



*Airborne Integrated Systems for Safety Improvement,
Flight Hazard Protection and All Weather Operations*

FLYSAFE
FORUM N° 01
Information/Communication
and the use of Data Link in
FLYSAFE

27 – 06 – 2006

EUROCONTROL Brussels

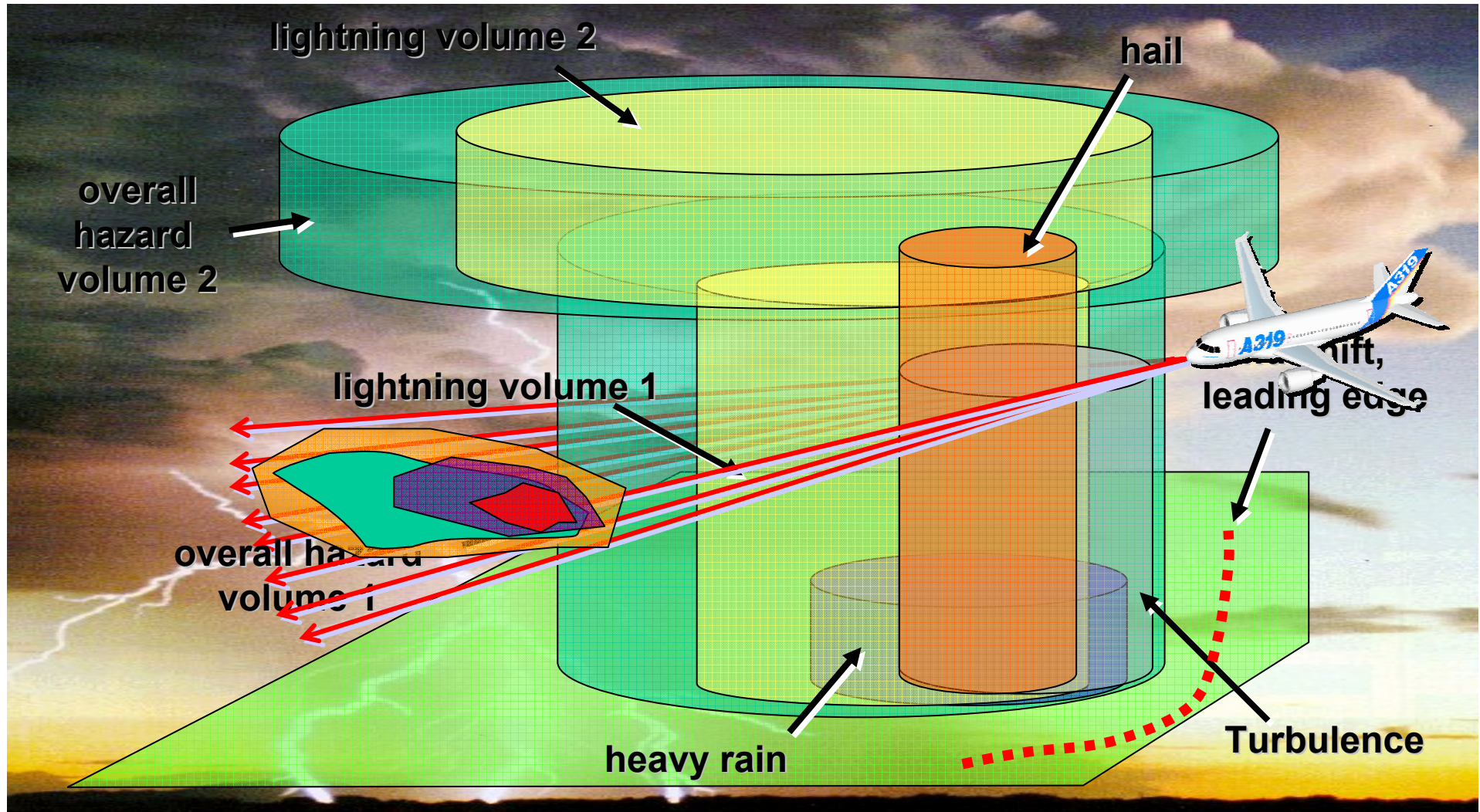


Introduction

- **Aircraft may encounter different types of threats during flight**
- **FLYSAFE opens the possibility of providing actual information about these threats**
 - **Weather**
 - **Traffic**
 - ◆ **In contrast to weather and traffic, FlySafe is currently not concerned with terrain 'updates'**
- **Appropriate means of data link have to be chosen**
 - **To ensure optimal sharing of hazard information**

