ICAO BANGKOK UNITING AVIATION

CRV development

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APAC Regional Office

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CRV development

- What?
- Why?
- How?
- Overview of the tender package

WHAT IS CRV?

What is CRV?

- a task force
  - created end 2013 under decision 24/32 of APANPIRG
- a programme
  - conducted by the Task Force,
  - programme management principles
  - risk management.
- an aeronautical service, part of Aeronautical Fixed Services (AFS)
  - will expectedly become a safe and secured IP-based transportation service offered to CRV users from 2017 onwards through a common contractual framework
- a common contractual framework
  - will be established in 2016 if the ongoing Sealed Tender process successfully selects a best and final offer.
  - CRV Users are expected to establish individual contracts based on the common provisions.
  - The ongoing Sealed Tender process makes it possible for all MID States, and more users, to join the initiative

What is CRV?

- Initially an aeronautical network by Asia-Pacific ICAO Members: CRV, the “Common Regional Virtual private network”
- A wholly dependable and reliable communications infrastructure for aeronautical communications enabling the GANP roadmap
- “Common aeRonautical Virtual private network”?

WHY CRV?

ANC/12 Recommendation

Recommendation 1/6 – Data communications issues

That ICAO:

a) organize a multidisciplinary review of air traffic control **communication requirements and issues**; and

b) review the **operation, management and modernization of a regional digital network technical cooperation project and other similar regional experiences with the aim that this efficient practice can be adapted for use in other ICAO regions**;

That States:

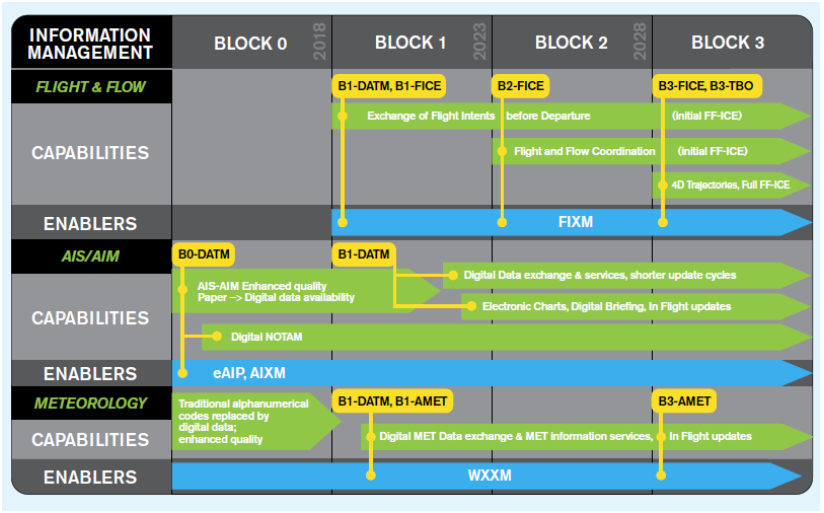
c) explore multi-modal solutions when appropriate to **overcome transition issues**; and

d) anticipate and accelerate the migration of **air traffic management communication systems towards more efficient technologies** to timely service the aviation system block upgrade modules.

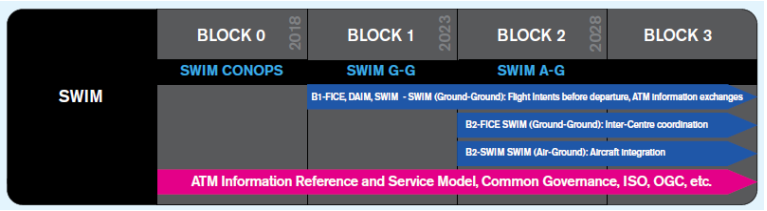
ATM Operational Concept

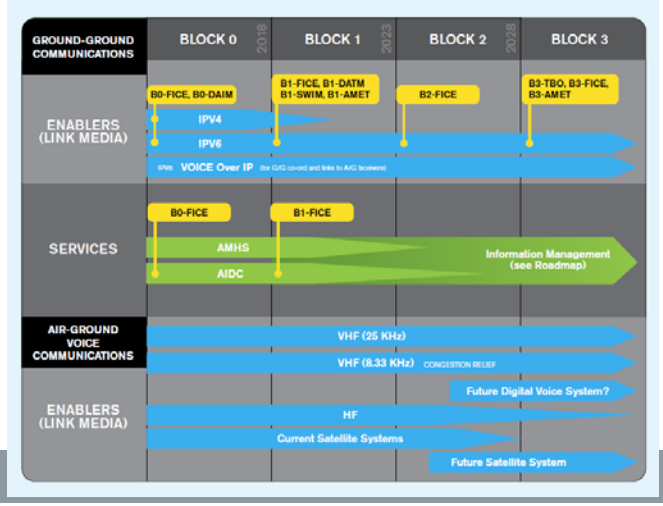
- Doc 9854 Global Air Traffic Management Operational Concept
- ***Media***
- 2.9.16 Information will use a variety of channels on the ground (and space-based segments). The best information routing will be selected for use on the basis of quality of service and economic criteria, possibly in real time.

GANP


INFORMATION MANAGEMENT
BLOCK 0
2018
BLOCK 1
2023
BLOCK 2
2028
BLOCK 3
FLIGHT & FLOW
B1-DATM, B1-FICE
B2-FICE
B3-FICE, B3-TBO
CAPABILITIES
Exchange of Flight Intents
before Departure
(initial FF-ICE)
Flight and Flow Coordination
(initial FF-ICE)
4D Trajectories, Full FF-ICE
ENABLERS
FIXM
AIS/AIM
B0-DATM
B1-DATM
AIS-AIM Enhanced quality
Paper –> Digital data availability
Digital Data exchange & services, shorter update cycles
Electronic Charts, Digital Briefing, In Flight updates
CAPABILITIES
Digital NOTAM
ENABLERS
eAIP, AIXM
METEOROLOGY
Traditional alphanumerical codes replaced by digital data; enhanced quality
B1-DATM, B1-AMET
B3-AMET
CAPABILITIES
Digital MET Data exchange & MET information services
In Flight updates
ENABLERS
WXXM

C.R.V.


