



# *Innovative Future Air Transport System*

*6th Framework program project*

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*Consortium IFATS – November 2005 – Web Site : <http://www.ifats-project.org>*

*Innovative Future Air Transport System*



## *Outline*

**What is the IFATS project ?**

**Current Air Transport System (ATS): Accident categories and causes, limitations**

**Future ATS: man involvement - Current studies**

**The IFATS project methodology**

**The IFATS project preliminary results**



## *What is the IFATS Project ?*

### **IFATS is a EC funded FP6 STREP Project:**

- Started on July 2004, planned to finish on December 2006
- Thematic priority 1.4 “Aeronautics and Space”, Key action 1.3.1.3: “Improving aircraft safety and security”

### **A multinational consortium is working on it:**

- ONERA - France
- EADS, France
- IAI, Israel
- Thales, France
- Alenia, Italy
- Erdyn, France
- DLR, Germany
- CENA, France
- CIRA, Italy
- University of Patras, Greece
- Technion, Israel Institute of Technology



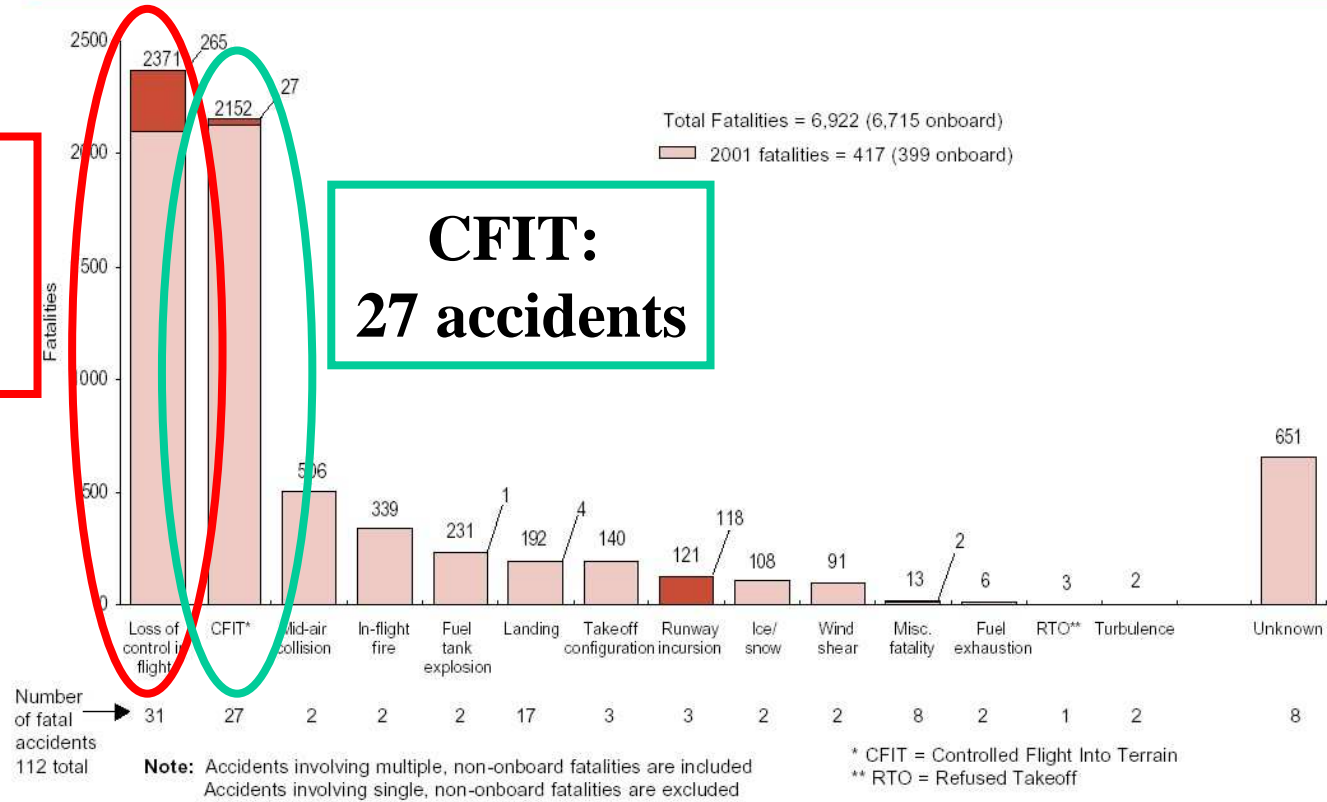
# CURRENT ATS : ACCIDENT CATEGORIES

## Fatalities by Accident Categories

Fatal Accidents - Worldwide Commercial Jet Fleet - 1992 through 2001

**Loss of control in flight:  
31 accidents**

**CFIT:  
27 accidents**





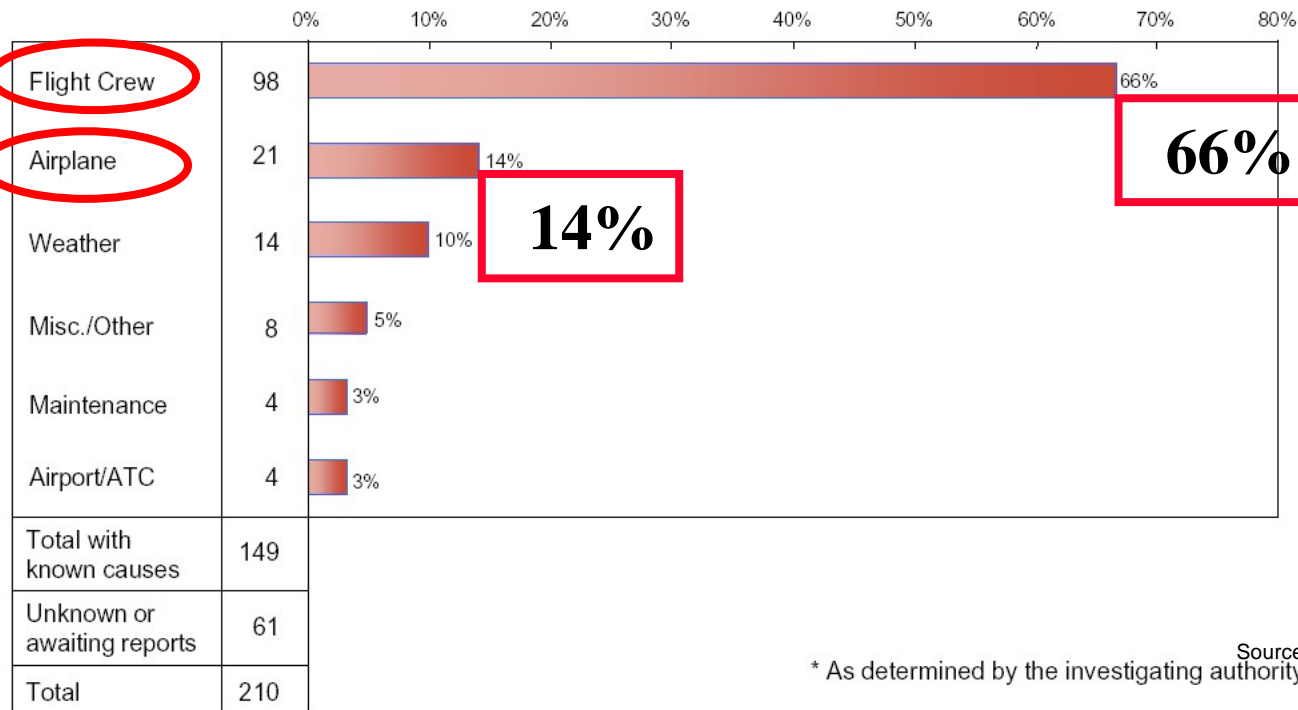
# CURRENT ATS : ACCIDENT CAUSES

## Accidents by Primary Cause\*

Hull Loss - Worldwide Commercial Jet Fleet - 1992 through 2001

**Flight crew**

**Airplane**



\* As determined by the investigating authority Source : Boeing



## ***CURRENT ATS : LIMITATIONS***

- **Radio frequencies**
- **Collision avoidance**
- **Surface Movement Guidance and Control**
- **Runway congestion**
- **Environment friendliness**

