



ATM Automation and Product Liability Insurance

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Why are we talking about new technologies in SES ?

- Will future technologies in the Single European Sky change
 - current allocation of risk and liability ?
 - insurance obligations ?
- What do recent court rulings for cases involving new technologies tell us about the future?

To answer these questions we will examine SES technologies and two past accidents relevant to the main issues.

Past court decisions could help to envisage responsibility reallocation and future insurance obligations.

New ATM technologies - SWIM, ACAS-X, GNSS

Überlingen accident

Product liability issues resulting from TCAS II technology

Milan-Linate accident

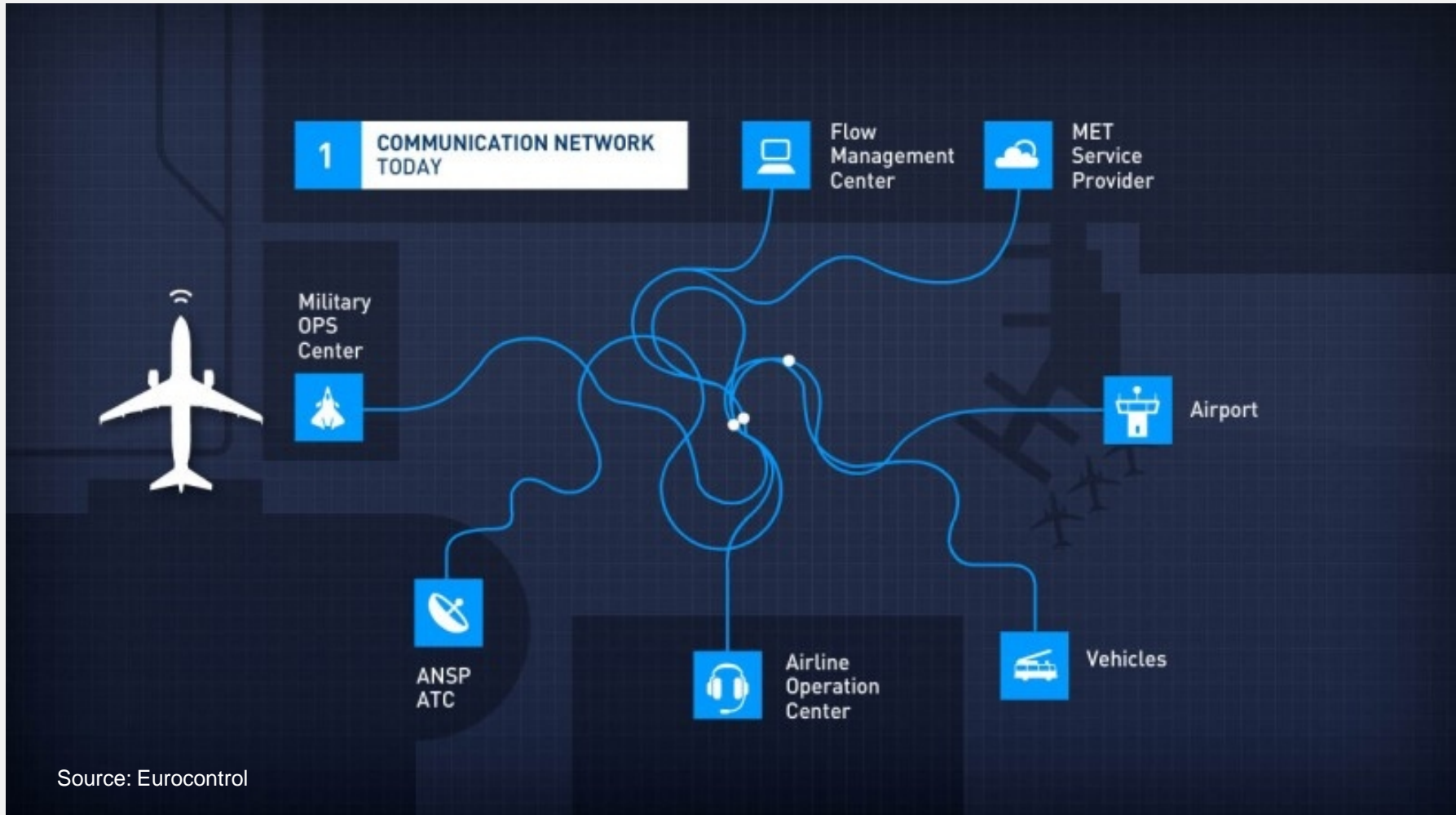
Liability issues resulting from lack of technology