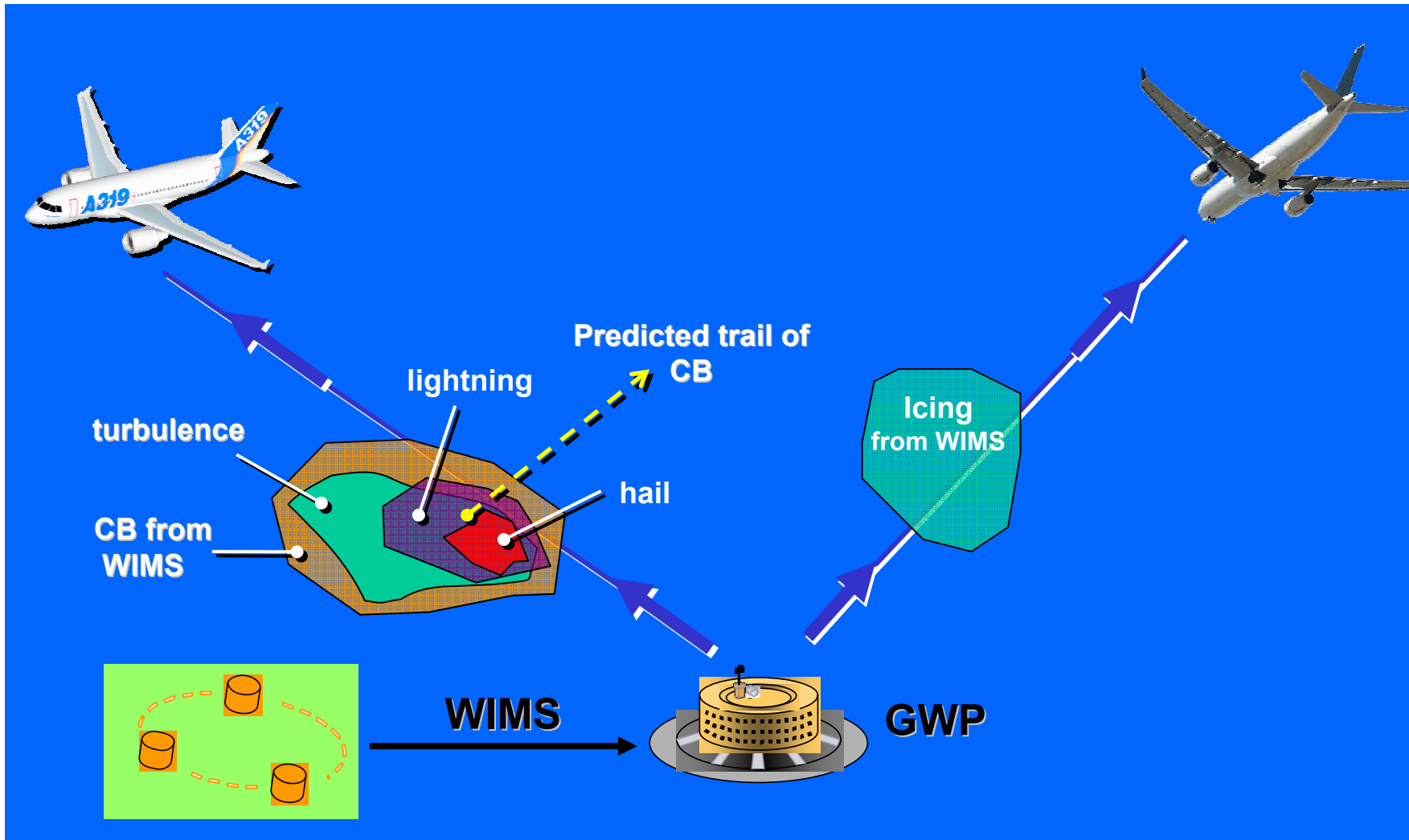


... and a conceptual model of a thunderstorm weather object within CB WIMS (WP225)



