AT-One
the ATM Research Alliance

NLR DLR

Integration of Remotely Piloted Aircraft into Civil Airspace

Concept Validation through Simulation

Dirk-Roger Schmitt & Henk van Dijk

AT-One EEIG

AT-One combines the strength of NLR and DLR in ATM Research

AT-One
the ATM Research Alliance

RPA usage

Need for Remotely Piloted Aircraft (RPA) to operate in non-segregated airspace

There is an enormeous variety in RPA type

The range of applications for RPA is expected to grow

AT-One
the ATM Research Alliance

Content presentation

This presentation will provide an overview of the state-of-play on the integration of RPA into airspace

This presentation will identify the challenges that ATM faces in the near future regarding the integration of RPA into airspace

State-of-play on RPA integration

RPA flights in non-segregated airspace require exemptions from local authorities (platform < 150 kilo) or EASA (> 150 kilo)

Most RPA flights occur in segregated airspace

Many initiatives in Europe, all working on different aspects of RPA integration:

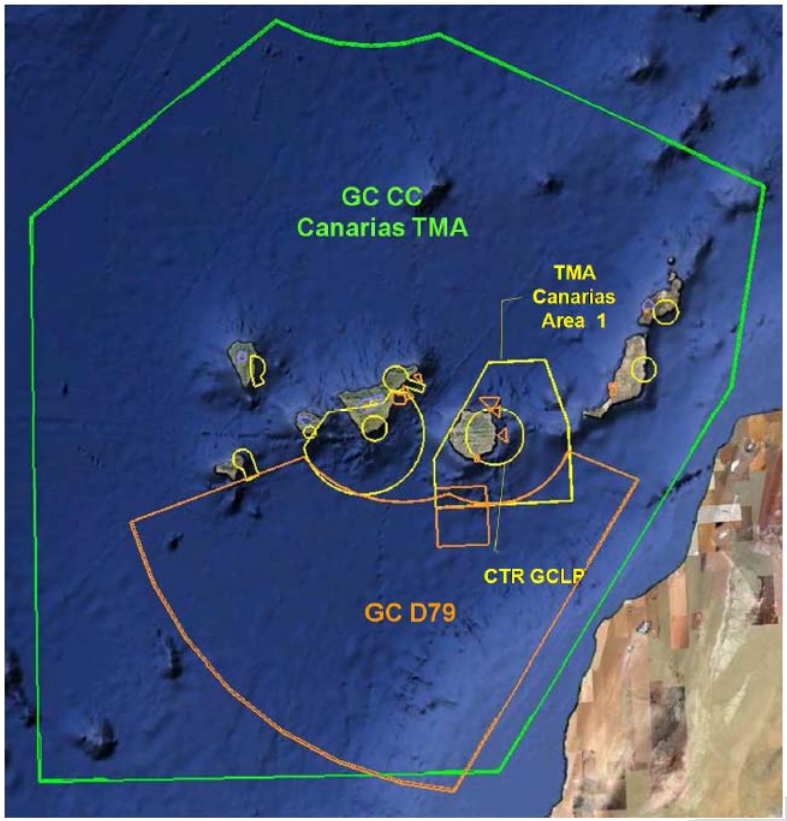
- Road maps, gap analysis
- Technology development and demonstrations
- Certification and standardization