SWIM
BLOCK 0
2018
BLOCK 1
2023
BLOCK 2
2028
BLOCK 3
SWIM CONOPS
SWIM G-G
SWIM A-G
B1-FICE, DAIM, SWIM - SWIM (Ground-Ground): Flight Intents before departure, ATM Information exchanges
B2-FICE SWIM (Ground-Ground): Inter-Centre coordination
B2-SWIM SWIM (Air-Ground): Aircraft integration
ATM Information Reference and Service Model, Common Governance, ISO, OGC, etc.


GROUND-GROUND COMMUNICATIONS
BLOCK 0
2018
BLOCK 1
2023
BLOCK 2
2028
BLOCK 3
ENABLERS (LINK MEDIA)
B0-FICE, B0-DAIM
B1-FICE, B1-DATM
B1-SWIM, B1-AMET
B2-FICE
B3-TBO, B3-FICE,
B3-AMET
IPV4
IPV6
VOICE Over IP
SERVICES
B0-FICE
B1-FICE
AMHS
AIDC
Information Management
(see Roadmap)
AIR-GROUND VOICE COMMUNICATIONS
VHF (25 KHz)
VHF (8.33 KHz)
ENABLERS (LINK MEDIA)
Future Digital Voice System?
HF
Current Satellite Systems
Future Satellite System

IPv4 / IPv6 interregional connectivity

Voice over IP

Directory / Security Services

B1-SWIM Performance Improvement through the Application of SWIM

B1-NOPS Enhanced Flow Performance through Network Operational Planning

B2-NOPS Increased User Involvement in the Dynamic Utilization of the Network

B2-SWIM Enabling Airborne Participation in Collaborative ATM through SWIM

B3-TBO Full 4D Trajectory-based Operations

B3-AMET Enhanced Operational Decisions through Integrated Meteorological Information (Near-term and Immediate Service)

Enables

Facilitates

B0-NOPS Improved Flow Performance through Planning based on a Network-wide view

B0-ASUR Initial Capability for Ground Surveillance

B0-FICE Increased Interoperability, Efficiency and Capacity through Ground-Ground Integration

B1-RATS Remotely Operated Aerodrome Control

B1-FICE Increased Interoperability, Efficiency and Capacity through FF-ICE/1 application before Departure

B1-AMET Enhanced Operational Decisions through Integrated Meteorological Information (Planning and Near-term Service)

B2-FICE Improved Coordination through Multi-centre Ground-Ground Integration (FF ICE, Step 1 and Flight Object, SWIM)

B3-FICE Improved Operational Performance through the Introduction of Full FF-ICE

B3-NOPS Traffic Complexity Management

Issues addressed

- Reduce telecommunication costs in most cases (to be confirmed by local CBA)
- Enable integration in the aeronautical infrastructure and enhanced services (GANP, regional objectives)
- Enhance information security
- Provide a standardized interface for AFS (instead of multiple protocols, some of which are obsolescent)
- Rationalize coordination for network management and enhancement
- Respond to Air Traffic requirements in a timely and standardized manner

Elsewhere

- European region has implemented the Pan-European Network Service (PENS)
- North American region has FAA Telecommunication Infrastructure (FTI) to support Canada and USA to distribute AFS data
- South America has REDDIG and Caribbean has MEVA

HOW?

How?

- Process
- Decisions made
- Funding stage 1
- Funding stage 2
- Project management
- Tasks for individual states/administrations
  - Local CBA
  - Local safety case
  - Local implementation plan

