Industrial position towards GA R&TD topics

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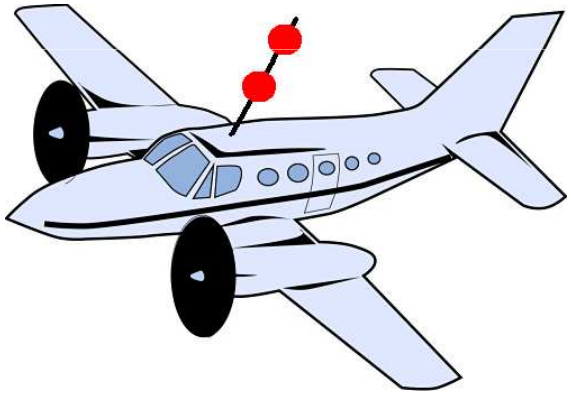
Key Challenges

- ‘Vessel Not Under Command’
- ‘Safety, Safety, Safety’
- Single Pilot Operation, Workload and skill
- System integrity
- Cost and the Business case
- What EqIMG can contribute

‘Vessel Not Under Command’

- Maritime term
  - UAS lost command and control link
- Aircraft must continue to fly
  - Pilot is a critical single point
  - Predictable behaviour essential
  - Aircraft not under command
- Good News
  - UAS developments but not fast enough



Business Jet Risks

A UK CAA study

- The fatal accident rate 2000 to 2007, per million hours
  - large jets in airline operation- fewer than 0.2 fatal
  - airline turboprops - about 0.8,
  - **business jets 1.7.**
- The top five primary causal factors were in the 59 accidents
  - flight handling (16 accidents/27%),
  - lack of positional awareness (11/19%),
  - omission of action or inappropriate action (nine/15%),
  - poor professional judgement/airmanship (four/7%)
  - disorientation or visual illusion (two/3%).
- With poor visibility or lack of external visual reference present in
  - 21 accidents (36%)

:Flight Daily News EBACE: Business aviation not as safe as it is cracked up to be? By David Learmount 11/05/09

Implications

- The report mentions training
  - including limited awareness of available technology
- and fatigue
  - Including the result of additional non flying duties

- For providers of technology the message is clear
  - Necessary new systems must be as intuitive as possible
  - Must contribute to Situation awareness
  - Decision support functions are expected to be very important

Specific ATC Recommendation

- Business aviation should work with ANSPs to:
  - Increase controller awareness of the performance characteristics of the aircraft
  - Recognise the workload impact for single-pilot operations of changes to clearances or other instructions.
  - Minimise the number of radio transmissions and frequency changes during critical phases of flight.

- *'SESAR' trajectory management will help but not for many years, workload will remain a factor*

