The Collaborative International Command and Control Research Testbed:
A Simulation Based Environment for Concept Development and Assessment

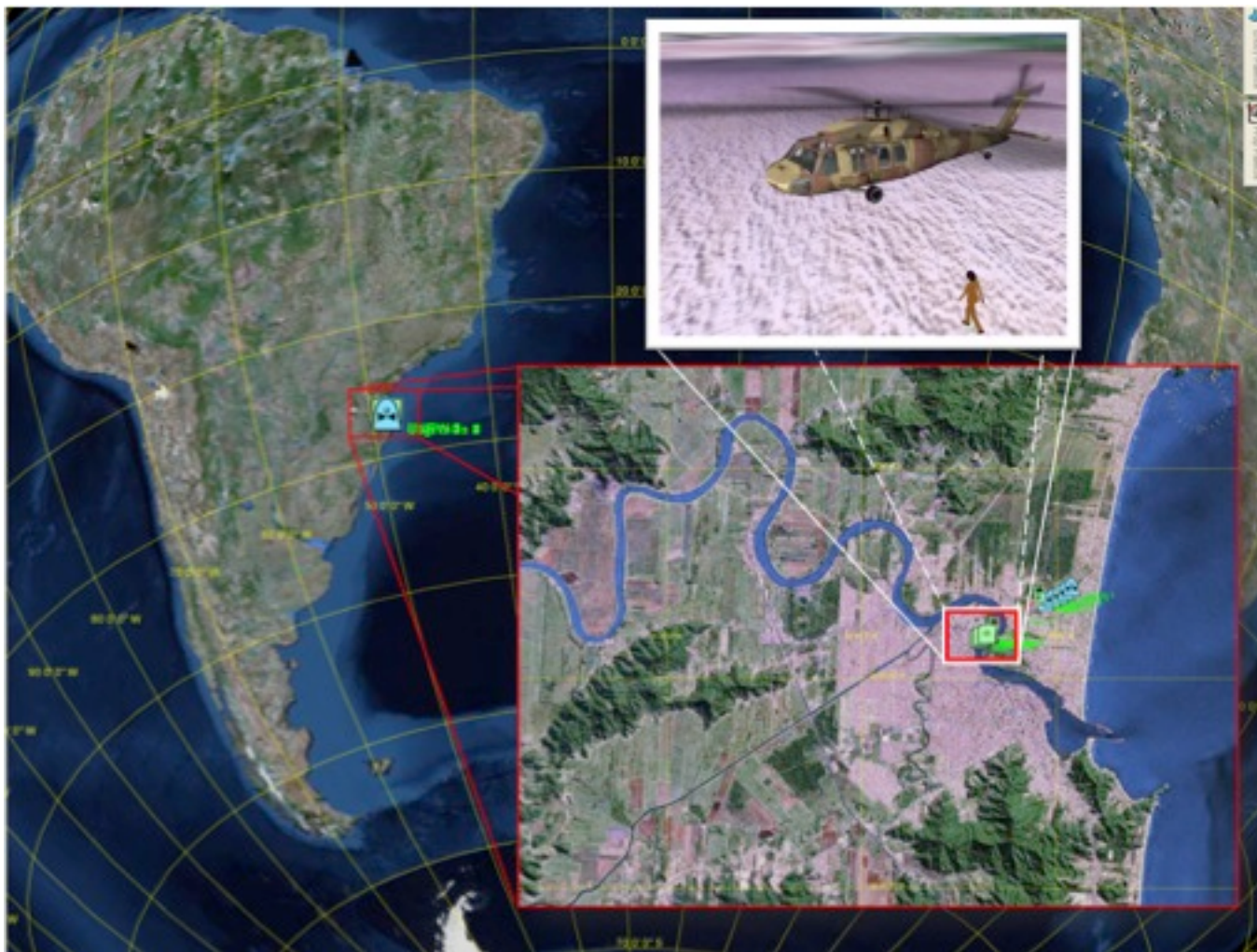*Dr. Michael R. Hieb*

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Brazil - US Collaborative C2 Experimentation Testbed