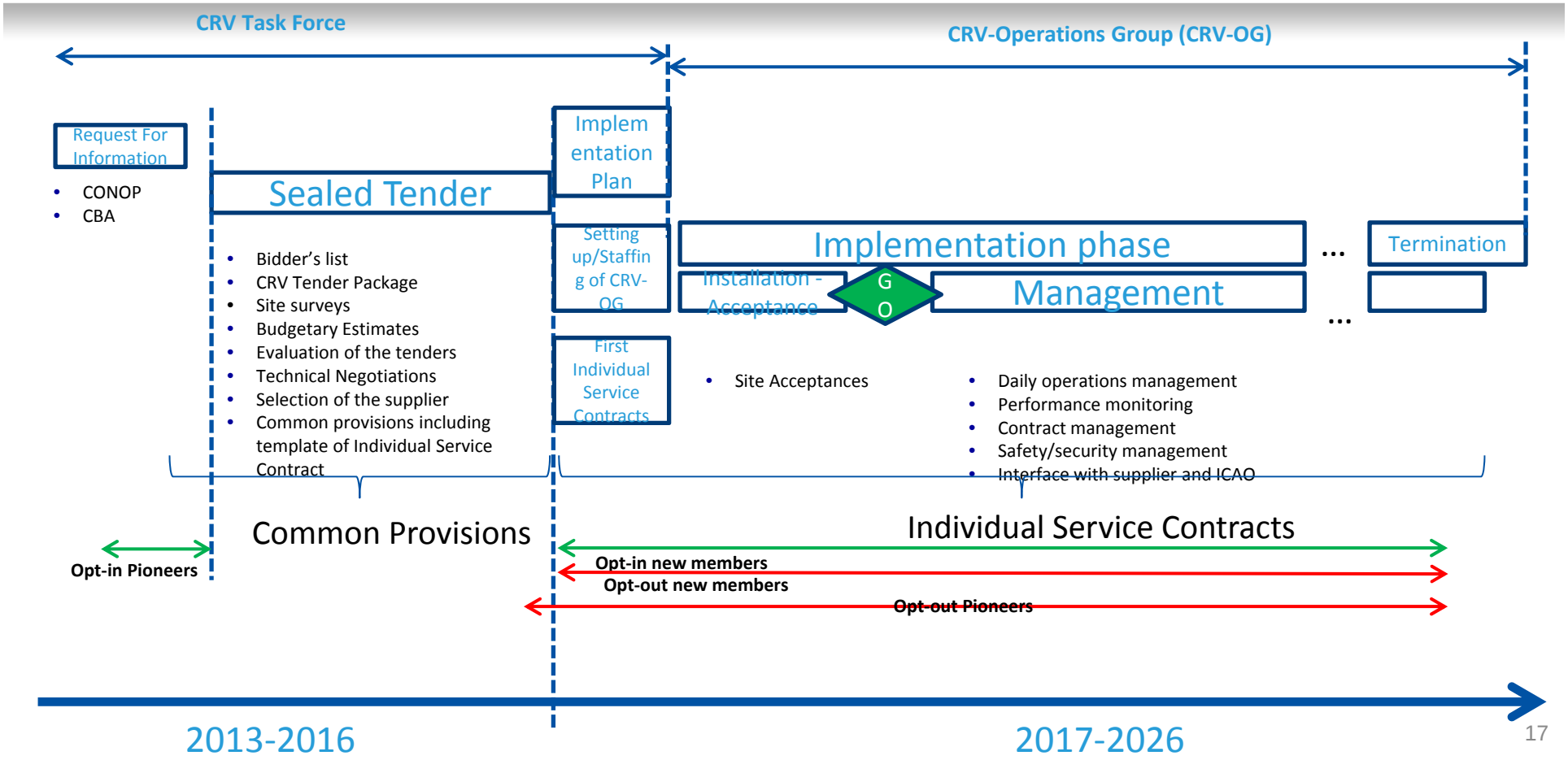
Process

HOW?

Process

- Stage 1: preparation
  - definition of requirements
  - issuance of procurement
  - awarding of the contract
  - preparation of operations (plan, operational group, individual service contracts)
- Stage 2: operations

Process


CRV Task Force
CRV-Operations Group (CRV-OG)
Request For Information
• CONOP
• CBA
Sealed Tender
Implementation Plan
Setting up/Staffing of CRV-OG
First Individual Service Contracts
• Bidder's list
• CRV Tender Package
• Site surveys
• Budgetary Estimates
• Evaluation of the tenders
• Technical Negotiations
• Selection of the supplier
• Common provisions including template of Individual Service Contract
Implementation phase
Installation - Acceptance
GO
Management
Termination
• Site Acceptances
• Daily operations management
• Performance monitoring
• Contract management
• Safety/security management
• Interface with supplier and ICAO
Common Provisions
Individual Service Contracts
Opt-in Pioneers
Opt-in new members
Opt-out new members
Opt-out Pioneers
2013-2016
2017-2026

Decisions at a glance

- **June 2013**: creation of the CRV Task Force by Decision of CNS SG 24/32 - Common Regional Virtual Private Network (VPN) Task Force, endorsed by APANPIRG 24
- **August 2013 – January 2014**: Request for Information (market survey) conducted in APAC
- **September 2014**: decision to collectively fund the assistance to procurement through Conclusion APANPIRG 25/34
- **August 2015**: Issuance of the Tender Package on ICAO eProcurement platform
- **September 2015**: Adoption of the
  - Cost Benefit Analysis for CRV - Conclusion APANPIRG 26/30
  - Preliminary Safety Analysis - Conclusion APANPIRG 26/31
  - Cost Arrangement Framework - Conclusion APANPIRG 26/32
- **September 2015**: Fourth Inter-Regional Co-ordination Meeting (IRCM/4) on Interface Issues between the Asia/Pacific (APAC), European and North Atlantic (EUR/NAT) and Middle East (MID) Regional Offices
  - APAC to present a paper to the MID Region on the concept and benefits of a regional IP network and CRV procurement for the MID Region
  - Interregional connectivity between PENS (Europe) and CRV - implementation target date end 2017
- **October 2015**: MID IP Network Project to use the procurement framework of the APAC Common Regional Virtual Private Network Programme - MAEP Draft Conclusion 2/3

Funding

HOW?

Funding stage 1

- **Conclusion APANPIRG 25/34:** Intention to join as a Pioneer State/Organization had to be notified to ICAO before end 2014 – the list of potential Pioneers was closed end 2014
- Pioneer States/Organizations shared the cost of conducting the Sealed Tender process on a cost-recovery basis
  - ICAO TCB services = one part-time expert in Aeronautical communications and procurement
  - Estimate of the total cost was USD109,300
  - Equal share between States/Organizations
- 17 Pioneer States have joined by paying their contribution

Funding stage 1

- Actively choose to integrate into the network:
  - Contribute to the roadmap and user requirements of the CRV network
  - Participate in the tender criteria, negotiations and selection of the winner
  - Bring expertise and experience
- Commits to fund the Procurement Process with other Pioneer States by signing MSA
- Pay a part of the costs incurred in the tender (to pay experts Technical Cooperation Bureau of ICAO, on a cost recovery basis)

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Funds received		
169,844.00	USD	
Assistance to procurement:	159,844.00	USD
CRV Expertise:	10,000.00	USD