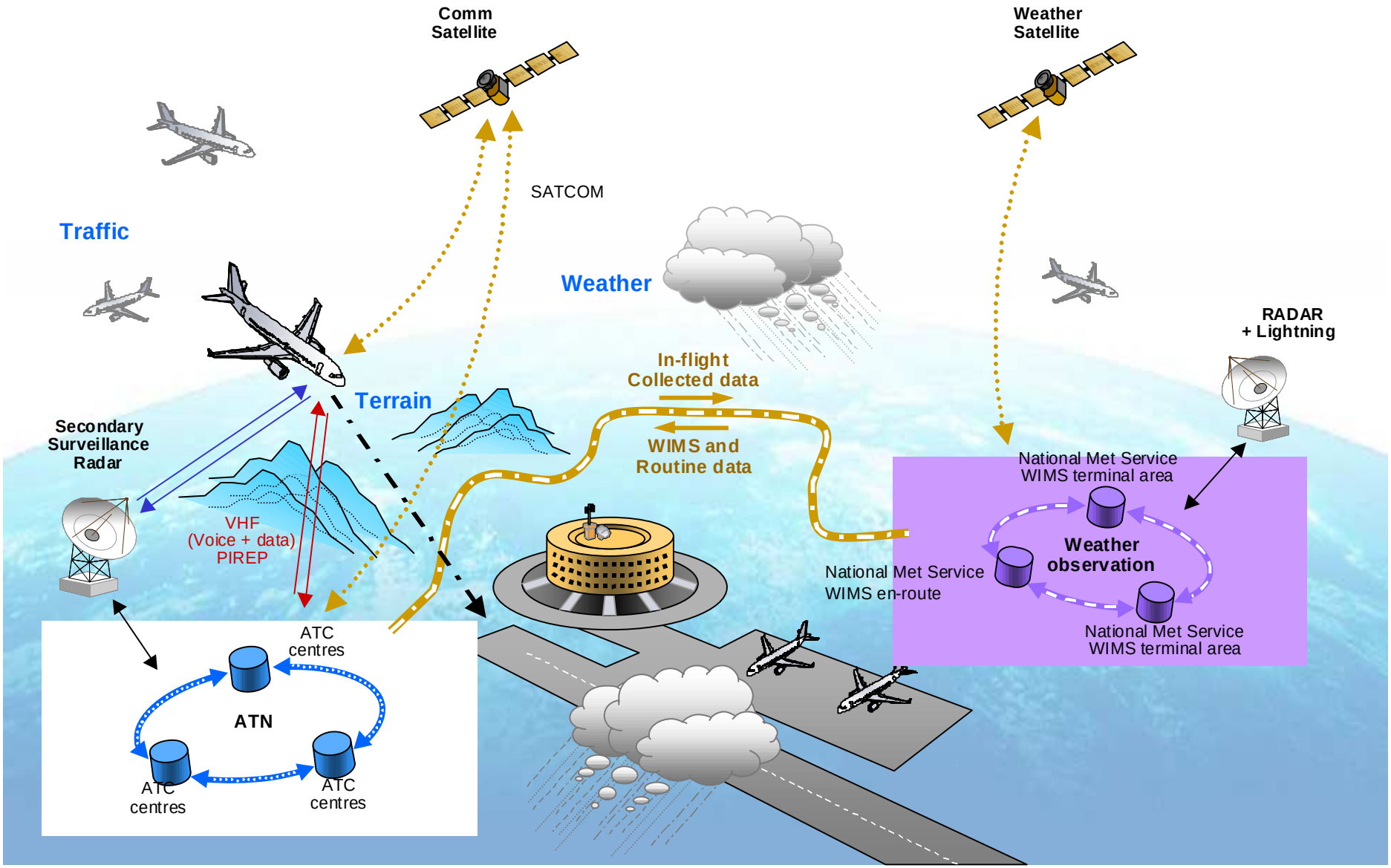
Single Pilot Operation

- A few other Issues - Workload
  - Collision avoidance
    - ‘See and avoid’ does not work well enough
    - TCAS?, ADS-B-IN, UAS Detect and Avoid
  - Flight Rules - routine IFR / separation support
    - Navigation precision? 3 and 4 D control
  - Management of systems failures
    - Advanced prognostics and heath management

Weather

- Severe Weather Hazards
  - Much greater for small aircraft
  - Avoidance Information - FLYSAFE
- Gust alleviation
  - Survival and passenger acceptance
  - new control and actuation methods
- Visibility
  - Precision landing aids
  - Enhanced and synthetic vision

FLYSAFE overall concept

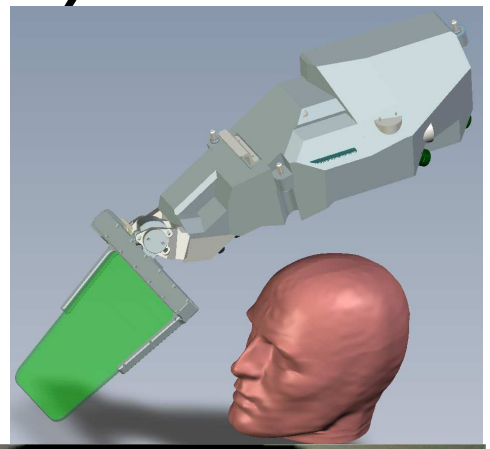


Gust Alleviation and advanced actuation

- Low cost Electro Mechanical Actuators for primary flight controls, landing gear and utilities
- Electrically driven Power Drive Unit for flaps
- Composite hydraulic actuators
- Jam tolerant ball/roller screws
- Distributed flap systems