SINUE

E4U

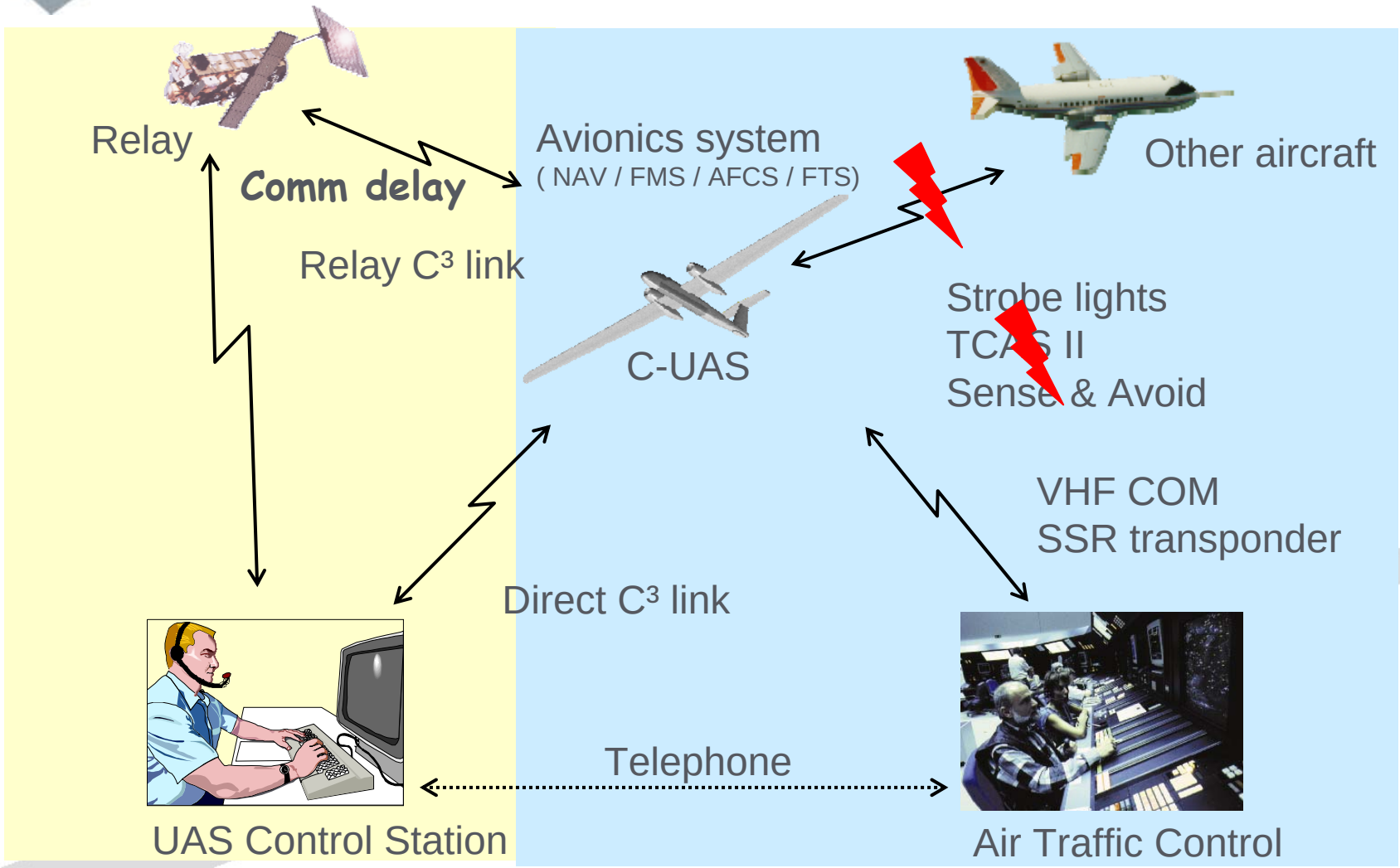
AT-One
the ATM Research Alliance

Project SINUE



Satellites enabling the Integration of UAS in non-segregated airspace in Europe

Integration concept SINUE

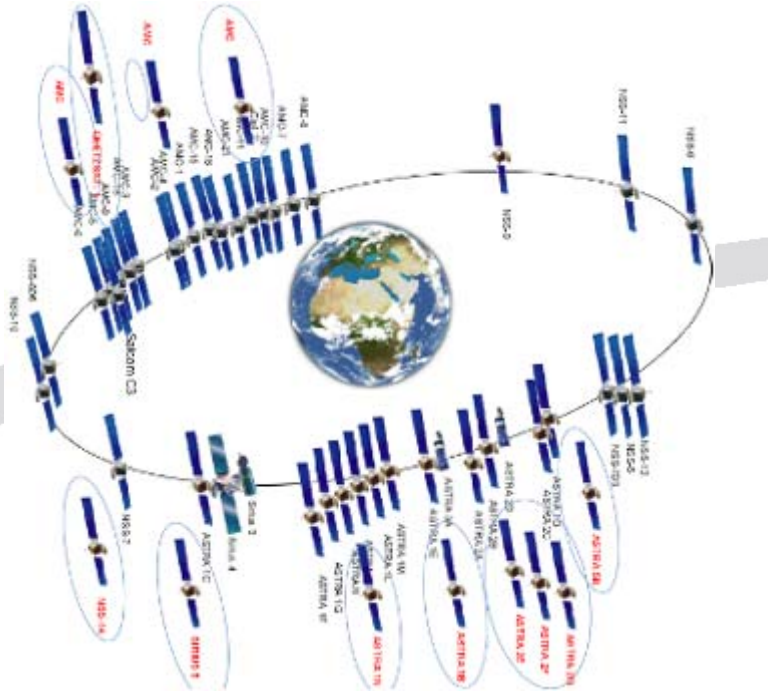


Satellite communicaton SINUE

Within the simulation architecture, a satellite model is included

In the underlying scenarios, several satellite issues are covered:

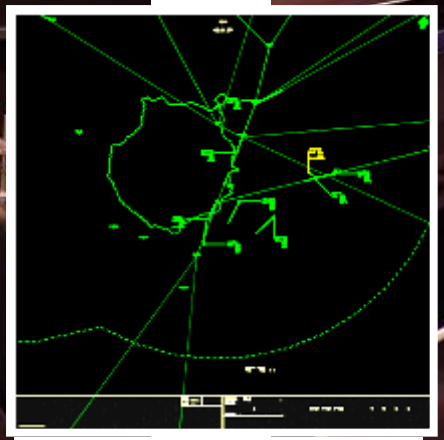
- Temporary comm failure because of satellite constellation
- Total comm failure
- C2 failure
- Time delay
- Bandwidth for real-time surveillance mission
- Cost-benefit study



Simulation facilities SINUE

AT-One
the ATM Research Alliance

Emergency procedures



ATC Interface

Separation

AT-One
the ATM Research Alliance

Communication overview SINUE

Pseudo Pilots

R/T
C2

Satellite

R/T

R/T
Radar

UAS

R/T C2

NARSIM

Back up telephone

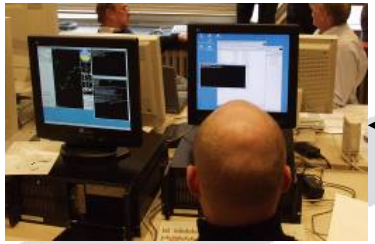
Ground Control Station

SINUE communication overview

Simulation set-up SINUE

- Telephone communication between controller and UAS pilot, if requested
- Radio telephony for controller / pseudo pilot voice communication
- Specially designed intercomm device over wirelink
- Communication delay for satellite link