Changing Defense Needs

The Testbed addresses several critical areas in C2 Research:

International Coalitions

> C2 between different Nations is increasingly important and a key technology need for the US

Integration of Military and Non Governmental Information Technology

> Looking at how different organizations can Represent Command Intent and how they can conduct operations together, and also the capability to still operate during Cyberwarfare

Operational Scenarios as Use Cases

> The use cases will be based in operational situations in Humanitarian Relief Operations and Cyberwarfare

Commercial Off the Shelf Technologies

> Using Readily available software and hardware

ITA – Aeronautics Institute of Technology

The "Brazilian MIT"

Modeled after the MIT in the 50's with the objective to support the creation of an aeronautical industry in LA from scratch

Less than 15 years later, the first prototype of the Bandeirante was flying and the EMBRAER was born

Consistently listed as one of the top engineering schools in LA

C2 Laboratory at ITA

Created in Dec 2010 to support academic research in C2

Leverages the technological complex around ITA focused on Defense research and applications (EMBRAER, Mectron, Atech, etc)

Partnership with the Volgenau School / C4I Center

Access to Brazilian C2 companies and government clients

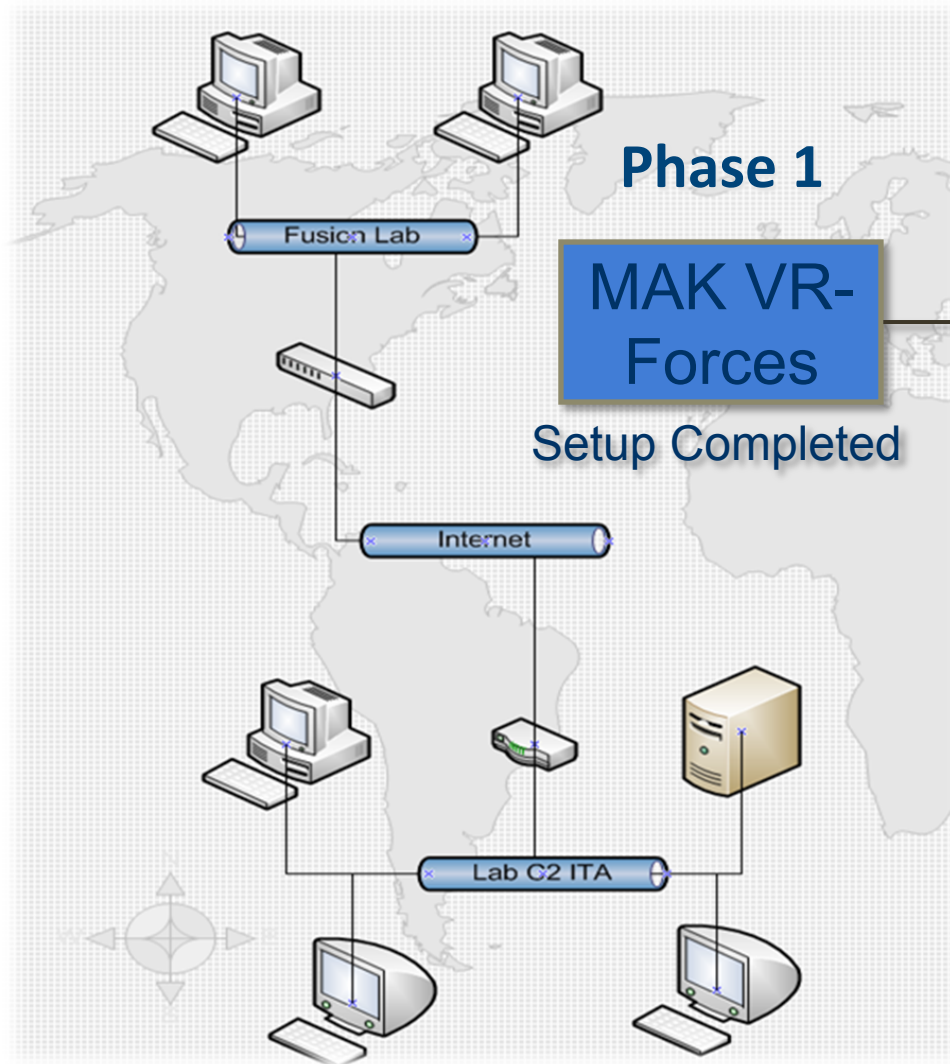Research collaboration on diverse problems

