

Communication Domain

ATN Conference

21st September 2005

Future Communication Infrastructure

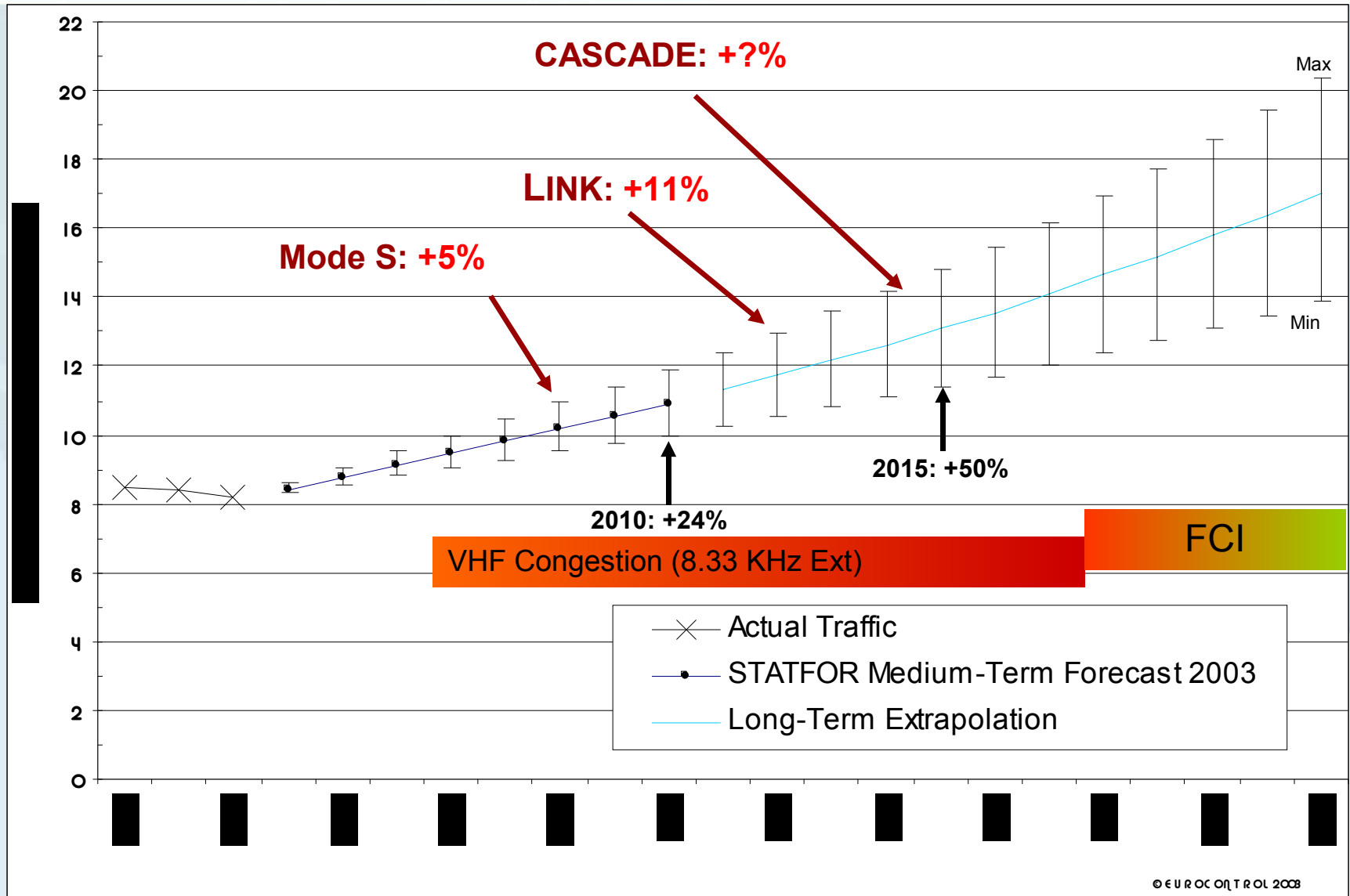
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EUROCONTROL



