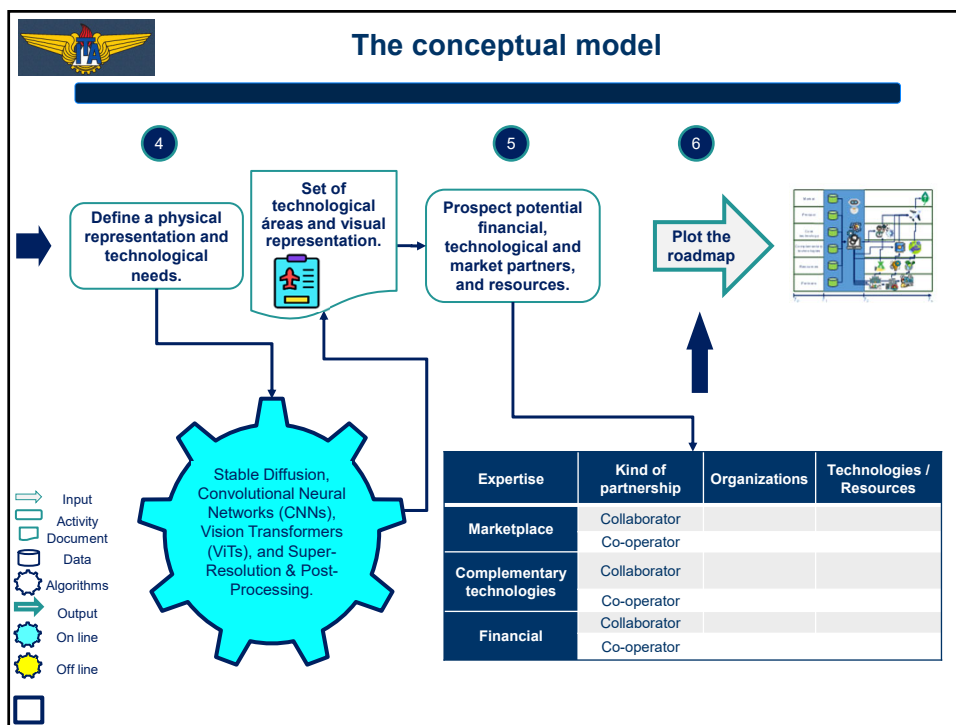
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## Results of the trial application

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### Some codes...

```

pip install diffusers transformers accelerate torch
pip install transformers PyPDF2
pip install requests beautifulsoup4
import os
from transformers import BartTokenizer, BartForConditionalGeneration
from PyPDF2 import PdfReader

def extract_pdf_text(pdf_path):
    pdf_reader = PdfReader(pdf_path)
    text = ""
    for page in pdf_reader.pages:
        text += page.extract_text()
    return text

def generate_summary(pdf_text):
    tokenizer = BartTokenizer.from_pretrained("facebook/bart-base")
    model = BartForConditionalGeneration.from_pretrained("facebook/bart-base")
    inputs = tokenizer(pdf_text).to(device)
    summary_ids = model.generate(**inputs)
    summary = tokenizer.decode(summary_ids[0])
    return summary

docs_folder = r"C:\Documents\DefenseAircraft"
tokenizer = BartTokenizer.from_pretrained("facebook/bart-base")
model = BartForConditionalGeneration.from_pretrained("facebook/bart-base")

for file_name in os.listdir(docs_folder):
    pdf_path = os.path.join(docs_folder, file_name)
    pdf_text = extract_pdf_text(pdf_path)
    summary = generate_summary(pdf_text)
    print(f"Summary: {summary}")

device = "cuda" if torch.cuda.is_available() else "cpu" # Use CUDA if available
pipe = StableDiffusionPipeline.from_pretrained(model_id)
pipe = pipe.to(device)

prompt = "Create a highly realistic depiction of a modern defense aircraft designed to maintain national airspace sovereignty and defend against emerging threats."
image = pipe(prompt, height=1024, width=1024).images[0]

output_folder = "/content/DefenseAircraft"
os.makedirs(output_folder, exist_ok=True) # Ensure the folder exists

image_path = os.path.join(output_folder, "DefenseAircraft.png")
image.save(image_path)

image.show()

print(f"Image saved successfully at: {image_path}")

```

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## Results of the trial application

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### Future Defense Aircraft





### AI Warfare System

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## Results of the trial application


### Final of phase 4



Future technologies to be developed and integrated into this new aircraft proposal:

- i. **Artificial intelligence & autonomous systems** with AI-assisted piloting;
- ii. **Swarming & network-centric warfare capabilities**, from the ability to coordinate with drone swarms and other military assets in a fully networked combat environment;
- iii. **Advanced stealth technology** to enhance radar-absorbing materials;
- iv. **Next-generation propulsion systems** by hybrid or fully electric engines;
- v. **Hypersonic capabilities** and the ability to operate up Mach 5;
- vi. **Quantum & secure communications**, using ultra-secure data links, quantum encryption;
- vii. **Directed energy weapons**, integrating laser or microwave-based weapons for missile defense and electronic warfare applications;
- viii. **Adaptive and morphing airframe**, combining the use of materials and structures capable of dynamically adjusting shape and aerodynamics;
- ix. **Advanced sensor fusion & AI-driven avionics** by 360-degree situational awareness with multi-spectral sensors;
- x. **Sustainable and low-logistics maintenance**, considering self-repairing materials, predictive maintenance AI.