Concept

An International C2 Testbed consisting of Joint Use Cases running on Simulations in both Brazil (ITA) and the US (George Mason C4I Center)

This Testbed facilitates collaborative C2 research by University Faculty, PhD/Masters Students and Industry. The end product of this research is:

1) Conference and Journal Publications,

2) Research Demonstrations, and
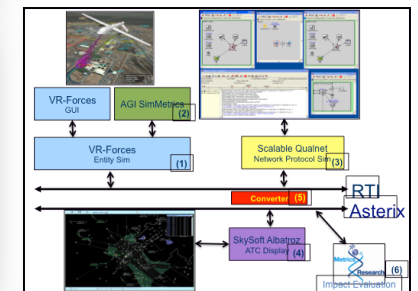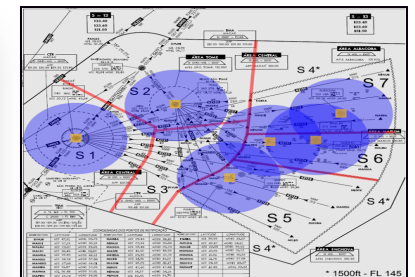
3) Research Prototypes

Development

Phase 1

MAK VR-Forces

Setup Completed

Phase 2

Scenario I

2011/2012 Humanitarian Relief Operation

Phase 3

Scenario II

2012 Cyberwarfare

Scenario I

Relief Operation in a Flooding situation

- The goal is to produce an environment to support **planning automation** during relief operations;

- Dynamic scenario that needs **re-planning**;