Funding stage 1: 17 Pioneers

Updated on:	Intention		Signing		Payment	
05 Jan. 16	Intends to sign MSA (Conclusion 25/34)	Intends to sign MSA (letter to ICAO RO)	Entity	Date of signing	Date of Payment reception	Amount
Australia	1		Airservices Australia	25-Nov-14	16-Jan-15	$9,975.00
China		1	ATMB	11-Dec-14	26-Jan-15	$9,979.00
Hong Kong, China	1		Civil Aviation Department Hong Kong	25-Nov-14	29-Jan-15	$10,000.00
Macao, China	1		ADA - Administration of Airports Limited		8-Jan-15	$10,000.00
Democratic People's Republic of Korea		1	General Administration of Civil Aviation	11-Dec-14	18-Mar-15	$9,960.00
Fiji	1		Airports Fiji Limited	8-Dec-14	28-Jan-15	$10,000.00
France	1		DSNA	12-Nov-14	22-Jan-15	$9,970.00
India	1		Airports Authority of India	3-Dec-14	28-Jan-15	$10,000.00
Japan	1		Civil Aviation Bureau, MLIT	25-Nov-14	23-Jan-15	$10,000.00
Myanmar		1	DCA	25-Nov-14	16-Jan-15	$10,000.00
New Zealand	1		Airways corporation of New Zealand	21-Nov-14	23-Jan-15	$10,000.00
Philippines	1		CAAP	25-Nov-14	11-Feb-15	$9,980.00
Republic of Korea		1	Ministry of Land, Infrastructure and transport Affairs	5-Dec-14	2-Jan-15	$10,000.00
Singapore	1		Civil Aviation Authority of Singapore	25-Nov-14	3-Feb-15	$10,000.00
Sri Lanka			Airport & Aviation Services (Sri Lanka) Ltd.	30-Dec-14	10-Feb-15	$10,000.00
Thailand	1		Department of Civil Aviation	29-Dec-14	22-Jan-15	$9,980.00
United States	1		FAA, Office of International Affairs	27-Oct-15	4-Nov-15	$10,000.00

Funding stage 2: implementation

- All States/Administrations (APAC, MID) encouraged to join
- States/Administrations will have to join CRV-OG before signing an Individual Service Contract with the selected supplier
  - A single basis (common provisions) for all ANSP, with selectable services/class of services/options, based on requirements, and associated prices
  - Only existing contracts: signed between each individual State/Administration and supplier
  - No contract between CRV-OG and the supplier
  - No contract between ICAO and the supplier (general case)
- The supplier could be a single provider combination of Telecom. Service Providers
- No cost to pay with a local/national service provider, this is a END TO END service

Funding stage 2: Cost Arrangement Framework

Conclusion APANPIRG/26/32 – CRV Cost Arrangement Framework

That, noting that cost arrangements on current telecommunications exist between some States/Administrations and considering the result of the second iteration of the CRV Cost Benefit Analysis, APAC States/Administrations be advised to:

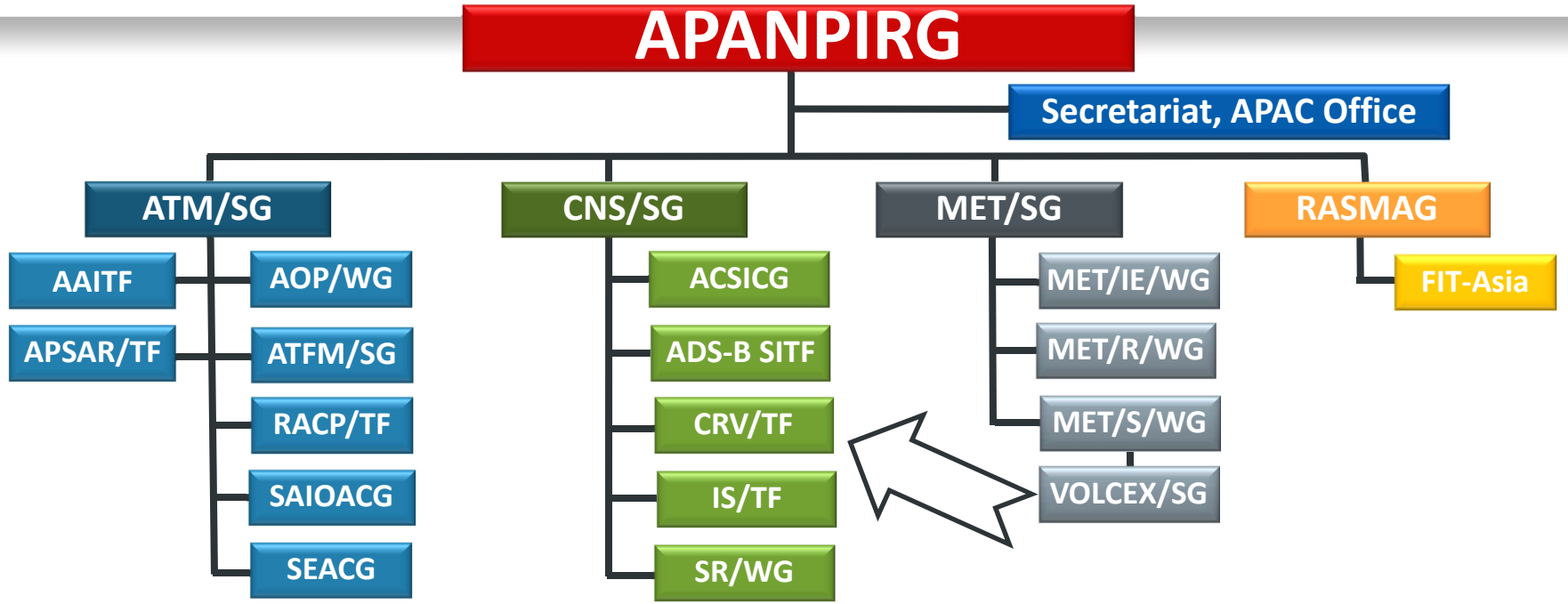
- make their own local Cost benefit analysis as needed;
- start discussions of possible new or improved cost arrangement frameworks with other ICAO Member State(s)/Administration(s), based on the Request For Information results; and
- endeavor to establish arrangements for mid 2016.