STRATEGY / ROADMAP



Expected Capabilities of the Future Aeronautical Communications: A Vision

- ☑ support the future ATM communications requirements, in all phases of flight and in all airspaces;
- ☑ employ technology transparently to the user;
- ☑ enable smooth transition and provide support for legacy systems (backward compatible);
- ☑ be implementable (time and space) in a phased manner;
- ☑ maximise synergies (general telecoms, military) and maximise reuse of available technology;
- ☑ if required, use different technologies for different phases of flight and/or applications;

Why EUROCONTROL considers Satellite Communications

A likely scenario

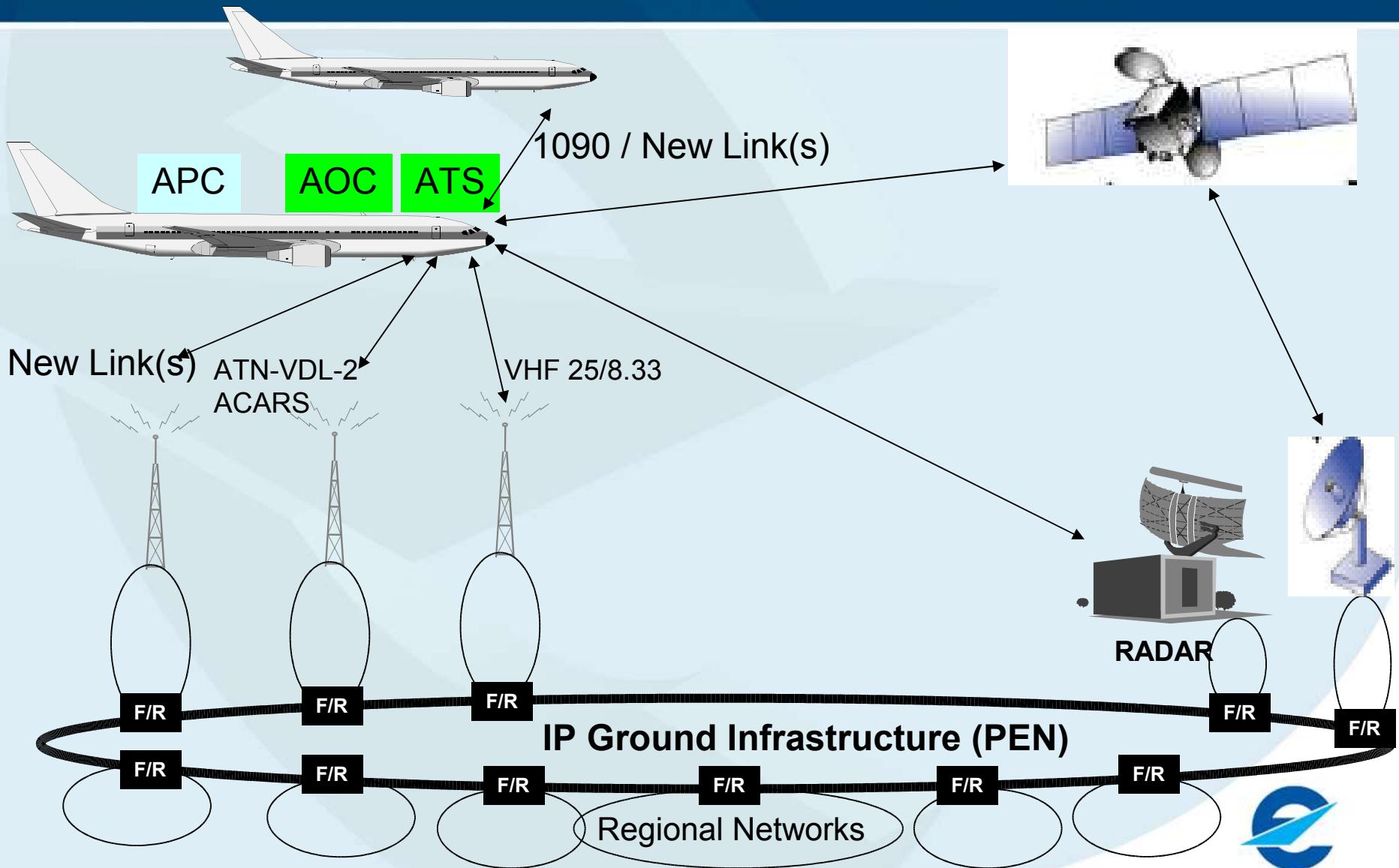
for the future aircraft communications architecture

