



# Real-time ionizing radiation monitor

Health in aviation

PIC 2025-2026

Link Website: [CosmoMeter](#)

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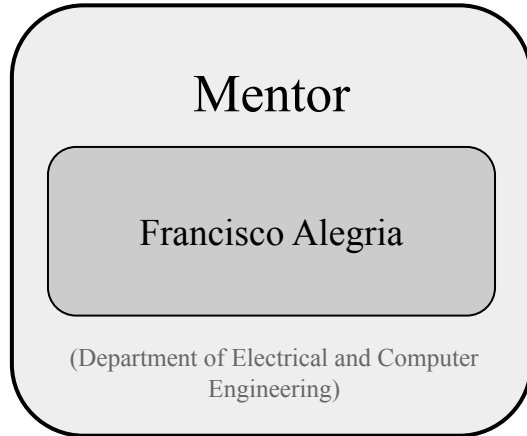
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# Mentor



# Problem Definition & Identification of solution beneficiaries

## Problem Definition

- Pilots and flight crews are consistently exposed to significantly higher levels of cosmic radiation than the general population. Exposure that has proven in medical case studies to provoke cancers such as Melanoma.
- Currently, radiation prevention relies on ground-based estimation software, which could be replaced by a more efficient and accurate, on-board portable sensor.

## Beneficiaries

Pilots

Flight Crews

Air travel companies

Air force (military)

# Case studies: Cosmic Radiation Exposure and Cancer Risk in Aviation

- Sanlorenzo, M., Wehner, M. R., Linos, E., et al. (University of California, San Francisco; Stanford University). (2015). *The risk of melanoma in airline pilots and cabin crew: A meta-analysis*. JAMA Dermatology, 151(1), 51–58. [The Risk of Melanoma in Airline Pilots and Cabin Crew](#)
- Scheibler, C., Toprani, S. M., Mordukhovich, I., et al. (Harvard T.H. Chan School of Public Health; Harvard Medical School). (2022). *Cancer risks from cosmic radiation exposure in flight: A review*. Frontiers in Public Health, 10, 947068. [Cancer risks from cosmic radiation exposure in flight](#)
- McNeely, E., Mordukhovich, I., Staffa, S., et al. (Harvard T.H. Chan School of Public Health). (2018). *Cancer prevalence among flight attendants compared to the general population*. Environmental Health, 17, 49. [Cancer prevalence among flight attendants compared to the general population](#)

# Description of the solution and the technology it will use

## Description

### Cosmic radiation monitor:

A semiconductor-based radiation detector capable of identifying high-energy charged particles generated by cosmic rays. The system includes a data logging system through which flight crew members must authenticate themselves using their personal RFID cards/chips in order to initiate the collection of data. The system is integrated with the core prototype, which is responsible for real-time dose calculation, digital signal processing/calibration, and data acquisition.

## Technology

**Microcontroller** responsible for real-time dose calculation, digital processing, signal calibration and **Geiger Counter** for data acquisition.

Rechargeable **battery** for autonomous operation and **communication modules** for transmitting measurements and processed data to personal or work device.

**RFID Reader** for user authentication and associating crew members to flights.

**Autonomous Calibration and Error Detection Algorithms**

# Competitors and previous work

## Previous Work:

- Dissertation - “[Desenvolvimento de um Sistema para Monitorização de Dose de Radiação em Cockpit de Avião](#)”, Joaquim João da Silva Horta;

## Competitors:

- [LIULIN-3M](#)/ Liulin series - Physical real-time radiation detector;
- [CARI-7A](#) - Software dose estimation model.