Project management

HOW?

Project management

- Meetings
  - Task Force meetings - *2/year*
    - Reports to CNS SG through ACSICG
  - Progress meetings (progress, issues, actions, risks) - *4/year*
  - Task meetings - *as needed*
    - *RFI*
    - *User Requirements*
    - *Preliminary Safety assessment*
    - *etc*
- Face to Face and Webconferences
- Secured portal



ATM/SG	- ATM Sub Group
AAITF	- AIS - AIM Implementation Task Force
APSAR/TF	- APAC Search and Rescue Task Force
AOP/WG	- Aerodrome Operations and Planning Working Group
ATFM/SG	- ATFM Steering Group
RACP/TF	- Regional ATM Contingency Plan Task Force
SAIOACG	- South Asia Indian Ocean ATM Coordination

CNS/SG	- CNS Sub Group
ACSICG	- Aeronautical Communication Services Implementation Coordination Group
ADS-B SITF	- ADS - B Study and Implementation Task Force
CRV/TF	- Common Regional Virtual Private Network (VPN) Task Force
IS/TF	- Ionospheric Studies Task Force

MET/SG	- Meteorology Sub Group
MET/IE/WG	- Meteorological Information Exchange Working Group
MET/R/WG	- Meteorological Requirements Working Group
MET/S/WG	- Meteorological Services Working Group
RASMAG	- Regional Airspace Safety Monitoring Advisory Group
FIT-ASIA	- FANS Implementation Team - Asia

Project management

- Benchmarking: the CRV TF first meeting benchmarked PENS and MEVA best practices, and coordination is being maintained with those programmes
- Risk management: management of top risks for the CRV programme, including enforcement of mitigation measures
- Establishment and maintenance of a detailed planning with all dependencies identified
- System Engineering: common technical provisions, including performance specifications, have been established following System Engineering methodology. A concept of operations and user requirements were defined.
- A cost benefit analysis with 2 iterations was done, including a Request For Information (market survey) to have the best possible picture of costs and benefits and support decision-making

Work Breakdown Structure

55 tasks

- CONOP
- MSA/Agreements
- CBA
- RFI
- RFP
  - Make Safety Preliminary analysis
  - Make user Requirements
- TCB Process
- Implementation Plan
- Start Individual Service Contracts

Concept of operations (CONOPS)

HOW?

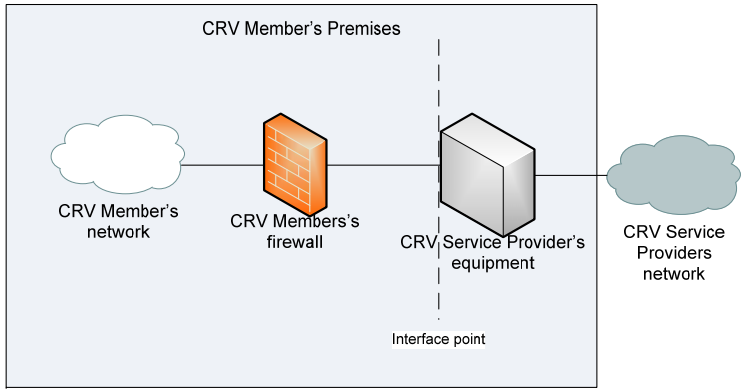
Services carried by CRV

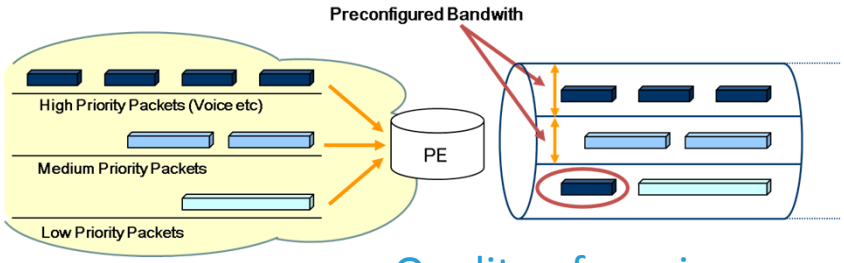
- "The objective of the CRV is to offer a safe, secure, robust and cost effective telecommunications transport service to all Members, and to offer the possibility to all Candidates to contract to that service"
- Ground-ground voice ATM communications, referred to as voice communications
- Air-ground Data Link communications (in case we have one day ATN routers in common), referred to as Data Link communications
- Ground-ground ATS surveillance data, referred to as surveillance data
- Ground-ground AIDC data, referred to as AIDC data
- Ground-ground AIM data, referred to as AIM data
- Ground-ground ATFM data, referred to as ATFM data
- Ground-ground SWIM data, referred to as ATFM data
- Miscellaneous data: other data not pertaining to the categories above, or carried for TEST purpose only
- Any other category as agreed later

CONOPS

- IP version 4 and version 6 address space will be proposed by the CRV Service Provider and agreed with the CRV Coordinator during the procurement process.
- It is anticipated that Members will need to use Network Address Translation (NAT) due to the various IP addressing schemes used by the Members.
- The OG Coordinator will manage the Regional IP address plan after the contract is awarded.