includes terrestrial and satellite links

in order to meet the required QoS

such as performance coverage, availability, priority etc.

Future Aeronautical Communications



AGCFG/1: Definitions

- **Future Communication Infrastructure, (FCI):** The totality of the communications equipment required to support the end to end communications requirements of ATM in the 2020+ timeframe. The FCI includes the avionics systems, a/g data and voice links and the essential elements of the ground infrastructure.
- **Future:** The term “future” in this context is used to denote the time period post 2020.
- **FCS:** The acronym FCS will be reserved to refer to the Future Communications Study within the framework of AP17 of the EUROCONTROL/FAA MoC.

FAA/Eurocontrol Joint Study

CCOM FAA/EUROCONTROL Co-ordination Committee



- FAA/Eurocontrol 3 year joint study*
- Objectives:

QinetiQ

- Identification of requirements and operating concepts
- Investigation into new mobile communication technologies
- Investigation of a flexible avionics architecture
 - Development of a Future Communications Roadmap
- Creation of industry buy-in
- Improvements to maximise utilisation of current spectrum

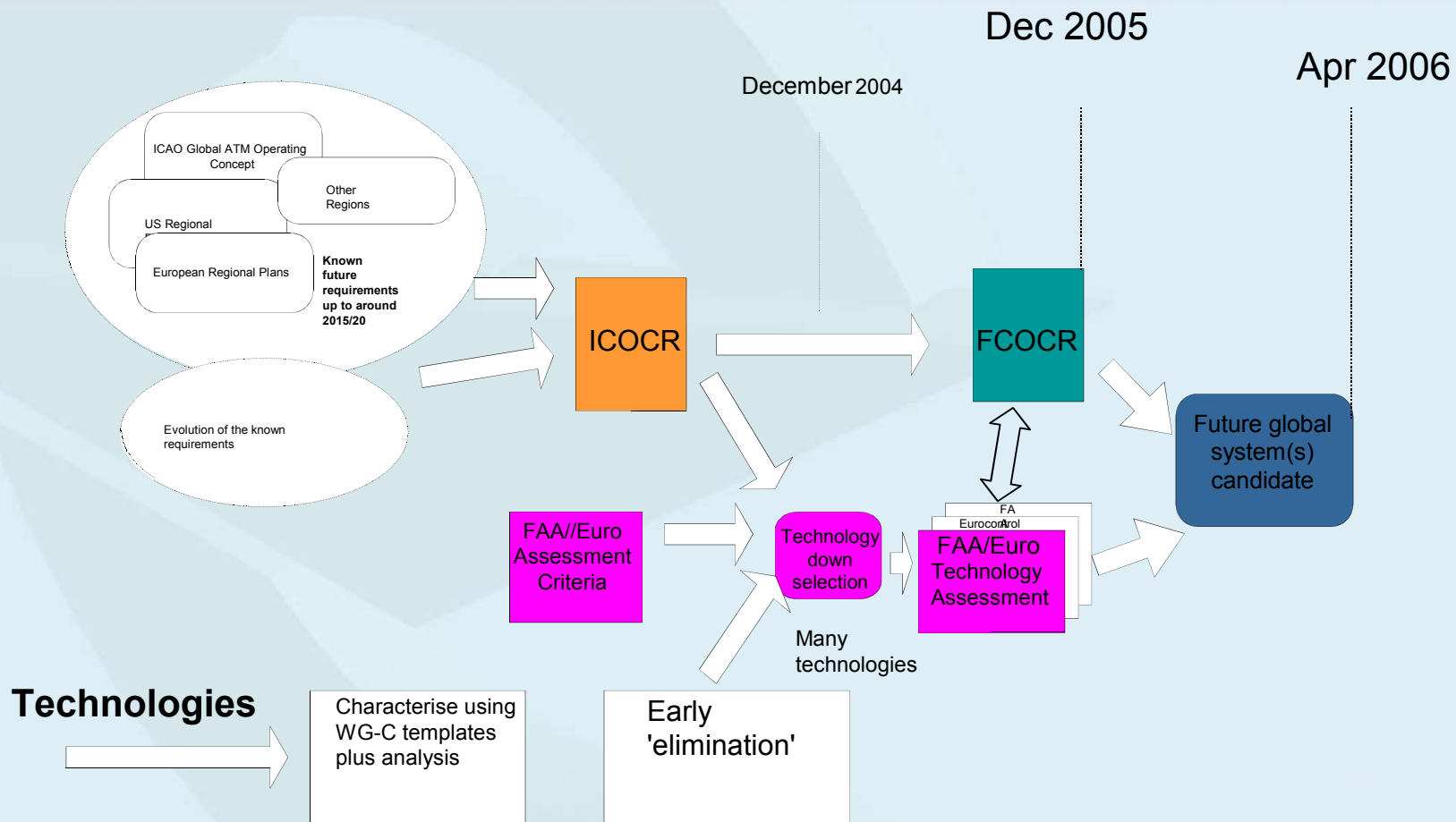


* Federal Aviation Administration/EUROCONTROL, Cooperative Research and Development Action Plan 17:
Future Communications Study (AP 17-04)