# ***CURRENT AIRCRAFT LIMITATIONS***



**Could already be flown without a pilot ?**



## *Future ATS : Current studies 1/2*

**Four types of provided services are foreseen as possible options (ASAS):**

- **“Airborne Traffic Situational Awareness**
- **“Airborne Spacing”**
- **“Airborne Separation”**
- **“Airborne Self-Separation”**





## *Future ATS: Current studies 2/2*

**Common characteristic to all the provided services options:**

- Smooth evolution of the current ATS situation
- **Man has still a central role**, under the supervision of automatic safety nets
- Lack of a clear view of what could be a “long term” solution (2040)



## *The IFATS project methodology?*

### **Two statements:**

1. We do not know what could be a long term ATS concept before studying potential solutions
2. The solutions based on the evolution of the current systems may be valid only for the short term



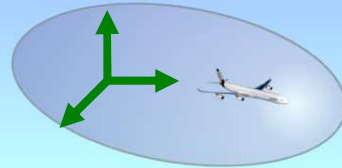
## *The IFATS project methodology?*

- 1. Study a “revolutionary solution” taking full benefits from automation capabilities*
- 2. Assess feasibility (technical, social, legal...)*
- 3. Analyse advantages and drawbacks*
- 4. Conclude on possible/acceptable ATS evolutions*