# Solution requirements

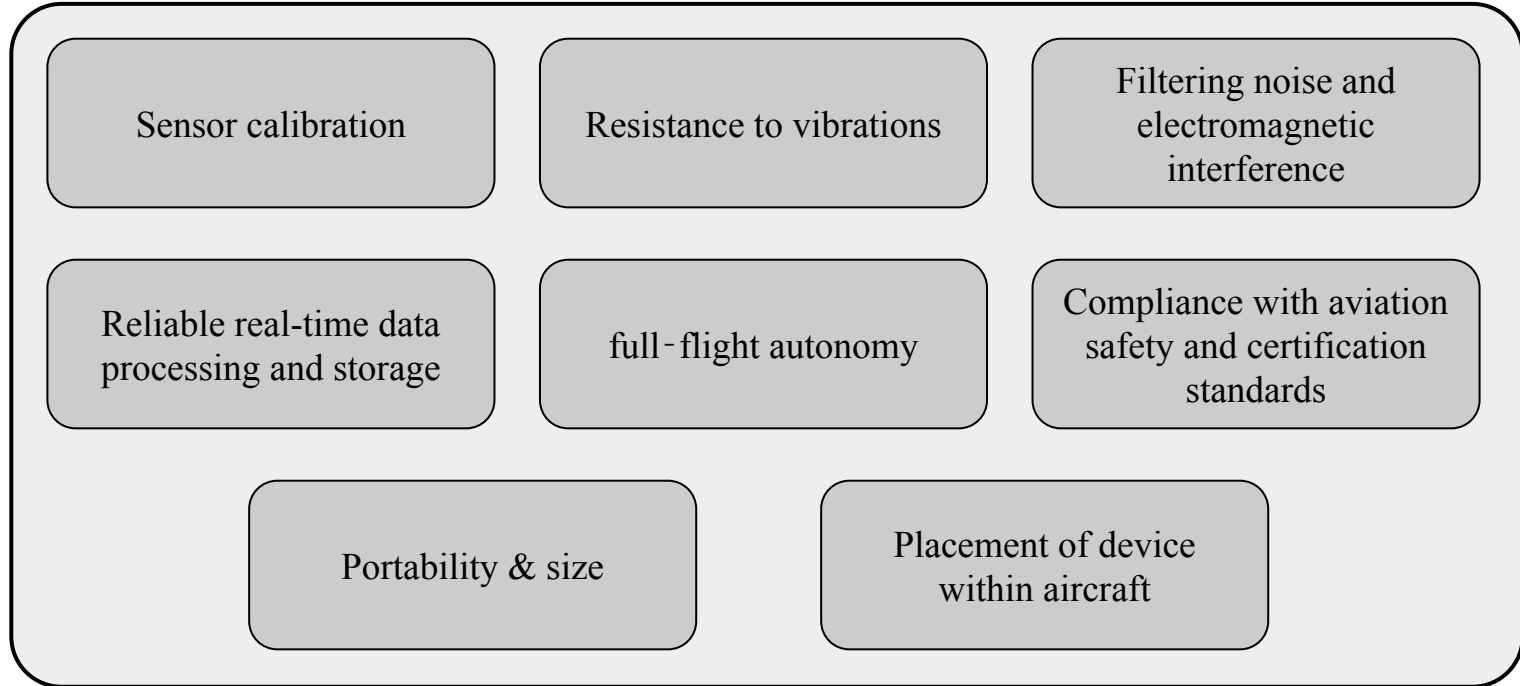
**Functionality:** the prototype must be able to correctly measure the amount of particles that pass through the Geiger Count, extract the data, and perform a intuitive data analysis.

**Performance:** the well calibrated microcontroller for different environments containing a suitable software, a battery capable of lasting long-duration flights.

**Security:** the prototype, must be well prepared and designed for the cockpit, avoiding compromising the pilots' workspace. Signal interference must be avoided.

**Usability:** the user authentication process must be clear and easy to use, interactive. The data, once received by the crew, must be perceptible and well-structured.