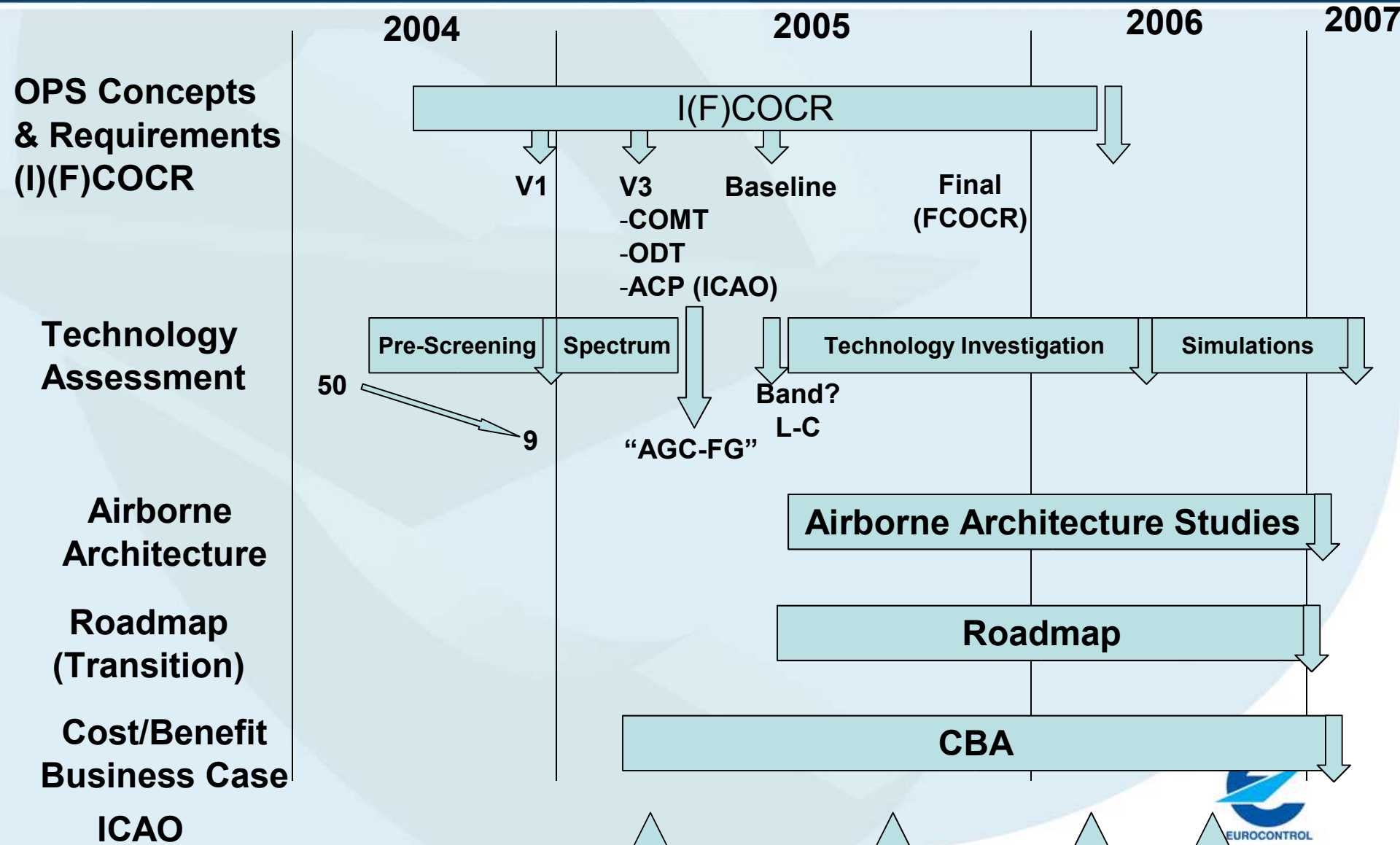


- **Technical Theme 1:** Improvements to Current Systems.
 - Frequency Management of Current System
- **Technical Theme 2:** Identify the Mobile Communication operating concept
 - ICOCR, FCOCR
- **Technical Theme 3:** Investigate new technologies for mobile communication
 - Technology pre-screening
 - Technology evaluation
 - Technology simulation
- **Technical Theme 4:** Identify the communication roadmap
- **Technical Theme 5:** Investigate feasibility of airborne communication flexible architecture
- **Technical Theme 6:** Identify the Spectrum bands for new system
- **Business Theme 1:** Create Multi National Framework (ICAO)
- **Business Theme 2:** Create Industry interest (Industry Interest)
- **Business Theme 3:** Business Model

Role of Requirements AP/17



Study Schedule



AP17: Current Status

- Concept and Requirements
 - Initial Draft completed (ICOOCR)
 - Next steps: Final version (FCOOCR) to be ready early 2006
- Technology Pre-screening
 - Develop methodology and criteria – Application with an initial set of assumption (one system for both voice and data, for 2015)
 - Next Steps: Review of methodology and criteria and reconsideration of assumptions

FCOCR - Operational Concept Evolution

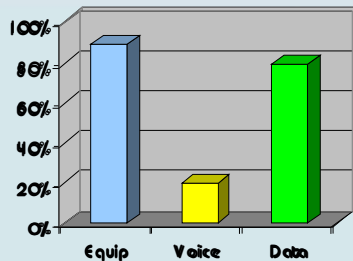
- For 2015, services are based on a mixture of voice; data services
 - Voice still primary, data link (CPDLC) supplemental with voice backup
 - En-Route : 60% data / 40% voice
- 2020 : Paradigm shift in ATM Operational Concept
 - Increasing traffic requires new ATM concepts to be introduced requiring enhanced data link performance; e.g. COTRAC
- For 2030, autonomous ops are the norm in designated airspace – based on 4-D Trajectory negotiations.
 - Traffic is 2.5 to 3x today; including “micro-jets” & UAV’s
 - Data is primary, new services are supported by automation tools & backup cannot be done via voice
 - En-Route : 95% data / 5% voice