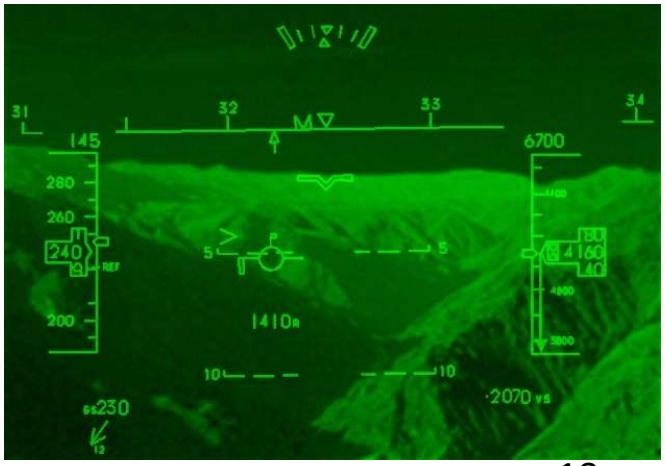
Visibility
Head Up Display (HUD)

- Fixed Display projects imagery
  - in the pilot's forward field of view
- Focussed at optical infinity,
  - symbology appears to lie on the horizon
  - accurately overlays the outside world scene
- Provides increased Situational Awareness
- Now available for small aircraft



Head Worn Displays

- Performs the same function as HUD
  - with comparable visual performance
- Supports viewing in all directions
- enables new application areas, e.g.
  - Identification and acquisition of traffic targets in all directions (e.g. enabled by ADS-B)
  - Enhanced terrain awareness
  - Weather detection and avoidance
- Applicable to very small aircraft
- R&D in required in some areas



Integrity

- Key questions for the community/regulators
  - How safe do these aircraft need to be?
  - How will these aircraft be classified?
  - Acceptability of new techniques?
    - eg SBAS precision landing
- New design approaches offer the potential of lower cost, high integrity architectures
  - Beginning to be applied to UAS
  - But much work still to be done
  - Retrofit likely to be more difficult
- A known Regulatory regime is essential

Business Case

- The initial analysis by EPATS and GA-ATS look very promising
- Implies a huge growth in small aircraft manufacturing
  - Does the capacity exist?
- Regulations, Compatibility of the ATM environment and Green issues will impact overall cost and viability
- New affordable high integrity technology needed
  - Similar to that expected for Civil Unmanned aircraft
  - But large R&D efforts (in both areas) limited by lack of interest from EU, SESAR and Platform manufactures
- Industry is very interested
  - but these issues need to be addressed urgently
- R&D support will be very important

EqIMG
Equipment Industry Manufacturing Group

- **The EqIMG was formed 17 years ago as an open forum for the European equipment industry**

- **To provide a technical interface between the European equipment industry and the European Commission in order to prepare and to define suitable programmes and subjects for research in the field of aeronautical equipment.**

- **Currently 26 participants from 11 Member States representing major companies, trade organisations and AeroSME.**

EqIMG - How it works

- **One meeting every month the most often in Brussels**
- **EqIMG collects all research ideas from Equipment sector**
- **EqIMG co-ordinates the proposals from the equipment sector**
- **Decisions are taken on the basis of consensus**
- **EqIMG co-ordinates its activity with the other groups (airframe, engines, ATM, research centres, universities)**

The European Aeronautics industry network for R&T

IMG4

- ASD-IMG4 coordinates industry's position with regard to the EU R+TD Framework Programmes.
- ASD-IMG4 represents, through the Industry Management Groups (IMG), the European Aeronautics Industry.

IMG4 comprises representation from four groupings :

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Agusta-Westland
Alenia Aerospazio
Airbus SP
Airbus G
Airbus F
Airbus UK (A)
Dassault-Aviation
Eurocopter
SAAB AB
S.A.B.C.A.
GKN-Westland

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- EqIMG position towards GA R&TD topics in order to maximize added value
- Equipment Issues
- Safety - operation , reliability modular
- maintainability
- Infrastructure – support
- ATM
- Airport approach etc
- Compatibility with existing air transport systems
- All Weather
- Pilot support - decision aiding , single crew
- Terrain
- Modular design
- Certification
- ICAO /EASA rather than national Cross border
- Low cost manufacture
- Composites structures
- Composite propeller blades
- Affordable avionics
- Required levels of integrity
- Flight control
- Actuators
- Engine reliably
- Alternative fuels etc
- Llnk to other aircraft and UAV

– Near autonomous FBW flight control
– Surveillance/image processing
– Autonomous See and avoid
– Autonomous control
– Intelligent crew support systems
– ATM.