Emerging liabilities from new ATM technologies

Product liability insurance implications

New ATM technologies - SWIM

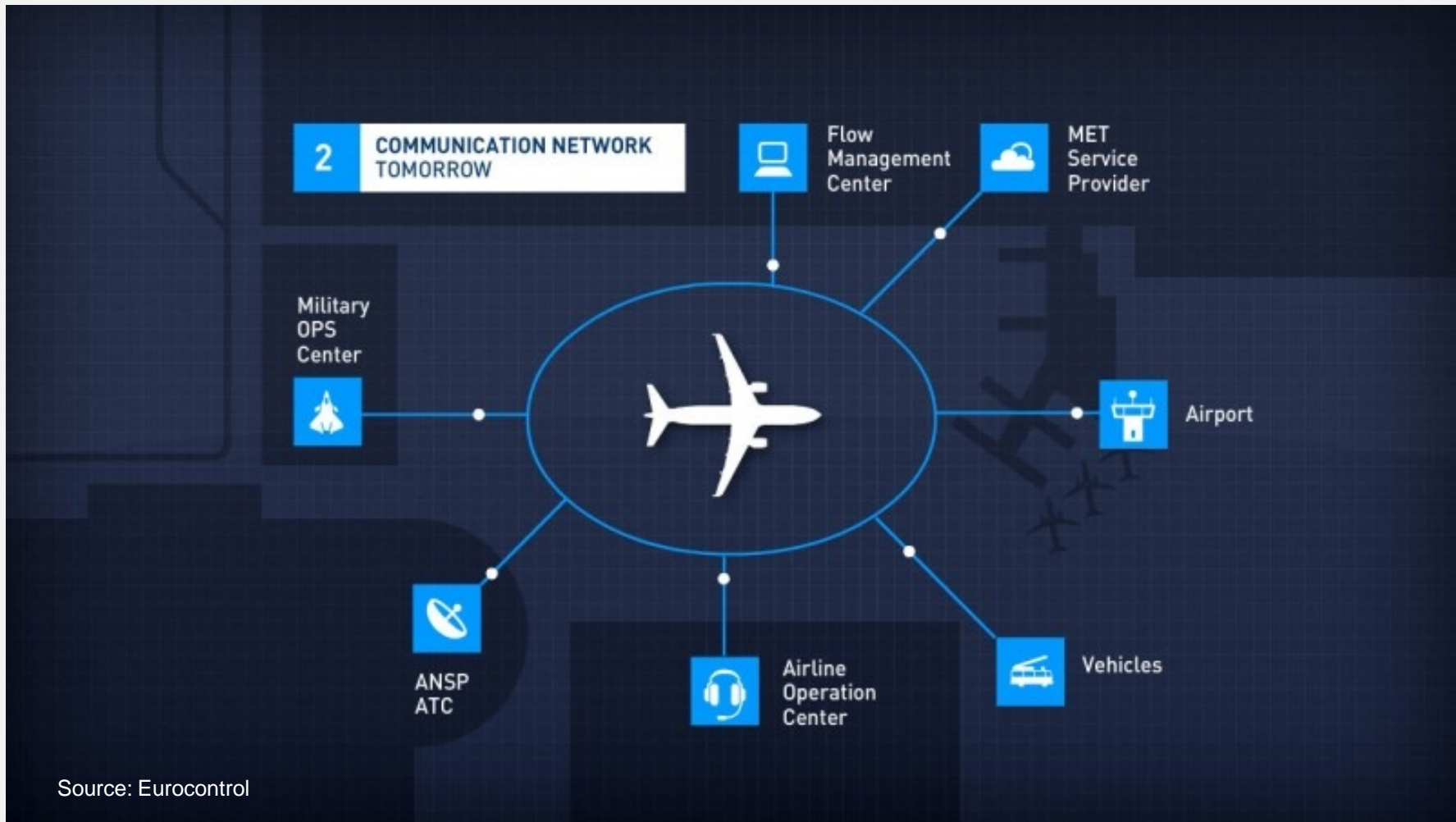