Security





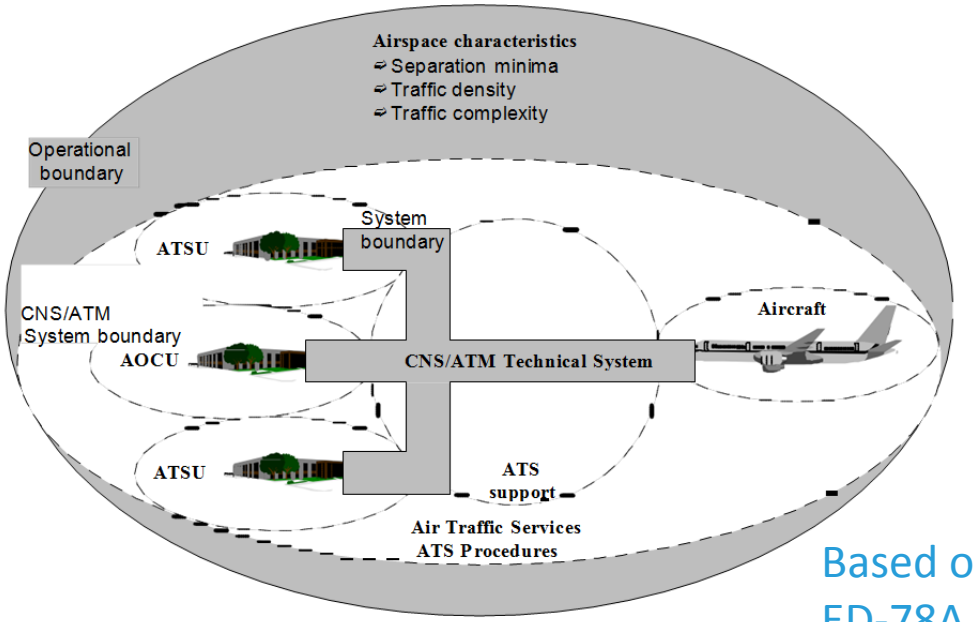
Quality of service

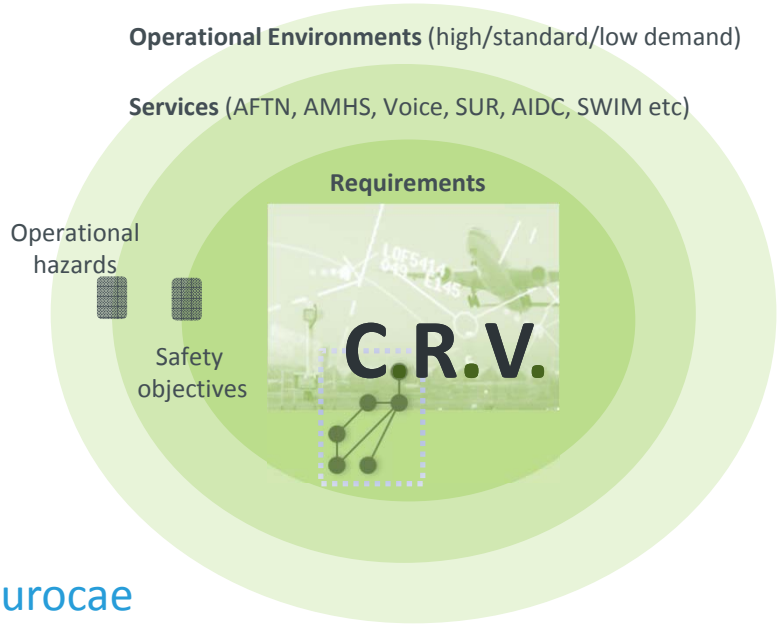
- each user of the network will take responsibility for their own IT security.
- network will support this security by being a closed private network, without access to the public Internet.
- Each Member can (and should) establish IT security protections so that they comply with their organization's security policies.
- At their discretion, some Members may also establish bi-lateral VPN overlays over the CRV to provide an additional layer of protection

Safety case

HOW?

Safety case





Based on Eurocae ED-78A methodology

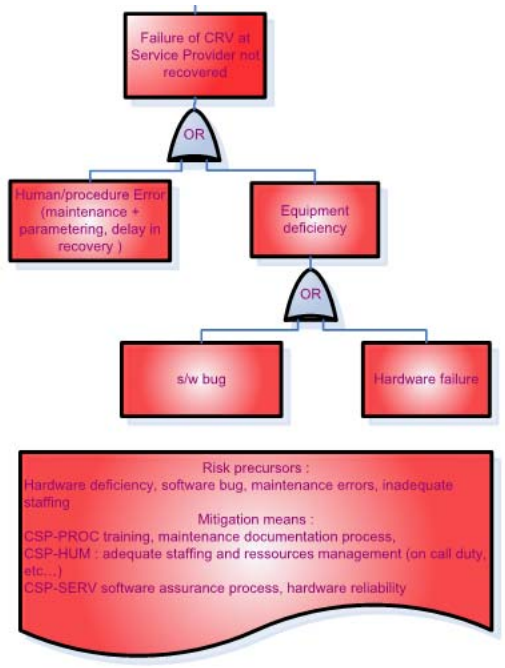
Safety case

- **Software** - the rules, procedures, written documents etc., which are part of the standard operating procedures
- **Hardware** - the Air Traffic Control suites, their configuration, controls and surfaces, displays and functional systems
- **Environment** - the situation in which the L-H-S system must function, the social and economic climate as well as the natural environment
- **Liveware** - the human beings - the controller with other controllers, flight crews, engineers and maintenance personnel, management and administration people - within the system