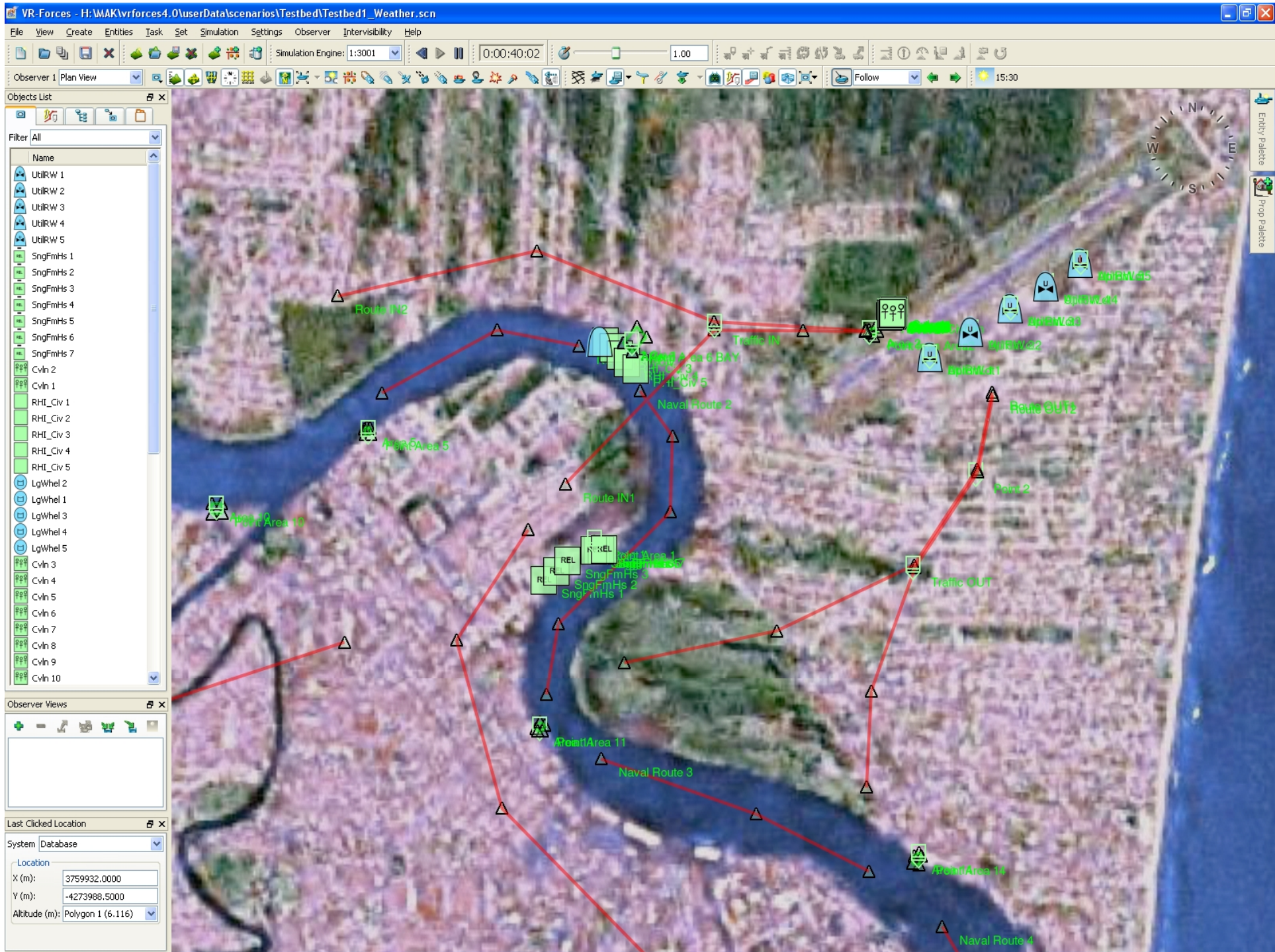- **Path constraints** to support vertical and horizontal separation during rescue missions in low visibility conditions.
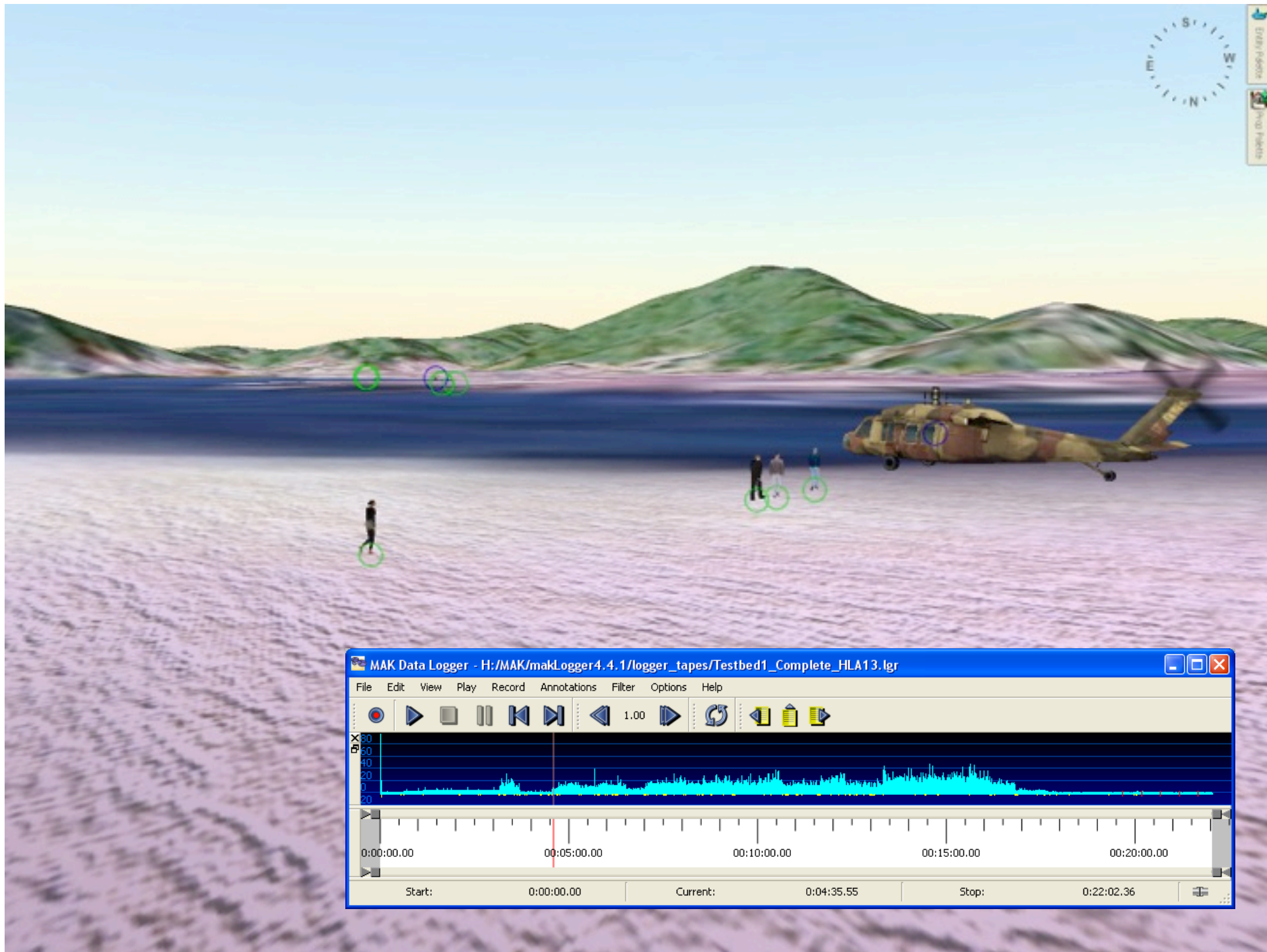
Challenges