Current ATM Information System



Source: Eurocontrol

New ATM Technologies

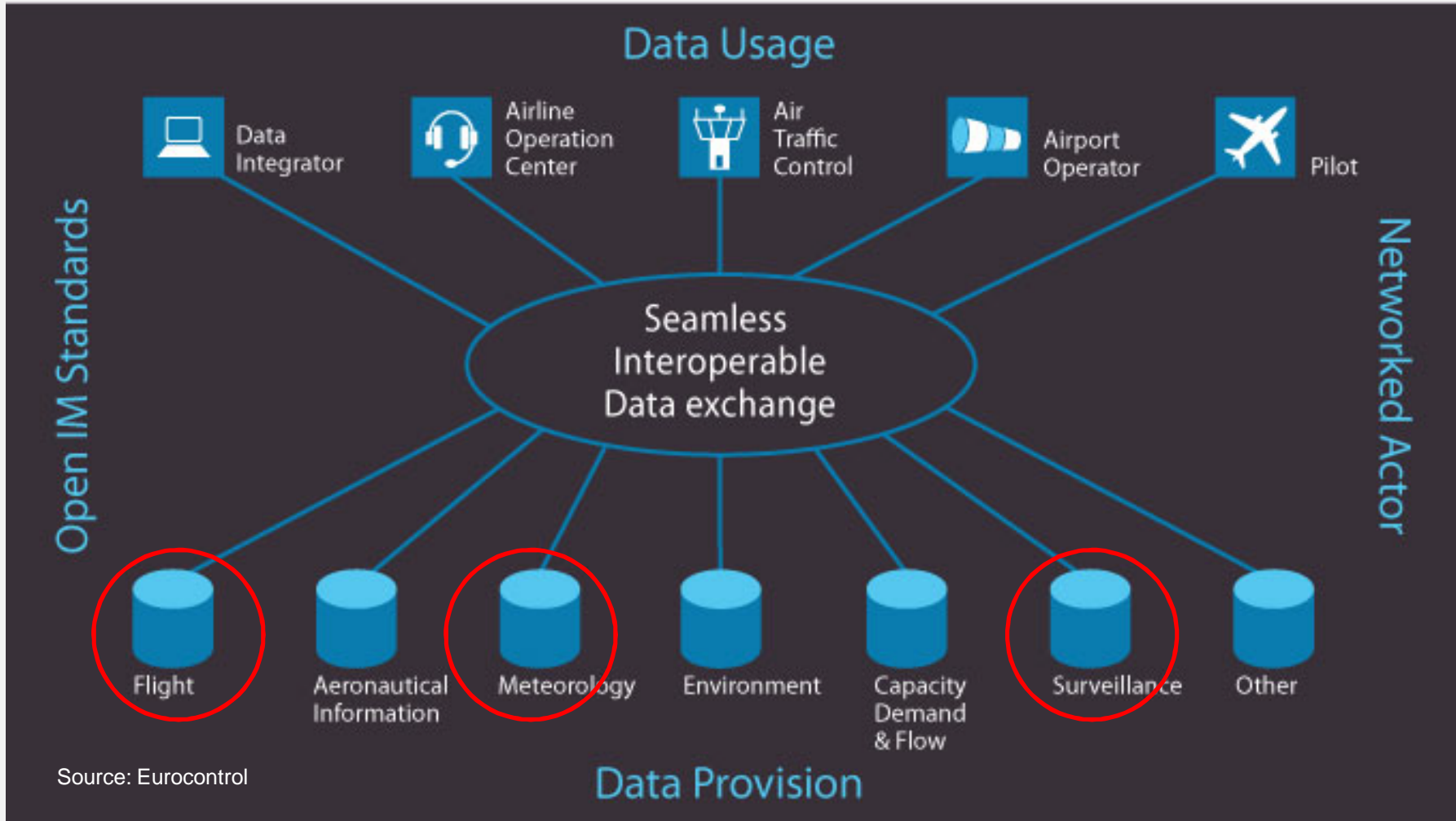
SWIM - System Wide Information Management