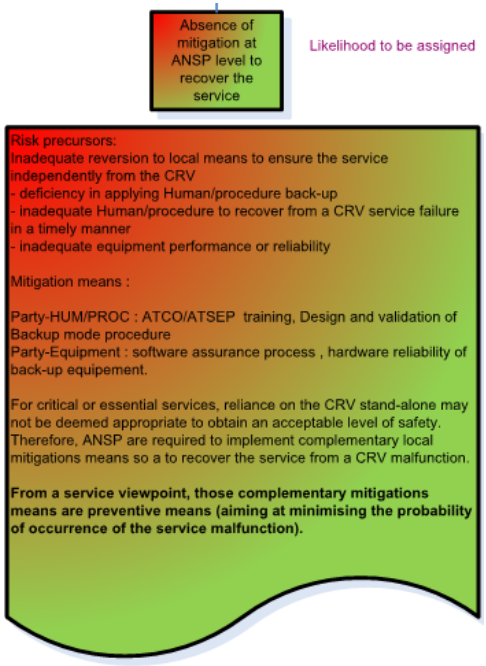
Safety case

- Basic OSED (Operational Services and Environment Description)
  - operational services (as per ICAO Doc 4444)
  - environments (separation minima, traffic density, airspace complexity) concerned by the applications/exchanges of data covered by CRV operations
  - define scope (people, equipment, procedures) of the safety preliminary analysis.
- OHA (Operational Hazard Analysis),
  - worst possible cases consequences of OH occurrence on operations,
  - assess the severity of their consequences,
  - based on the severity, allocate safety objectives
- PSSA (Preliminary System Safety Analysis),
  - plausible causes and barriers
  - Severity, Likelihood, Risk Index and Tolerability tables, including a quantified approach to allocate the safety requirements
  - safety requirements
- SSA (System Safety Assessment):
  - States local assessments + CRV-OG + supplier

Safety case



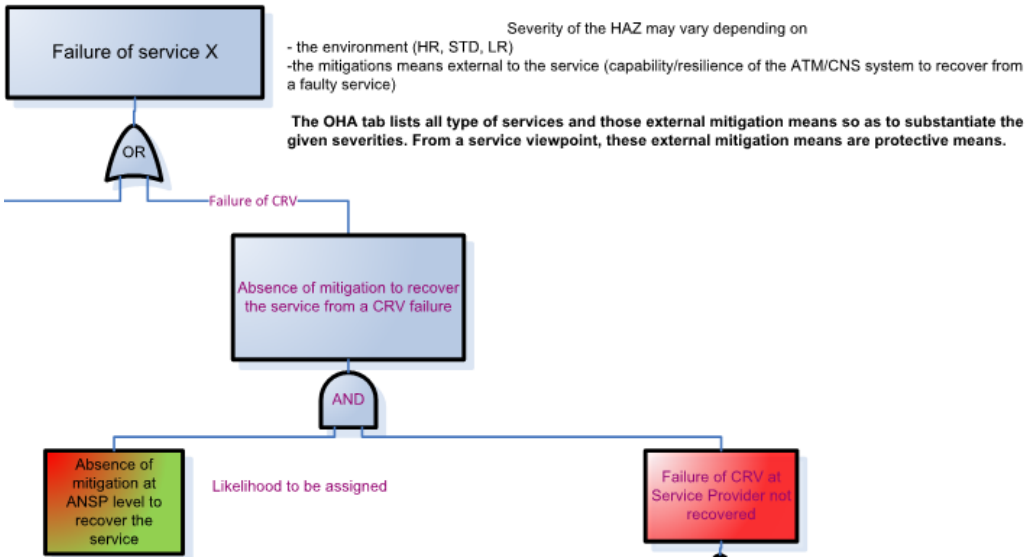
CRV service provider



ANSP

If (when) CRV fails……and….it is not detected and properly mitigated by ANSP

Safety case

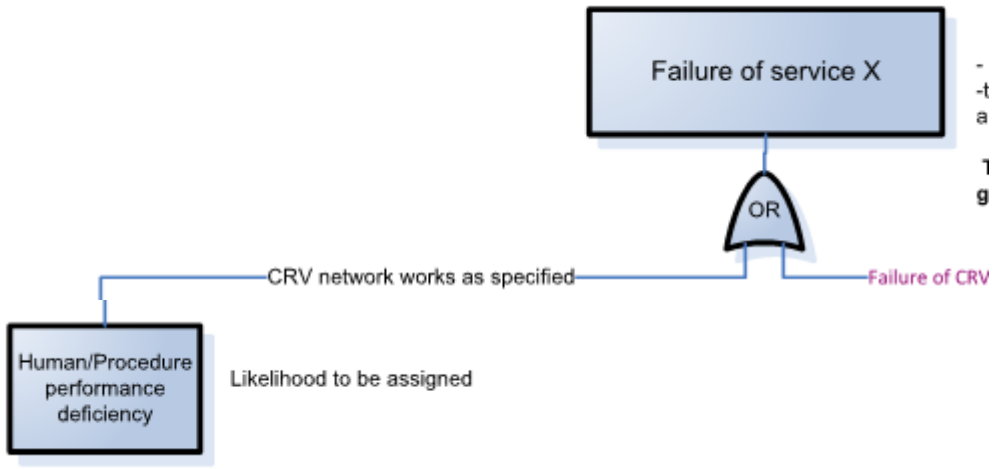


Examples of hazards:

- Loss of AMHS/NOTAM
- Corruption of AMHS/MET or WXXM data
- Loss of Voice communications
- Corruption of Surveillance data
- …

..then the **failure** will impact an air navigation **service** delivered to airspace users: a **hazard**

Safety case



Examples of hazards:

- Loss of AMHS/NOTAM
- Corruption of AMHS/MET or WXXM data
- Loss of Voice communications
- Corruption of Surveillance data
- …

..or when CRV works as specified but is misused or has a wrong design, this will also cause a **hazard**

Examples of safety requirements for CRV User (ANSP)