- Planning in dynamic real-time scenarios (Path-Planning and Command Intent Representation);

- Resource allocation in relief operations;

- To capture the decision-maker preferences.

Weather Conditions
Good 0.20
Fair 0.30
Bad   0.50

Local Flooded
T 0.78
F 0.23

People to Rescue
Normal 0.60
Injured 0.30
Killed 0.10

Air Transport Availability
Low   0.30
Medium 0.50
High   0.20

Ground Transport Availability
Low   0.20
Medium 0.60
High   0.20

Resource Allocation
Air   0.11
Ground 0.12
Water   0.77

People Saved

Water Transport Availability
Low   0.20
Medium 0.60
High   0.20

MAK Data Logger - H:/MAK/makLogger4.4.1/logger_tapes/Testbed1_Complete_HLA13.lgr

File   Edit   View   Play   Record   Annotations   Filter   Options   Help

1.00

0:00:00.00   00:05:00.00   00:10:00.00   00:15:00.00   00:20:00.00

| Start: | 0:00:00.00 | Current: | 0:04:35.55 | Stop: | 0:22:02.36 |

Scenario II

Cyber Warfare in a Critical Infrastructure

- The goal is to reproduce the **impact** over one mission (*Airspace Policing Mission*) for a **cyber attack** on **critical infrastructure**. Another research goal is to be able to do a continuously evaluation and visualization on these aspects.