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## Results of the trial application

**Partners, types of partnerships, and potential resources available.**

Expertise	Kind of partnership	Organizations	Technologies / Resources
Marketplace	Collaborator	Airbus	Business analytics.
	Co-operator	Brazilian Air Force	Radar and surveillance data.
Complementary technologies	Collaborator	Embraer	Aeronautics.
		Anduril Industries	Surveillance systems.
	Co-operator	Saab	Human-machine integration.
	Co-operator	Aeronautics Institute of Technology	Scientific research.
		Helsing GmbH	Defense systems.
Financial	Collaborator	Sine Engineering	Unnamed flight.
		Breaker	Robotics.
	Co-operator	Defense Advanced Research Projects Agency	International funding.
		Brazilian Ministry of Defense	National funding.
		Inter-American Development Bank	International funding.

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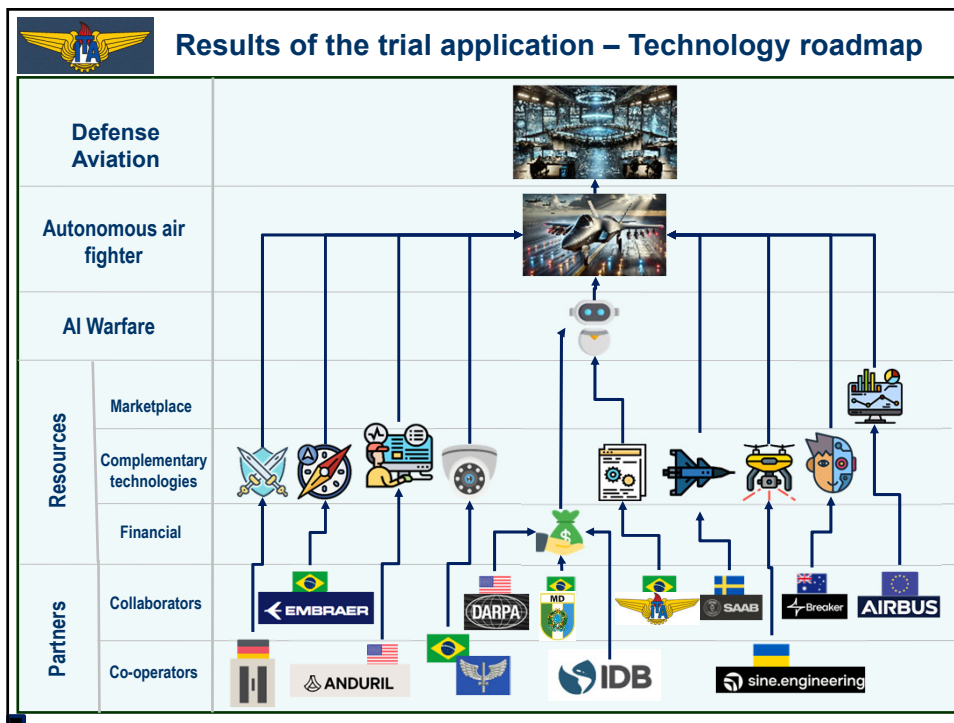


### Results of the trial application

**Patent search for partners: Espacenet - European Patent Office (EPO, 2025) - from the 41,136, only five patents identified in the class F41H: Armour; Armoured turrets; Armoured or Armed Vehicles; Means of Attack or Defense:**

Patent title	Number	Applicant	Year	Main description
Armored vehicle with enhanced blast protection.	EP3456789A1	ABC Defense Systems Ltd.	2020	Design of an armored vehicle with improved blast-resistant features to protect occupants from landmine explosions.
Bulletproof composite material.	EP3567890A1	XYZ Materials Inc.	2021	Development of a lightweight, bulletproof composite material for use in personal body armor and vehicle protection.
Modular protective shield for military personnel.	EP3678901A1	DEF Military Innovations GmbH	2022	A modular protective shield system designed for military personnel, offering customizable coverage and enhanced mobility during combat situations.
Transparent armor with improved ballistic resistance.	EP3789012A1	GHI Security Solutions	2023	Innovation in transparent armor technology provides improved ballistic resistance while maintaining optical clarity for use in armored vehicles.
Energy-absorbing seat for armored vehicles.	EP3890123A1	JKL Automotive Defense Systems	2024	Design of an energy-absorbing seat mechanism to reduce the impact of explosions on occupants within armored vehicles.

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**THANK YOU SO MUCH!!!**

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