Source: Eurocontrol

New ATM Technologies

ATM Information and Data Exchange



New ATM Technologies

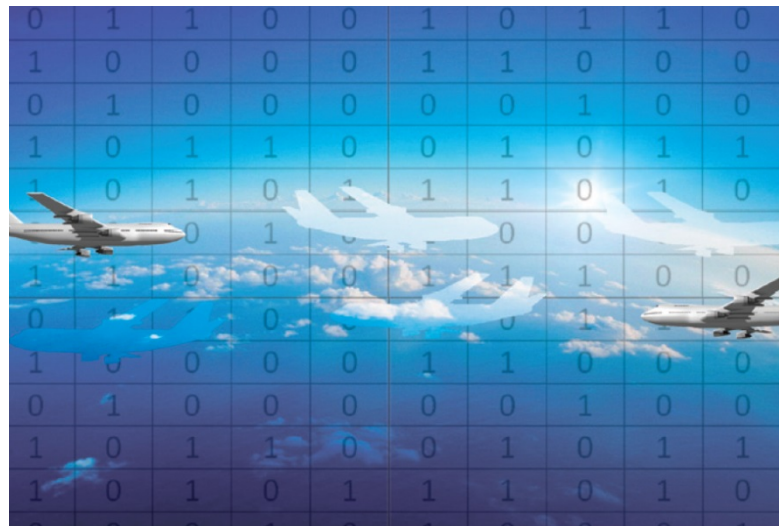
ACAS X – the future of airborne collision avoidance



New ATM Technologies

Why develop ACAS X ?

- TCAS II not compatible with new operational concepts that SESAR and NextGen plan to implement
- More efficient and optimized use of separation minima or spacing between aircraft needed for an efficient flow of traffic
- New system logic and integration of sensor data from several sources required