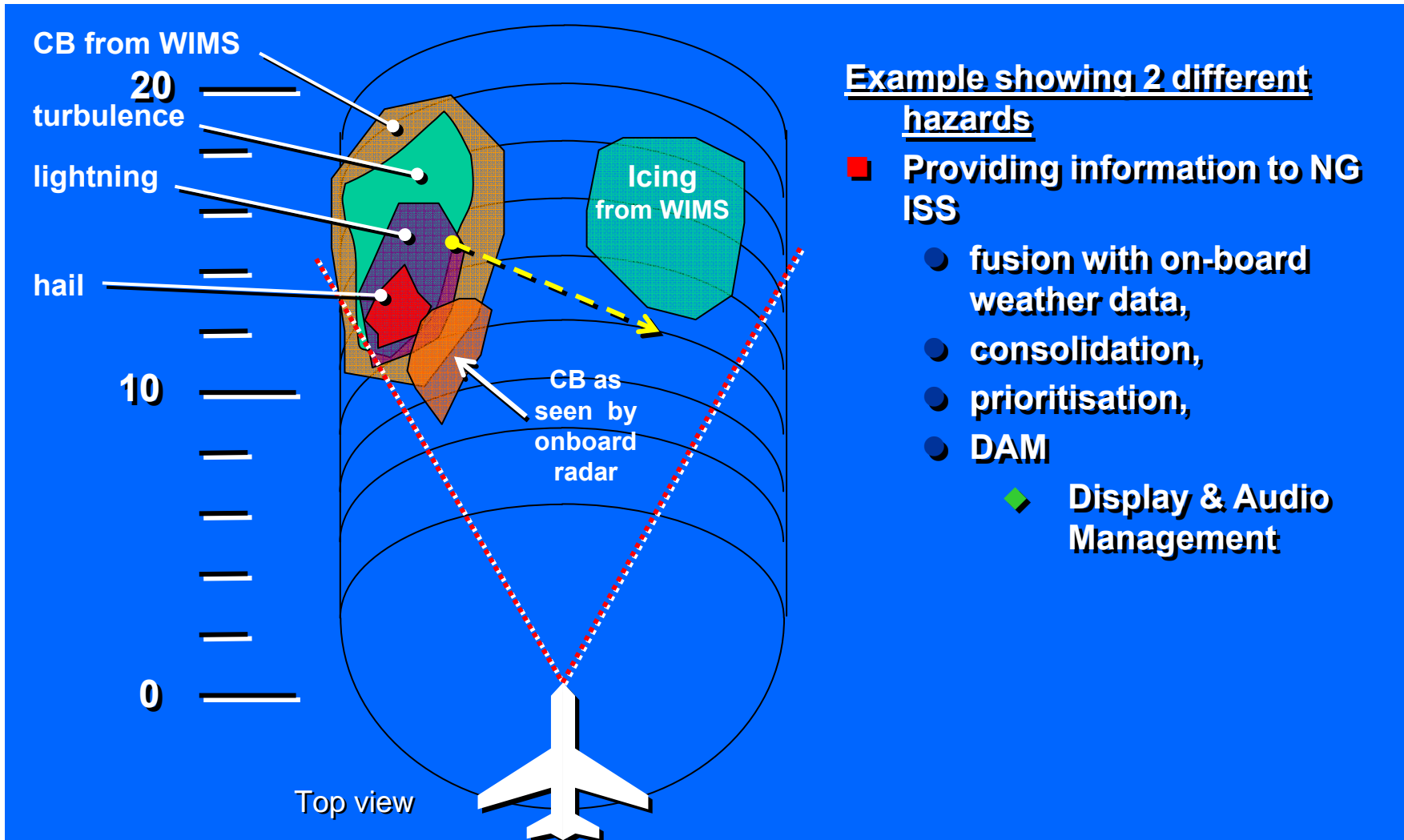


Information flow Ground – a/c





"actual" time window: $t \leq 20$ min



Example showing 2 different hazards

- **Providing information to NG ISS**
 - fusion with on-board weather data,
 - consolidation,
 - prioritisation,
 - **DAM**
- ◆ **Display & Audio Management**



Airborne Traffic, usage of Data Link

- **Traffic Surveillance (ADS-B, TIS-B)**
 - e.g. Aircraft ID
 - Location
 - (intent)
 - etc.
- **Flight Information Services (FIS-B)**
 - NOTAM
 - METAR
 - ...
- **Controller–Pilot Data Link Communications (CPDLC)**
 - e.g. routine clearances, ASAS Instructions, traffic identification...
 - data link or voice radio
- **Company data communications to-from the Airline Operations Centre (AOC)**
 - general communications
 - ◆ progress reporting, ... (not Traffic specific)



Airport Surface Movement Traffic, usage of Data Link

- **Traffic surveillance - ADS-B, TIS-B**
 - e.g. Aircraft ID, location, surface vehicle location...