## *IFATS 4D contract concept “freedom bubble”*

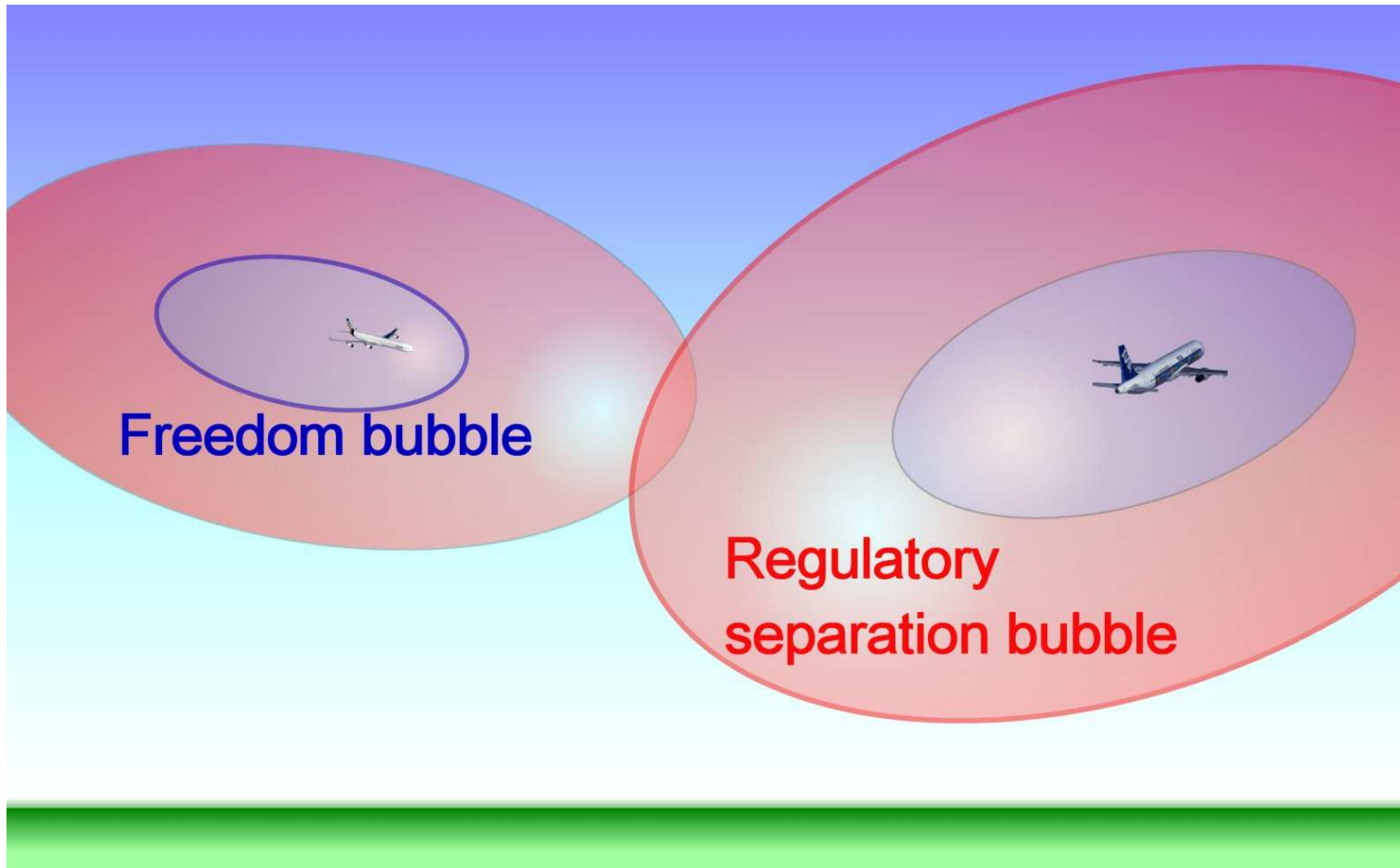
Freedom  
in space



**Conflict free trajectories** : the aircraft must stay in a «freedom bubble» moving according to a 4D contract or ask for a new 4D contract



## *IFATS 4D contract concept* *“Separation and freedom bubbles”*



**4D contracts are built such as separation between aircraft is always achieved**



## *IFATS basic principle*

### *Flight plans generation*

- Initiated at a planetary scale
- Consist of 4D contracts
- From airlines wills and ATM possibilities
- Leads to a fully conflict free traffic aiming at maximizing the satisfaction of airlines demands.

This is the “**strategic planning**”



## *IFATS basic principle*

### *Departure*

- *Boarding and ground preparation as today's procedures*
- *When the aircraft is ready, "ready for departure" signal is given to the ATM*
- *Take-offs precisely sequenced according to the various sizes and weights of aircraft and to the local meteorological conditions*
- *Changes made to the initial strategic planning allow the definition of a new planning called the **tactical planning***