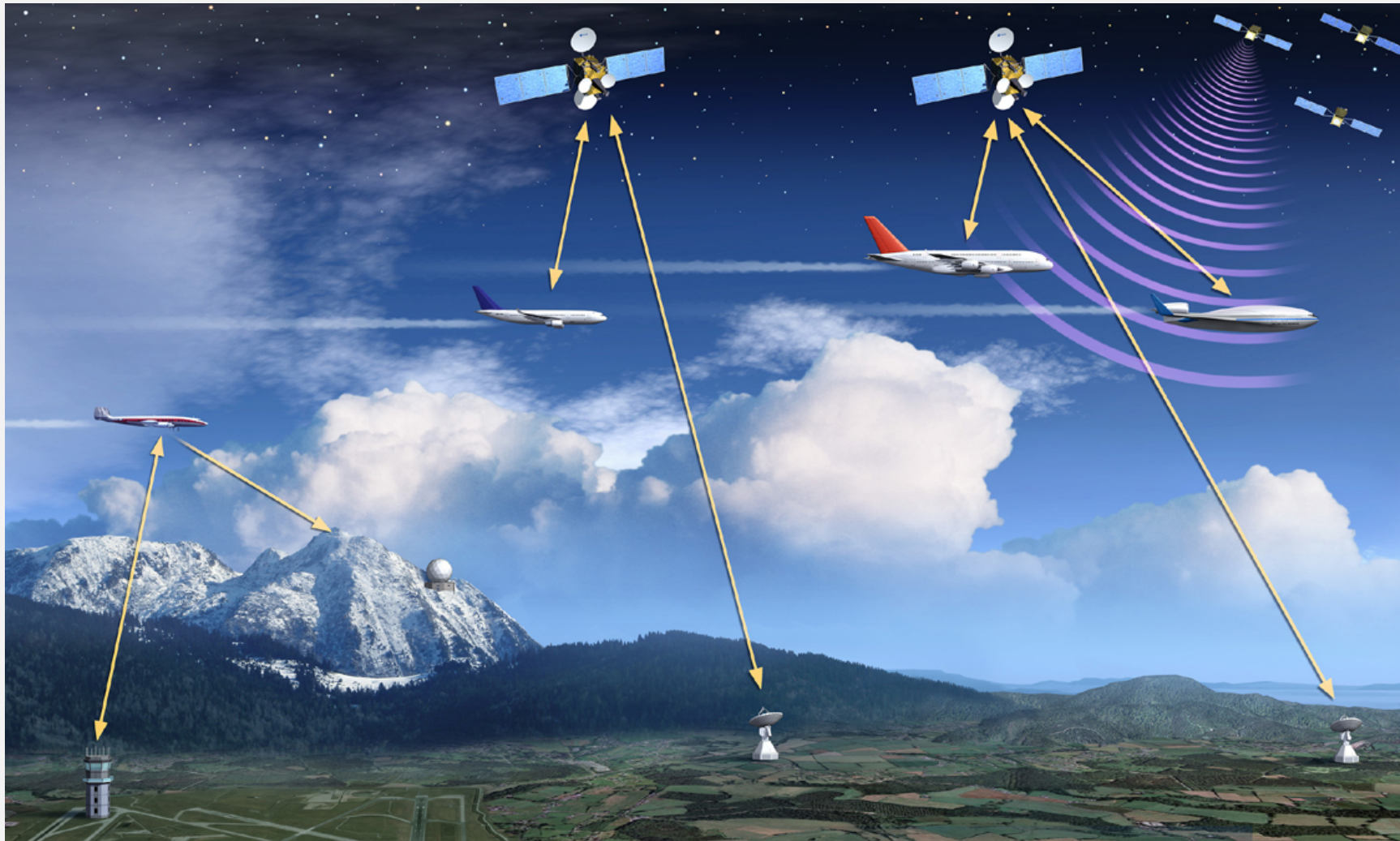


New ATM Technologies

Which will the benefits of ACAS X be ?

- Reduction of unnecessary advisories
- Less operational limitations
- Reduced risk of collisions
- Extends collision avoidance to GA, UAS/RPAS
- Minimal changes for pilots and controllers
- Changes of Liabilities ?