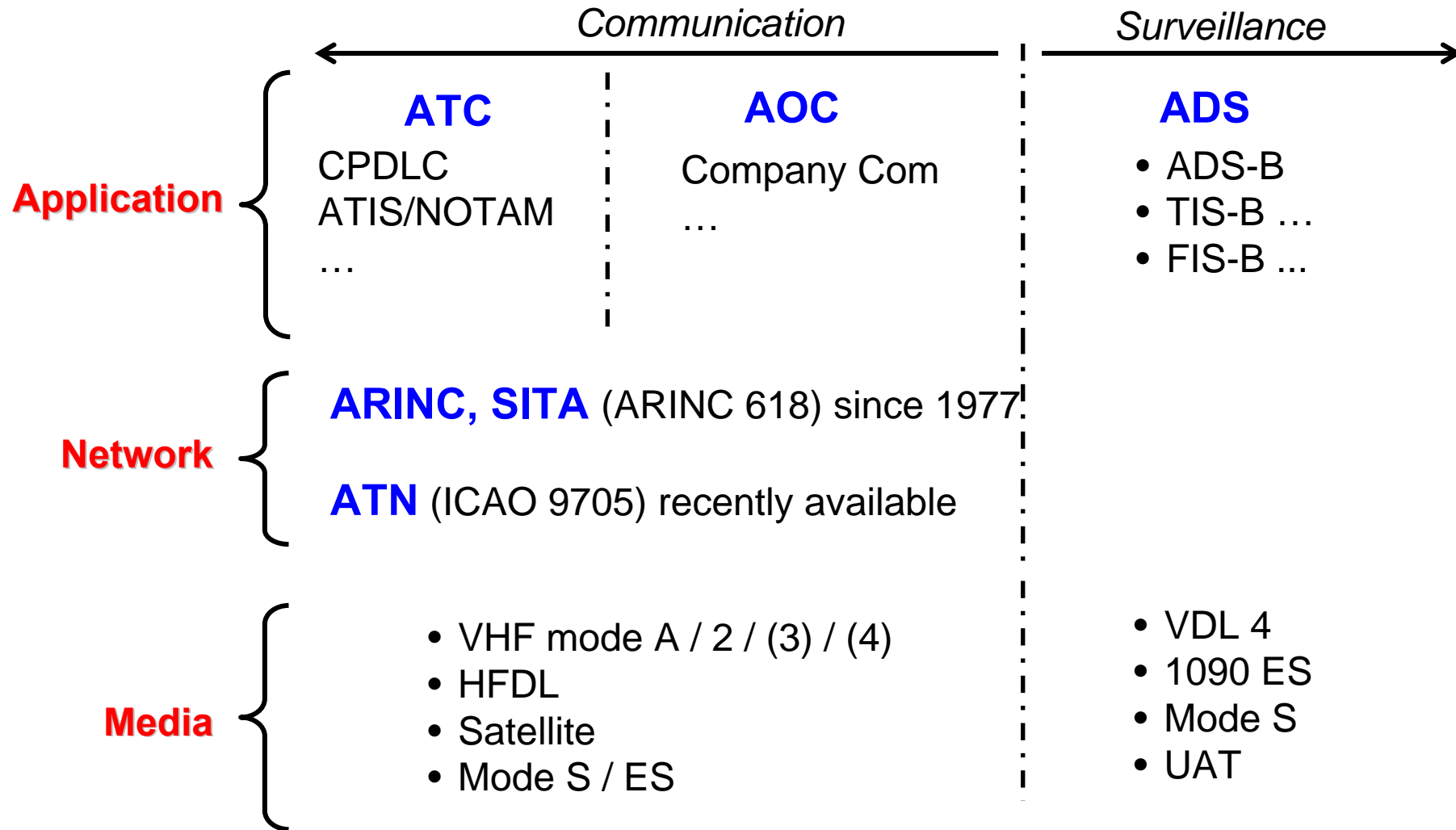
- **Flight Information Services (FIS-B)**
 - e.g. NOTAM, airport Met conditions...

- **CPDLC (or voice radio)**
 - Cleared taxi route, initial flight plan clearance, movement instructions...