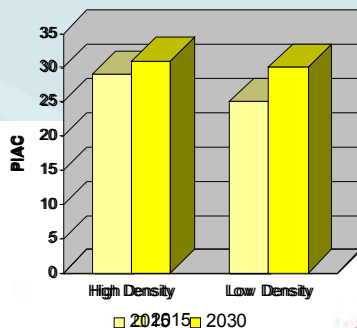
FCOCR : ATC/AOC Services by Domain

En Route/Oceanic/Polar

En Route
2038



PIAC: En Route

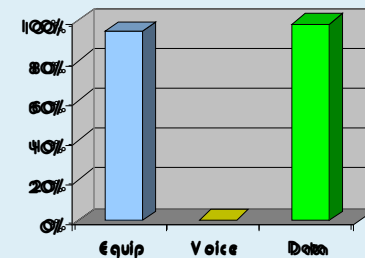


- ACM
 - FLIPCY
 - FLIPINT
 - ACL
 - PPD
 - GRECO
 - DSC
 - D-SIGMET
 - ADS-B
 - ADS-B / ITP
 - ARMAND
 - D-ORIS
 - SAP
 - ADS-B / S&M
- NOTAMS
 - Free Text
 - Weather Request
 - Position Report
 - Flight Status
 - Fuel Status
 - Flight Plan Request
 - Engine Performance Rpt
 - Maintenance Troubleshooting
 - Real Time Maintenance
 - Graphical Weather
 - Real Time Weather
 - Online Technical Troubleshooting
- COTRAC
 - DYNAV
- ADS-B / C&M

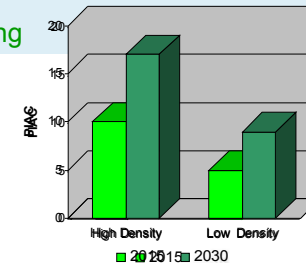
Blue = ATS Services
Green = AOC Services

Red = Service Available After 2015

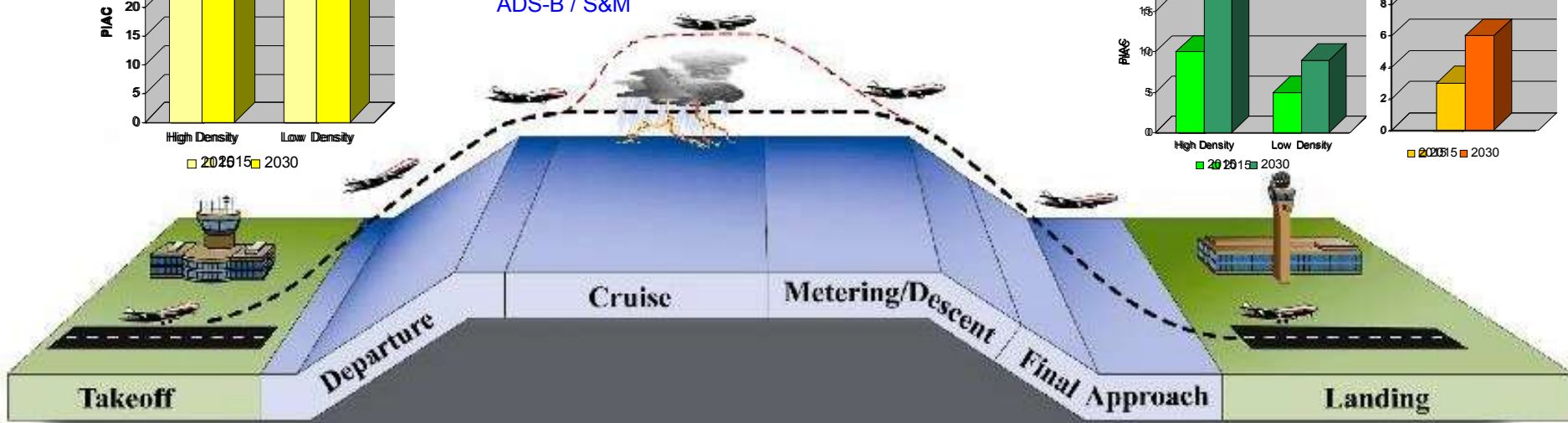
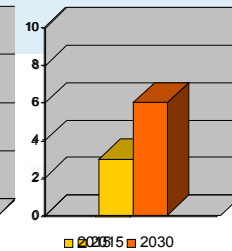
Oceanic/Polar
2038