Future Air Traffic Management Global Navigation Satellite System, GNSS



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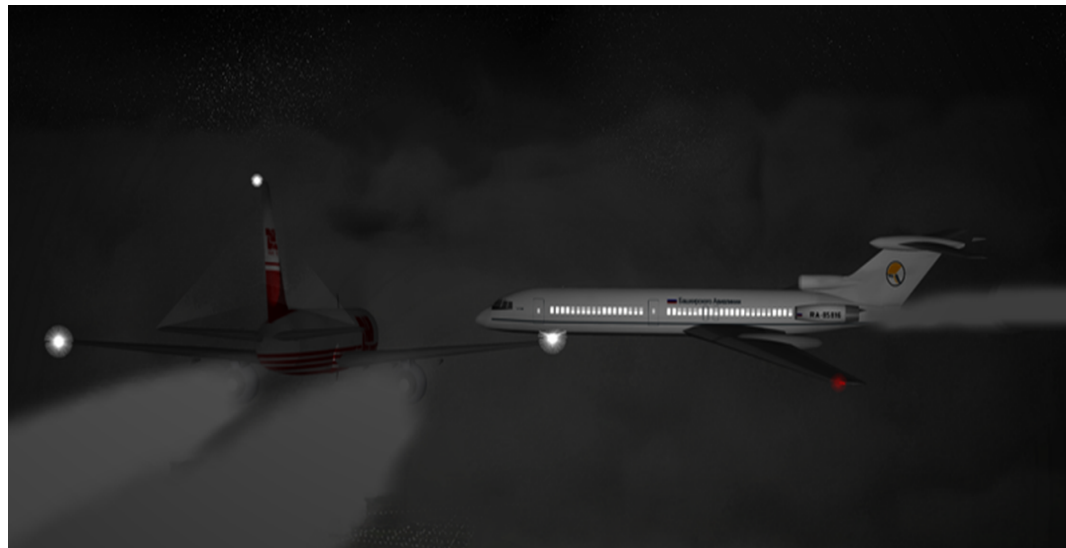
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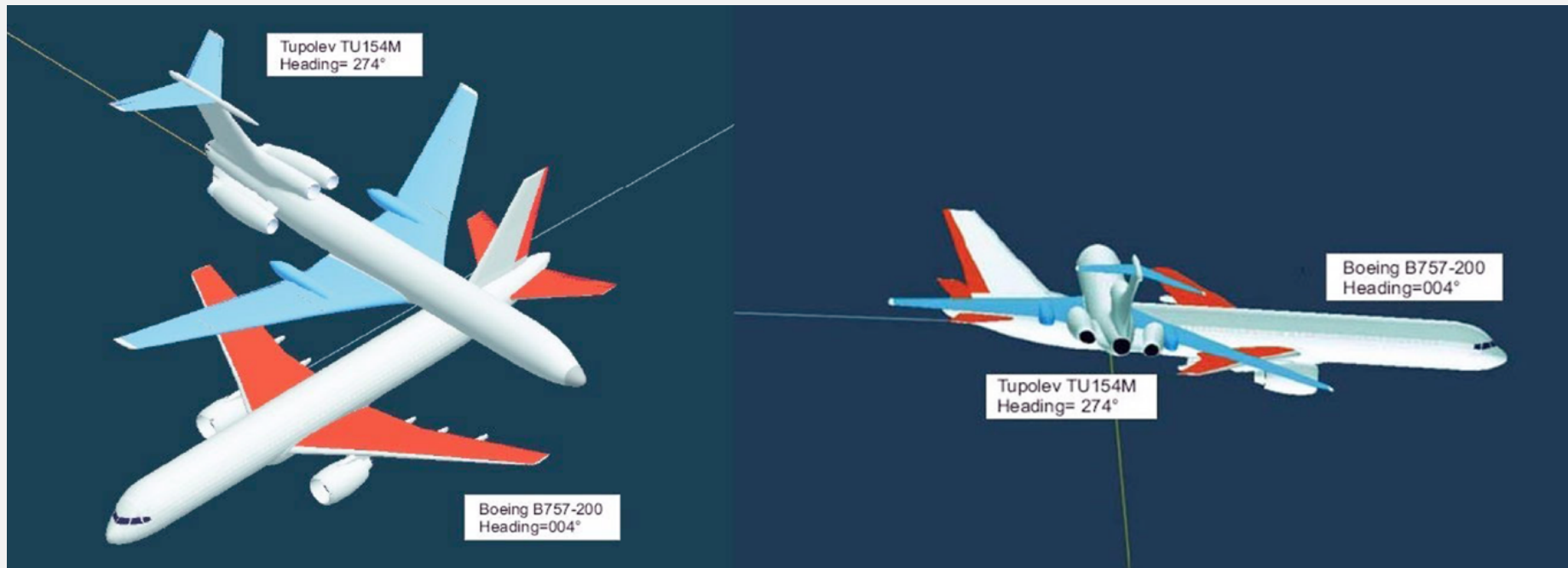
Product liability insurance implications

DHL/Bashkirian AL mid-air collision over Überlingen

On the night of July 1st, 2002 over Überlingen a mid-air collision occurred between a **Tupolev TU-154M** aircraft chartered to operate for Bashkirian Airlines (BAL) travelling from Moscow to Barcelona and a **Boeing 757-200** freighter operated by DHL Airways Flight 611, travelling from Bergamo to Brussels.