- **AOC updates**
 - nothing specific to Traffic



Current aeronautical Communication technologies





Current Data Link Technology

	HF	AMSS (SatCom)	VDL A	VDL 2	VDL 3 Voice/Data	VDL 4	Mode S 1090ES	UAT
Pt to Point	😊	😊	😊	😊	😊	😊	Mode S 😊	
Broadcast						😊	1090ES 😊	😊
Network	ACARS ATN	ACARS ATN	ACARS	ACARS ATN		ATN		
Frequency	3 to 30 MHz	L band	118 – 136.975 MHz	118 - 136.975 MHz	118 - 136.975 MHz	118 - 136.975 MHz	1090 MHz	960 - 1215 MHz
Bit rate (at Radio level)	1.8 kb/s	4.8 kb/s	2.4 kb/s	31.5 kb/s	31.5 kb/s	19 kb/s	1 Mb/s	1 Mb/s
Standards	ARINC 753	ARINC 741 DO 270	ARINC 750	ICAO ED 92 ARINC631	ICAO ARINC 750	ICAO ED 108A ETSI	ICAO DO 260 ARINC 718A	ICAO DO 282
Deployment	Significant	Significant	Significant	Growing	Stopped	Regional	Growing	Regional



Foreseen Data Link Technology

EUROCONTROL Candidate technologies

(presented to the ICAO Aeronautical Communication Panel (ACP) Working Group C Future Air-Ground Data Links in March 2006)

Evolution of existing aeronautical systems or concepts	xDL4, xDL3 E-TDMA
New terrestrial systems	B-VHF <i>128 kb/s</i>, 3G systems, P34
Satellite systems	SwiftBroadband (AeroBGAN) <i>432Kbps</i> New Satellite System(s)
Airport / Surface systems	IEEE 802 WLAN derivatives (-11, -16 and -20; Airport Data Link)

- xDL4 adaptation of VDL4 to upper VOR band or lower DME band
- xDL3 adaptation of VDL3 to lower DME band
- E-TDMA new concept with deterministic slot assignment scheme...(DME lower band) (DSNA)
- B-VHF (broadband VHF) : EU project started on 2004
- 3G 3GSM, 3rd generation of GSM; mobile broadband 384 kb/s
- P34 Project 34 of Electronic/Telecommunications Industries Association



Data Link Technology Issues for FLYSAFE Weather objectives

- **Determine a list of FLYSAFE weather products as produced by WIMS**
- **Identify the WIMS data requirements and constraints**
 - type, size, refresh rate, scale...
- **Take into account recommendations**
 - Eurocontrol, ICAO WG-C, AGC-FG (Air Ground Communications-Focus Group) ...
- **Follow current programs**
 - Link2000+, CASCADE, ANASTASIA, SESAR ...
- **Evaluate promising Data Link technologies**
 - according to the WIMS data constraints
- **Identify weather data link characteristics**
- **Specify an Airborne weather data link management system**



Data Link Technology Issues for FLYSAFE Traffic Objectives

- **Surveillance data quality**
 - **ADS-B and other data link based surveillance is becoming accepted**
 - ◆ **situation awareness and spacing**
 - **But is it (will it be) of sufficient 'quality' to support sole means of separation?**
 - ◆ **Note: this issue is beyond the remit of FLYSAFE, but we are interested in establishing data link limitations that could impact future system development**
- **System integration**
 - **FLYSAFE envisages a significant increase in the degree of integration**
 - ◆ **within the aircraft equipment architecture**
 - ◆ **including interfaces between CMU (comms) and NG-ISS, possibly also the FMS**
 - ◆ **Is this acceptable? If so, where is the limit of integration?**
- **Data-link message sets**
 - **advanced functions e.g. ASAS require an extended CPDLC message set + enhanced message content (e.g. A/C ID)**
 - **are limitations / delays foreseen in agreeing and implementing?**



Summary - Data Link Technology Issues for FLYSAFE

- **Critical issue for the successful exploitation of the FLYSAFE results**
 - The choice of the data links
 - and the implementation of newly designed services on them
- **FLYSAFE cannot fully resolve this issue**
 - requires the contribution of many stakeholders
 - coordination and standardisation at a global level
- **However, the project will help to solve it at best, by:**
 - defining the new services
 - defining the requirements on data links
 - reviewing the data links characteristics
 - ◆ and matching them with the requirements
 - designing solutions
 - ◆ both on-ground (WIMS and processor)
 - ◆ and airborne (NG ISS)
 - ◆ flexible enough to be adapted to the future choices made