## *IFATS basic principle*

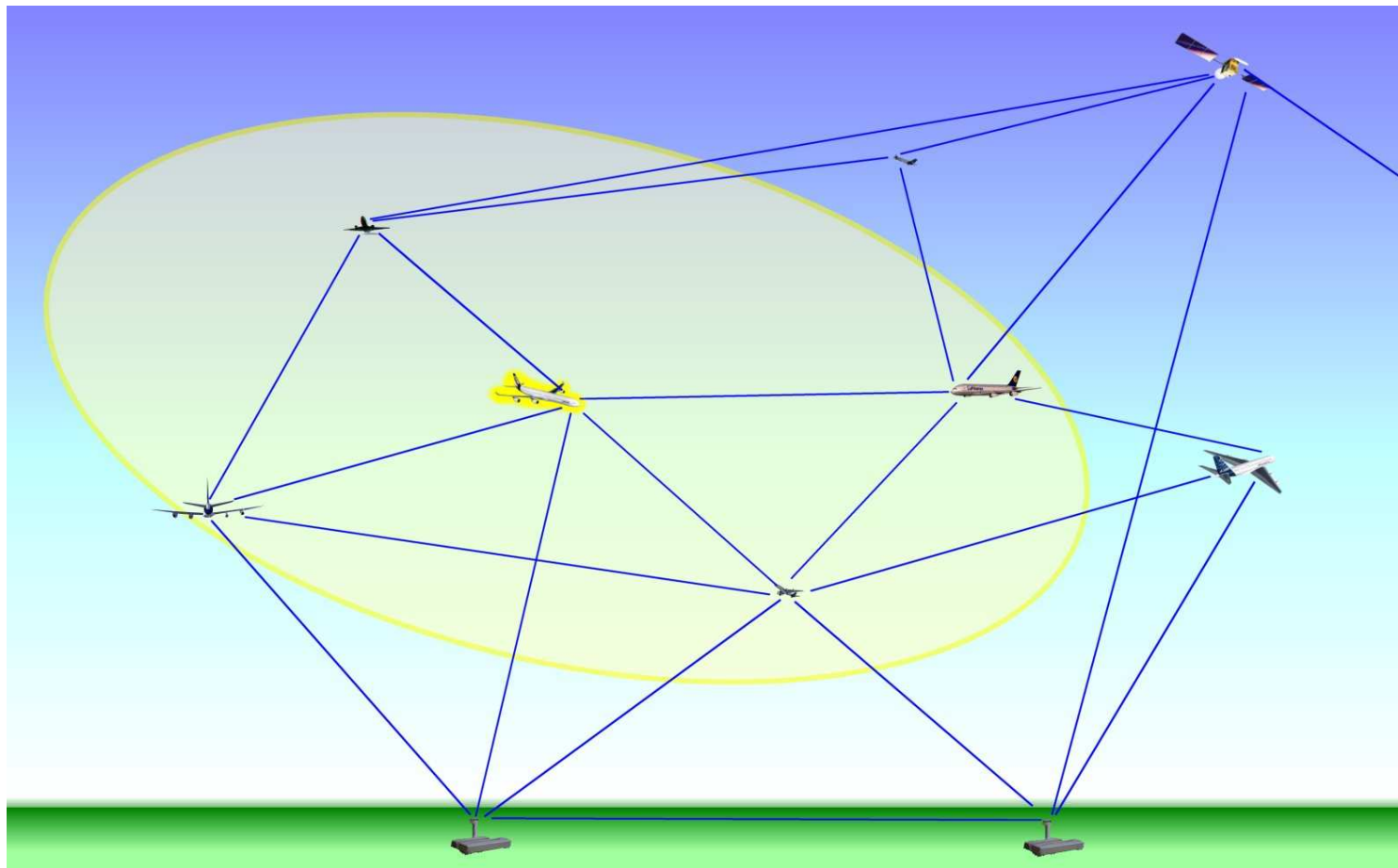
### *En route and approach*

- *4D contracts given according to the tactical planning updated through the system network information*
  - *Conflict free trajectories*
  - *Any aircraft linked to the ground segment either directly or via satellites or via other aircraft (network centric architecture)*
  - *Any aircraft broadcasts its 4D plan in a limited area*