Challenges

- To represent the dynamic aspects and restrictions of a mission;

- To collect a simulation's data and format the data to be able to do a continuous analysis; and

- To evaluate and visualize the impact of a dynamic and continuous scenario.
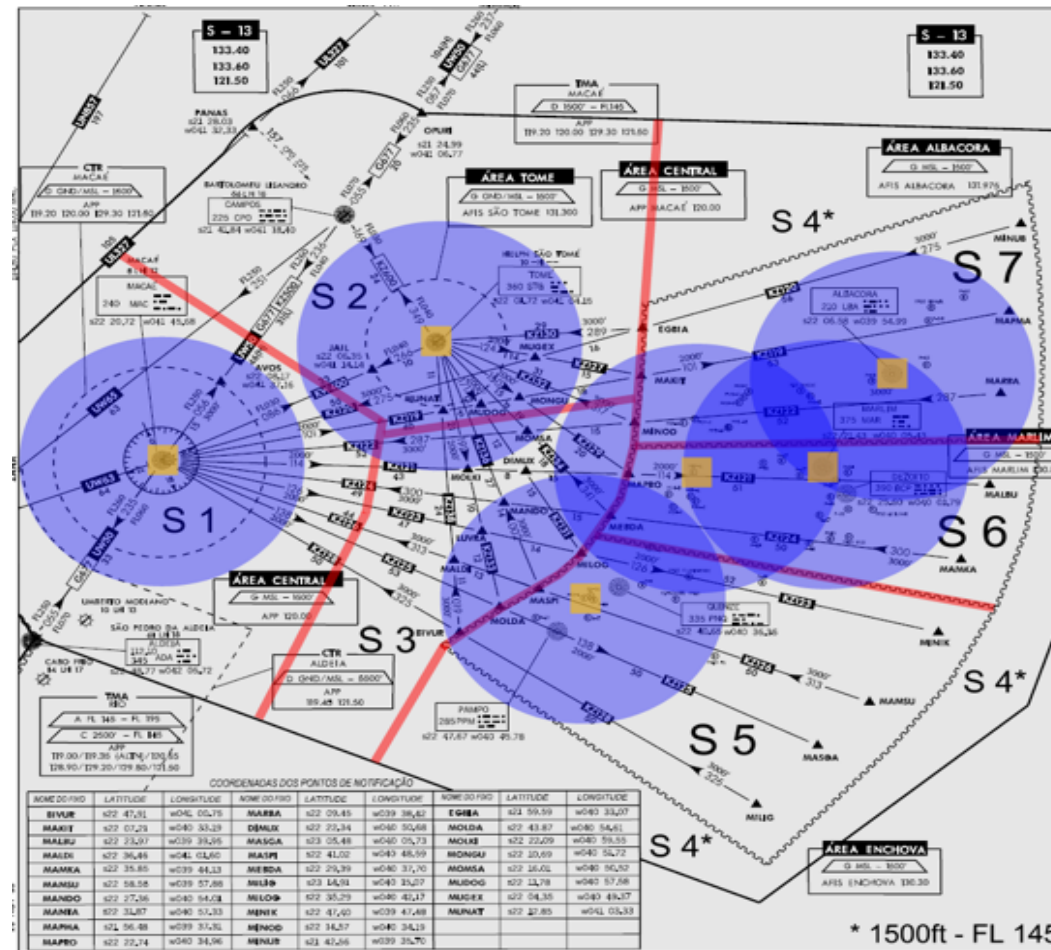
Macaé Terminal Control Area

Brazil's Airspace Optimization Plan

Brazilian Department of Airspace Control. Use of ADS-B at the Macaé – Cuenca De Campos TMA. First Meeting of the Communications, Navigation, and Surveillance / Air Traffic Management Subgroup (CNS/ ATM/SG/1) (Lima, Peru, 15-19 March 2010)

Benefits

GMU/ITA

- PhD Internship broadens Research Collaboration
- Development of Joint Use Case focuses research and provides validation technique
- Publications
- External Evaluation Provides C2 Expertise to Academic Programs
- GMU Lecturers for ITA's Conferences/ Symposia

Industry

- Publicity for Products/Services
- Press Releases
- Demonstrations at Trade Shows
- Product Awareness in Universities
- Research Prototypes for incorporation into Products

Backups