The accident

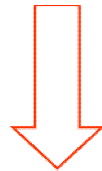


1. The TCAS II installed issued RA (Resolution Advisory) to both aircraft
 2. The Tupolev received an initial RA to [**climb**] while the DHL B757 received an initial RA to [**descend**]
 3. The DHL B757 followed the RA [**descend**]
 4. The Tupolev 154 had received prior instruction from an air traffic controller (ATC) [**to descend**], and followed the instructions of the ATC
- The **conditions** for a **reversal RA** were met many times during the **23-second window** before collision. Nonetheless, the TCAS II system on board the two aircraft **did not issue a reversal RA.**

This resulted in the **two aircraft continuing to advance towards one another**, approaching at the same altitude.

Different parties, claims and conclusions

criminal judgment* (2006-2007)



**organizational weaknesses
of the ANSP**

**civil judgment for product liability
(Barcelona 2010-2012)**



malfunction of TCAS II vers.7

Elements in common:

Omission to supervise, inform and act in order to remedy the known failures of the system

* Judges did not find intentional criminal activity, but pointed out that the convicted ATCOs employees and managers had an opportunity to remedy known safety measures, and failed to do so.

Omissive action as a common element in the 2 judgments

CRIMINAL JUDGMENT



Omissive Action



CIVIL JUDGMENT

Three defects in the TCAS II product were **alleged** against the designers and manufacturers as producer, designer, distributor and seller of the TCAS:

1. **The system did not invert the RAs** due to reasons that were intrinsic to the system; the device did not comply with the minimum requirements established by the FAA.
2. **The TCAS Pilots Manual did not clearly indicate that priority to TCAS orders must be given in the event of conflicting orders**: regulations indicate that "RA" warnings from TCASs are obligatory. In the event of a conflict between an RA and an ATC order, as it was the case, the crew must always follow instructions from the TCAS .
3. **The design was faulty**, despite the fact that there was a software update to correct the problems of version 7, as also previously stated by Eurocontrol.

The legal basis in the ruling against the designer and manufacturer of TCAS II

The Court found that:

Slowness in processing information was a TCAS II malfunction: if the system had been able to refresh data every second (in the 23-second window), the reversal RA would have been issued and the accident could have been avoided, thereby opportunities were lost to give the pilots correct instructions.



- 1. designer:** The architecture of the software and the design of the hardware of the TCAS II system, Version 7, ***did not meet the minimum standards*** and was, thus, defective.
- 2. manufacturer:** it was aware of defects but **did not adopt necessary measures to resolve them** (the same legal conclusion, albeit with different facts, was reached in the Linate case).

1. The Court experts' investigation said that:

a) the potential for an accident was **predicted in 2000**.

b) it was affirmed that the **absence of a reversal RA** was a factor that contributed to two serious events: the accident in Yaizu (Japan) in 2001 and the mid-air collision in Überlingen in 2002.

2. The Überlingen accident and the other incidents could have been avoided with the upgraded version 7.1 of TCAS II,

(The defendant noted that it could not be installed because it was not approved by the FAA.)

1. The poor functioning of the Zurich Air Control Centre, managed by SKYGUIDE, **was not the final cause of the collision***.

1. The **conduct of the crew of the Tupolev was not found negligent**: the Court found no evidence in this regard (no vicarious civil liability).

The reversal RA would definitely have prevented the accident



The responsibility was exclusively that of designer and manufacturer

* “Although it is evident that the Zurich Air Control Centre, managed by SKYGUIDE, failed as a primary safety measure, as has been extensively explained in the BFU report, there is no doubt that the TCAS also failed as an additional safety system which has to function in order to counteract any human or technical errors that could cause a collision, since it is conceived as a safety system for when the first one fails”.

If the TCAS had not been installed, the controller would have prevented the collision, even though he gave the order very late, because the Tupolev would have [**descended**] and the Boeing would have **continued at the altitude it had.**

The Court stated: “the **final** and **actual cause** of the airplane accident in Überlingen was the TCAS II system and its defects.