## *IFATS network centric architecture*



**IFAT System  
architecture  
enables real time  
weather data  
and system state  
information  
update**



## ***IFATS basic principle***

### ***Aircraft not able to comply with its contract***

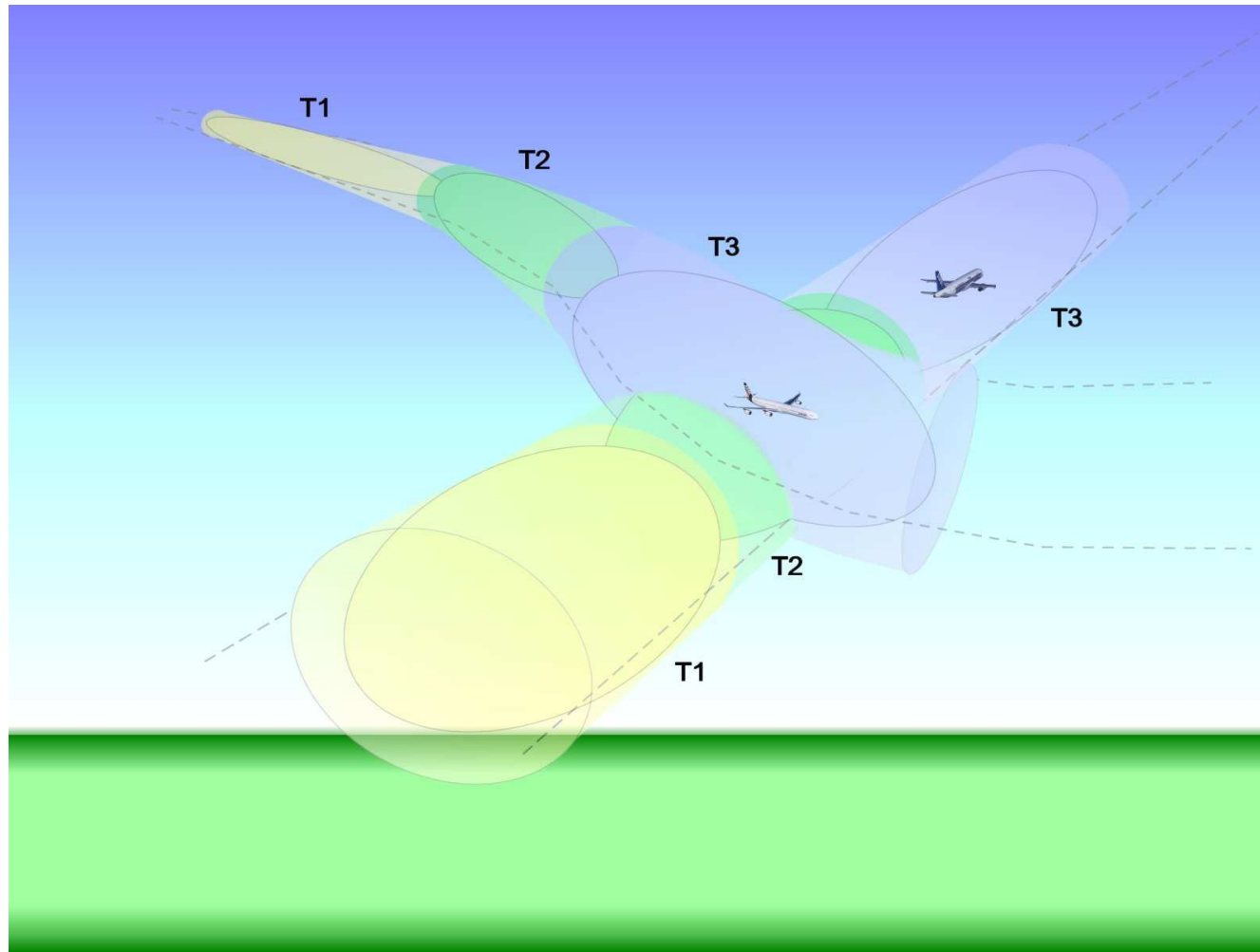
- *Asks for a new one to the ground segment:*
  - Either given with the lowest modification of other contracts
  - Or optimizing local or general overall traffic
- *Builds a new short term one according to its local situation awareness, if data link not available*