Pseudo Pilots

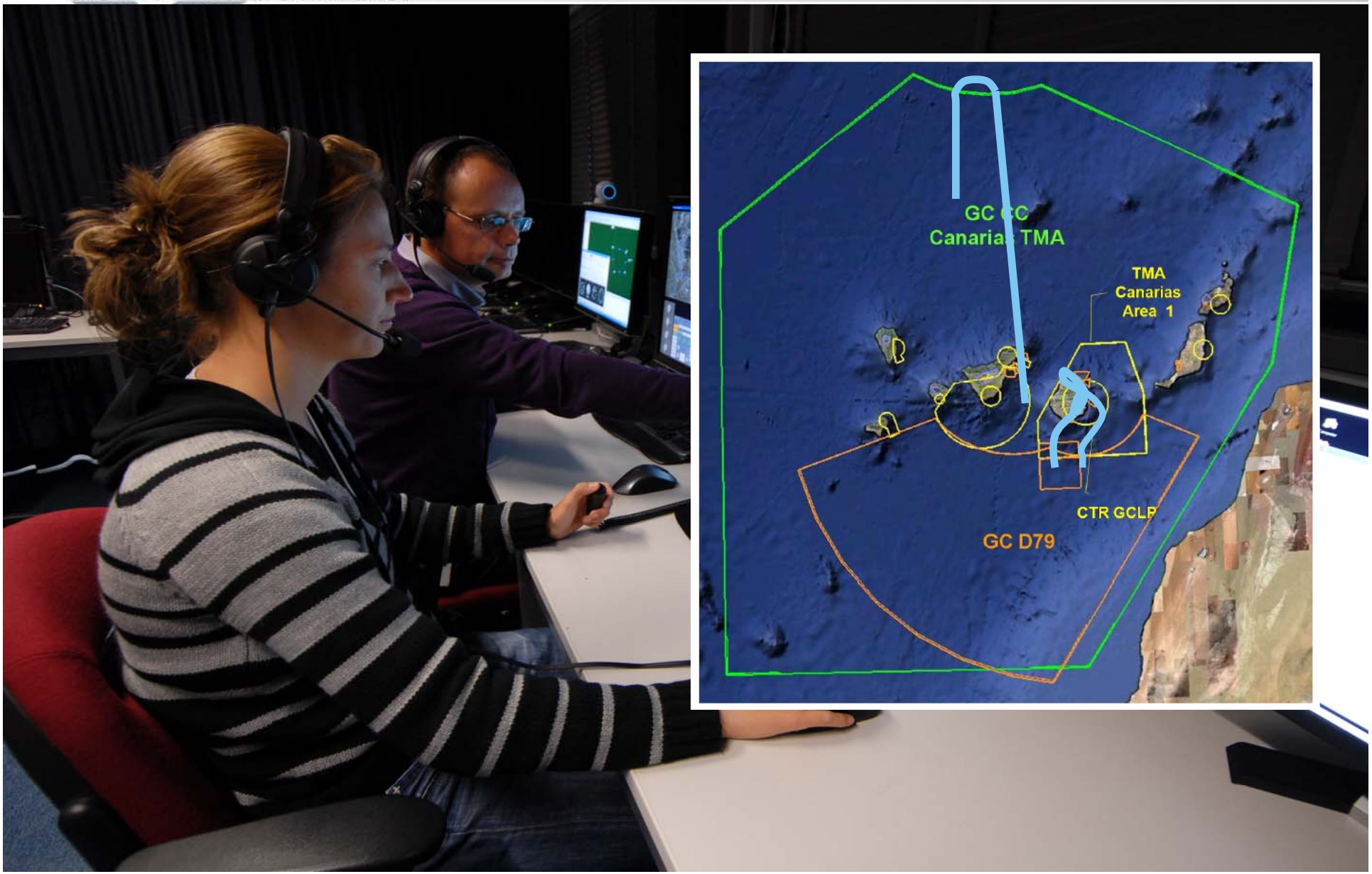


UAS Pilot

ATC

AT-One
the ATM Research Alliance

Mission SINUE



Validation scenarios SINUE

Evaluation of the UAS integration concept:

- Normal operations
  - Avoidance of severe weather
- Emergency operations
  - Standard emergency procedures:
    - Comm loss
    - Thrust loss
- Loss of separation

General results SINUE

- No special problems with UAS in airspace
- Integration concept allows treatment of UAS like normal aircraft
- Telephone comm between ATCo and UAS pilot could be a benefit compared to manned aircraft
- Sense & Avoid is still an issue to be solved with highest priority

Missions are feasible in near future

EREA for UAS

The E4U study was focused into assessing the European state of the art in UAS technologies main technical topics, further subdivided into several subtopics

The assessment procedure involved the identification, rating and ranking of technological challenges to be addressed for each of the subtopics assigned

E4U challenges

The prioritization of challenges has led to identify the following high priority-ones:

1. *ATM interfaces*
2. *Safe recovery systems, decision making and autonomous behaviour*
3. *Taxi, automatic take-off and landing*
4. *Sense and avoid*
5. *Weather detection and protection*
6. *Safe automated monitoring and decision architecture*
7. *LOS/BLOS infrastructures (+ GMES)*
8. *Dependable emergency recovery*
9. *Ground station - HMI*

AT-One’s unique RPS facility

MUAGCS: Mature Unmanned Aircraft Ground Control Station for research activities within AT-One

Key indicators of a MUAGCS are:

- Easy to use
- Generic and flexible (test) environment
- Linkable to other research facilities, such as ATC Radar

AT-One
the ATM Research Alliance

Conclusion presentation

We provided a brief overview of the state-of-play on the integration of RPA into airspace, with SINUE as typical example

We identified challenges that ATM faces in the near future regarding the integration of RPA into airspace, with Sense & Avoid still an issue to be solved with highest priority

AT-One offers stakeholders support in validating system concepts by means of a unique Remote Pilot Station simulation facility, coupled to ATC Radar

AT-One
The ATM Research Alliance