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Milan-Linate Accident

Scandinavian Airlines Flight 686 - Cessna Citation

1. On the 8th October, 2001 a Scandinavian Airlines aircraft collided during take-off with a business jet Cessna Citation CJ2.
2. The accident occurred on a very foggy day with visibility of less than 200m.



The **incursion of the Cessna aircraft** in the runway designated to commercial airlines

The airport was operating **without a ground radar system**

Technical malfunctioning due to problems in the R/T, audio was often distorted and unclear

The Cessna was allowed to land, although **aircraft and pilot were not licensed** to operate in the airport

Inadequate runway signs: old signs (written in ICAO standard font) were no longer in use at the airport, but still present and visible on the taxi lines

CRIMINAL JUDGMENT



NON – use of adequate technology

ATCOs were found criminally liable; vicarious civil liability.

Managers of Italian ANSP: were found criminally liable; vicarious civil liability

Several crimes of **omission** in the implementation of **adequate technology** and safety measures were found by the Court, and were identified as follows:

- **The CEO of the Italian ANSP**, because the old radar system had been deactivated, and the new radar system was not yet operative
- **The ATCOs** because they failed to identify the correct position of the Cessna jet
- **The Linate-Malpensa Airport Directors** (employees of CAA) because they failed to ensure that the Italian ANSP and other bodies had all necessary safety measures in place throughout the airport

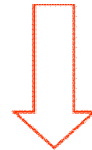
The Court confirmed that the accident was the result of technology omission and declared that the accident was caused by:

- Lack of **operative radar system (responsibility of ANSP)**
- Human error** (the Cessna pilots and ATCOs)

However, the **ultimate cause** of the accident **was the failure to use the new technology** (ground radar) at the airport by Italian ANSP

Had the radar system been in operation, the Court held that there would have been an approximate **100% probability of avoiding the accident.**

The Court of Appeal, in the light of this probability, acquitted the Airport Directors.



The non-use of the necessary technology was the fundamental cause of the accident

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- SES introduction of **widely use automated air traffic control technology** could shift liability to the technology manufacturer
- The importance of modern technology **can create liability for omission** of doing something which could prevent the accident
- New technologies can make it **more complex to identify who** is actually commanding an aircraft, thus **making liability allocation more difficult**.
- The trend of EU policy planning is to go in a more concrete and strict direction (e.g. RPAS, SWIM etc.).

This involves establishing definite and applicable principles of law 

Which are the principles that legislation will have to take into account to adequately deal with new technology? (I)

Principles already applied for **high risk activities** with the potential to cause significant damage (CLC Convention; Fund Conv.; Nuclear Conv.; Hazardous and Noxious Substances Conv., etc.)

- **Strict liability regime**
- **The channelling of liability to a single liable party (**operator/user of the system?**)**
- **Limited liability of the liable party (cap?)**

Which are the principles that legislation will have to take into account to adequately deal with new technology? (II)

- **Compulsory insurance of the liable party, up to the limit, and direct claim against the insurer?**
- **Limitations of the amount of compensation?**
- **Right of recourse against the manufacturer/designer or other parties?**



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- NextGen ATM system and new technology will improve safety
- Automation will reduce human error factor
- New ATM technologies will **change liability risks and/or allocation of liabilities**
 - **Manufacturers liability risks** might increase 
 - Defective GPS satellites or satellite parts
 - Government immunity and Disclaimer
 - Complex liabilities
 - ATM system failures
 - Hardware defects
 - Software defects
 - **Operators liability risks** might decrease 

- **Increase of financial losses**
 - Airspace or airport closures
 - Cancellations, delays and diversions
 - Aircraft fleet groundings
- **Cyber security will be high risk category**
 - Aircraft hacking
 - Cyber attacks against ATM Systems
 - Signal interference
 - GPS spoofing
 - GPS jamming
- **Frequency and severity of cyber losses will increase**

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