# Technical challenges



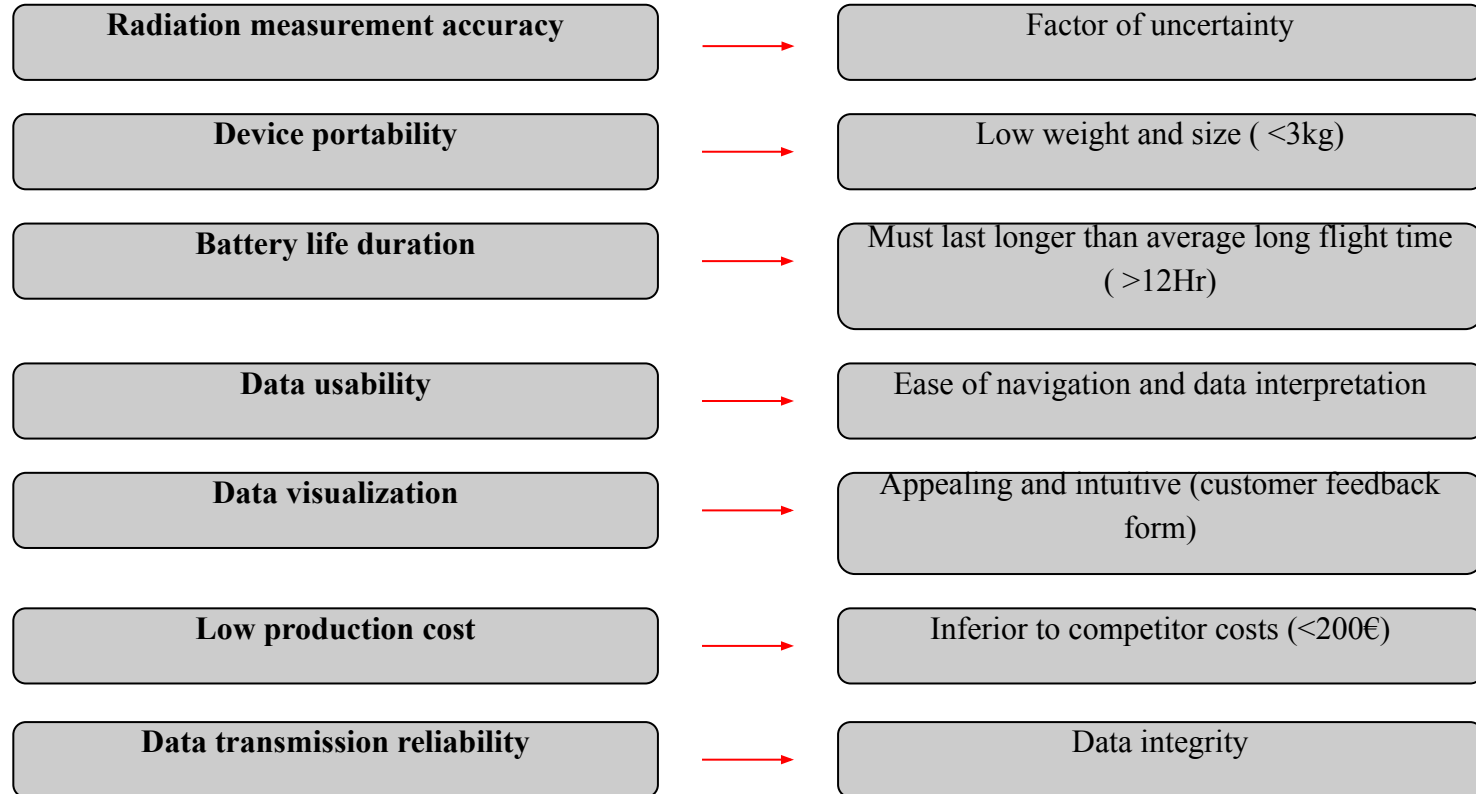
# Partners

- **Portugália Airlines** - Owned by TAP S.A., Portugália Airlines operates under the TAP Express brand, with its own fleet, crews, and services, delivering essential operational functions fully integrated within the TAP Group.

Portugália  
Airlines



# Testing and validation metrics for the solution



# Tasks and division of work among team members

1/2

## Planning

(Business model and strategic direction)

Júlio Demba

## Design

(User experience and UI)

Pedro Santorum

## Engineering

(Technical development and implementation)

Tomás Amado

## Marketing & Sales

(Customer acquisition and communication)

Sebastião Castelo Branco

## Project Management

(Team coordination and workflow organization)