PIAC: Oceanic



PIAC: Polar



Also Available: D-ALERT AMC URCO

FCOCR – Performance, Security Reqs

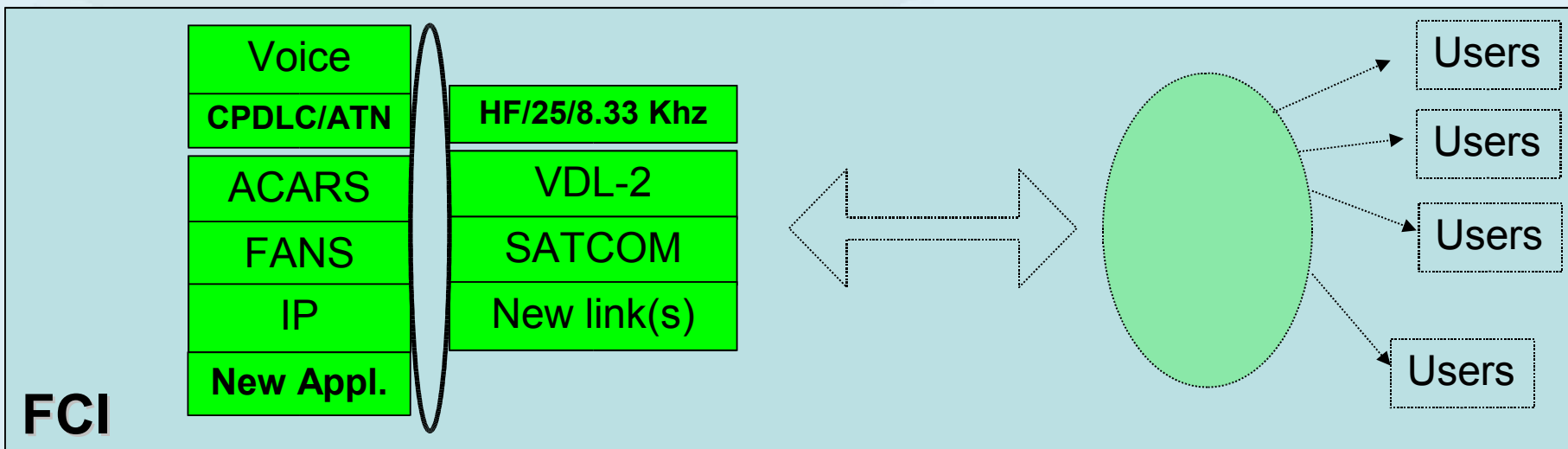
- Performance/QOS Future System determined by
 - Operational concepts of ATC services
 - Results High level Safety Analysis
 - Instances of individual ATC services per airspace type
 - Projected Traffic Density for typical airspace volumes
 - Requirements from AOC services
 - Use of queuing model
 - ➔ Bytes/sec per A/C and Bytes/sec per nominal airspace type
- Security
 - Quantify the reqs for Confidentiality, Integrity, Availability wrt Safety, Flight Regularity, and Protection of proprietary information
 - Risk Assessment required with definition of countermeasures
 - What needs to be protected in the A/G chain, and how

FCOCR Document

- Version 0.2 available - distributed to ICAO ACP/WGW, COMT
- Available at ICAO Website
 - <http://www.icao.int/anb/Panels/ACP/WG/W/WGW01/ACP-WGW01-WP0>

Future Communication Infrastructure Flexible Airborne Architecture

- FCI is an amalgam of several systems, including the legacy systems that will still be operational in the future and new components (terrestrial and likely satellite), operating in a transparent way to the user.



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