### ***In both cases three degrees of freedom are used***

- *Aircraft speed*
- *Aircraft trajectories (lateral and vertical)*



## IFATS “4D tubes”



**4D contracts are arranged to avoid any “same time at same position” situation by speed and trajectory adjustments**



## *IFATS basic principle*

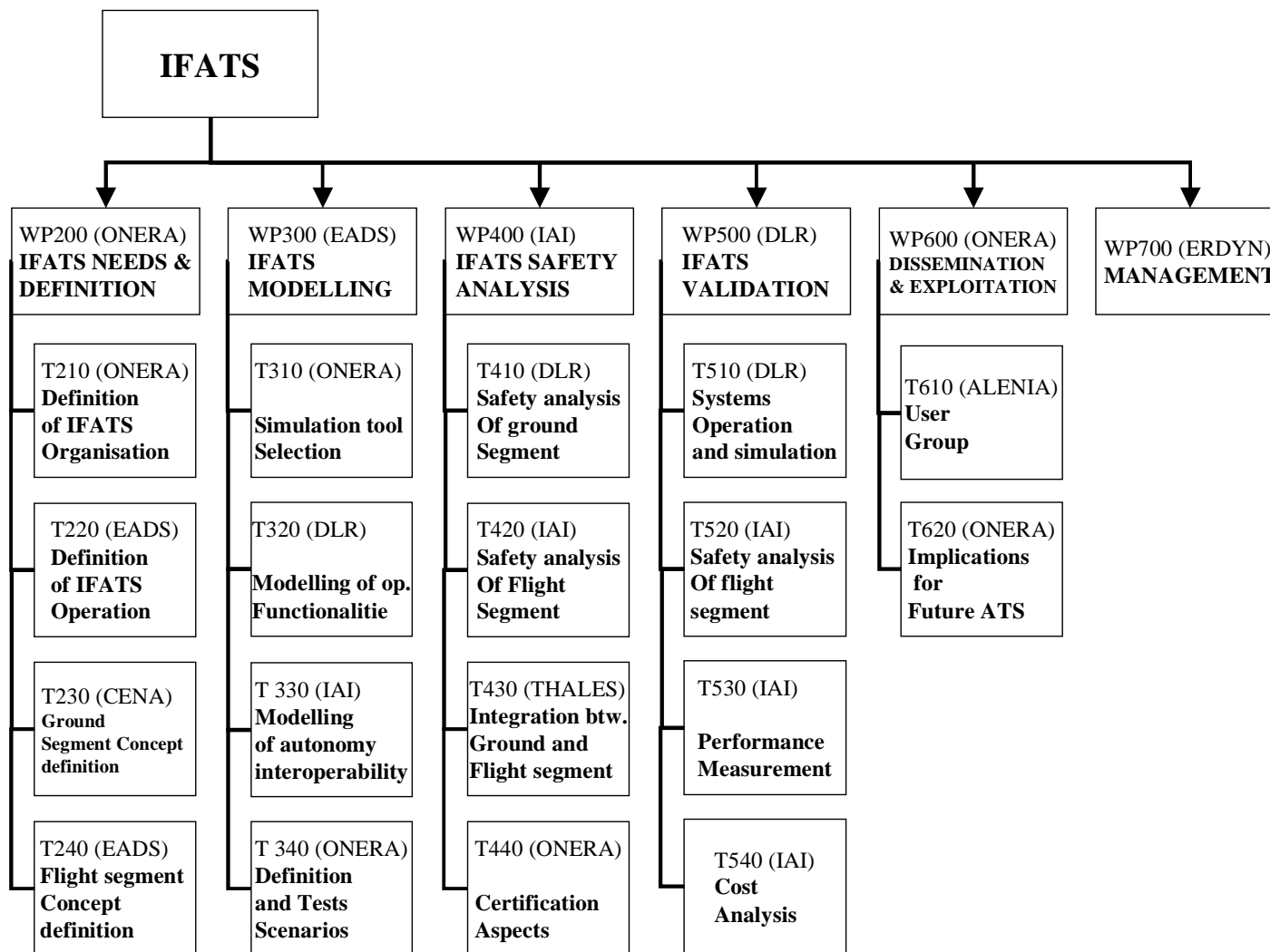
### *Aircraft in trouble*

- *Problem with implemented palliative strategy*
  - Applies the strategy
- *Problem without implemented palliative strategy*
  - Current state downloaded to the ground segment
  - Palliative strategy built by the GS
  - Palliative strategy uploaded to the aircraft

*Men are still in the loop, but at a remote location*



# IFATS project work breakdown structure





## *What can be the ATS evolution ?*

**Can IFATS vision be considered as straying into science fantasy?**

*“This is not because things are **difficult** that we do not **dare**,  
this is because we do not **dare** that things are **difficult**”*

*(Seneca)*

- **Today’s technology is not far from what is required to design IFATS**
- **Industry and airlines are used to focus on the near term**

***IFATS consortium has to set a long term vision***

*A revolutionary concept  
of ATS: no pilots, no  
controllers, both replaced  
by ground operators*

**Any questions?**