Rui Loureiro

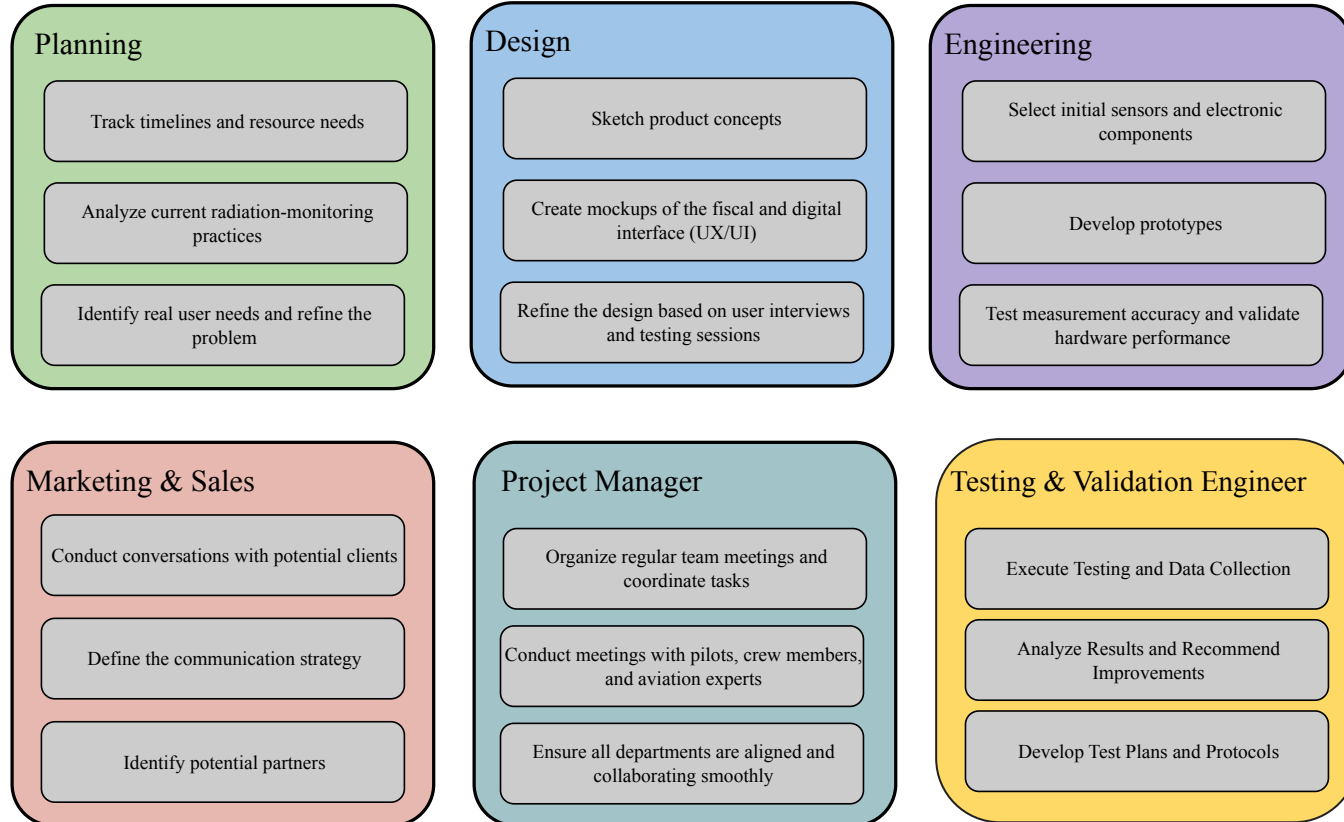
## Testing & Validation Engineer

(Plans and conducts tests on the prototype)

Rodrigo Pedroso

# Tasks and division of work among team members

2/2



# Activity Schedule

## February

1	2	3	4	5	6	7
[Red bar]						
8	9	10	11	12	13	14
[Red bar]						
15	16	17	18	19	20	21
[Red bar]				Meeting		
22	23	24	25	26	27	28
Sketch products concepts				Make website		Make Blog

## March

1	2	3	4	5	6	7
Make Blog	Meeting	Site Blog	Conduct Interviews			
8	9	10	11	12	13	14
Conduct Interviews		Interviews	Make requisite list			
15	16	17	18	19	20	21
Make requisite list		Requisites		Meeting		Select sensors
22	23	24	25	26	27	28
and electronic components		Materials				Meeting
29	30	31				
Make pitch deck		Temporary Mid-Program Pitch deck				

# Activity Schedule

## April

1	2	3	Meeting	Refine pitch deck	Mid-Program Pitch deck	
8	9	10	Development of each module individually			Meeting
15	16	17	Development of each module individually			
22	23	24	Development of each module individually			Meeting
29	30					

## May

Make prototype						
Meeting	Make prototype					
Meeting	Make prototype			1st Prototipe	Refine prototype	
Meeting	Refine prototype		Meeting	Final Prototipe		
29	30	31				

# Activity Schedule

## June

1	2	3	4	5	6	7
Prototype testing and planning the presentation						
8	9	10	11	12	13	14
Prototype testing and planning the presentation						
15	16	17	18	19	20	21
Planning the presentation						
22	23	24	25	26	27	28
Planning the presentation					EleetroCap	
29	30					