- Train Operational supervisors and ATCO on alarms raised when communications have failed (including CRV) and procedure to follow
- SUR: Separation minima applied (radar, Tier1, WAM)
  - Option 1 : either the CSP can meet safety objective (no additional requirement for ANSP)
  - Option 2 : CSP cannot meet the safety objective. In this case, the safety objective is met by both CSP and ANSP. examples of ANSP related mitigation means that can be implemented :
    - acquisition of surveillance data should also be done through a channel independent of CRV (independent back-up)
    - reversion to degraded mode of operation with augmented separation minima where possible combined with regulation measures
    - adequate procedure and training of ATCO for reversion to tier2 operations,
    - procedural controls combined with regulation measures
- define adequate staffing and training related to CRV network interface
- implement adequate training to capture and recover from any corruption
- implement Emergency Procedures
- implement ATFM message acknowledgement procedure when considered necessary
- Plan for alternative means or channels for ATFM operation and establish procedure for failure cases.
- Plan for acknowledgement of data in case of corruption in the test process or simulation process.
- define a policy for issues tracking and reporting + troubleshooting with CSP (crisis cell)

Tasks for individual states/administrations

- Local CBA
- Local safety case
- Local implementation plan

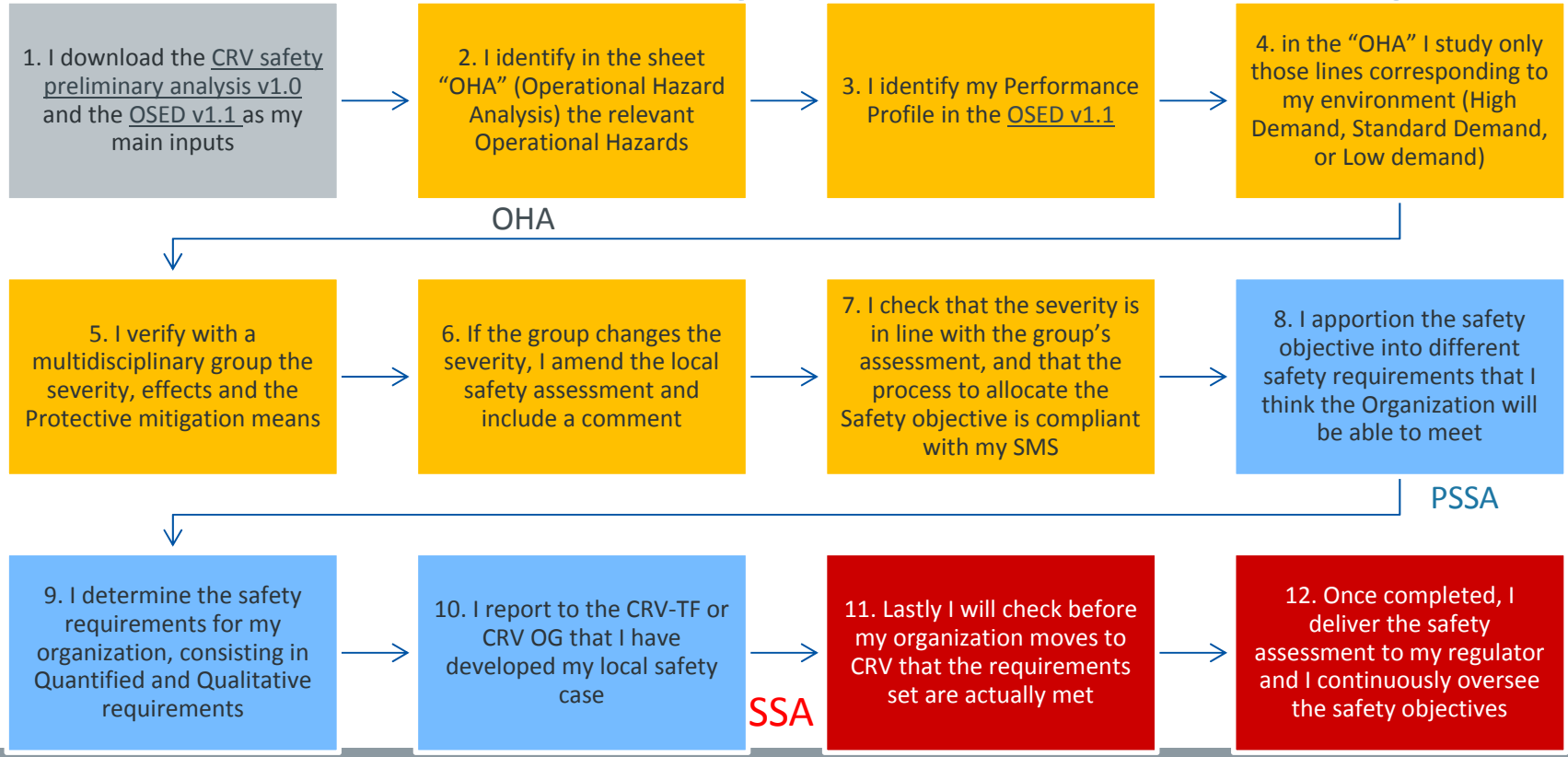
Local CBA

- Based on CBA + bids received
- Will be addressed in Agenda Item 6

Local safety case

- As an Organization providing Air Navigation Services, your delivery of services will rely on CRV for international ground-ground communications (aeronautical fixed services) once you have moved to CRV
- Therefore this constitutes **a change** to your Air Navigation System (people, equipment, procedures) and you need to check that using CRV, your safety objectives will be met on a continuous basis
- Doing so, you should follow your SMS directives. The best is to check with your regulator the details of the process that needs to be conducted and agree on a way forward.
- The material available from the CRV Task Force is an input to your process, but cannot supersede your local safety assessment(s)
  - *Note that if your organization is mature, probably the safety objectives/requirements regarding the international ground-ground communications were allocated by different safety assessments that your organization has conducted in the past:*
    - *Examples: when you have commissioned Voice Communications, AIDC, shared ADS-B data with your neighbors*
  - *In this case you will need to check that using CRV, the assumptions made at that time will still be valid and that the safety requirements allocated will still be met for 1- the transition from your current situation to the use of CRV, and 2- when you will use CRV services*

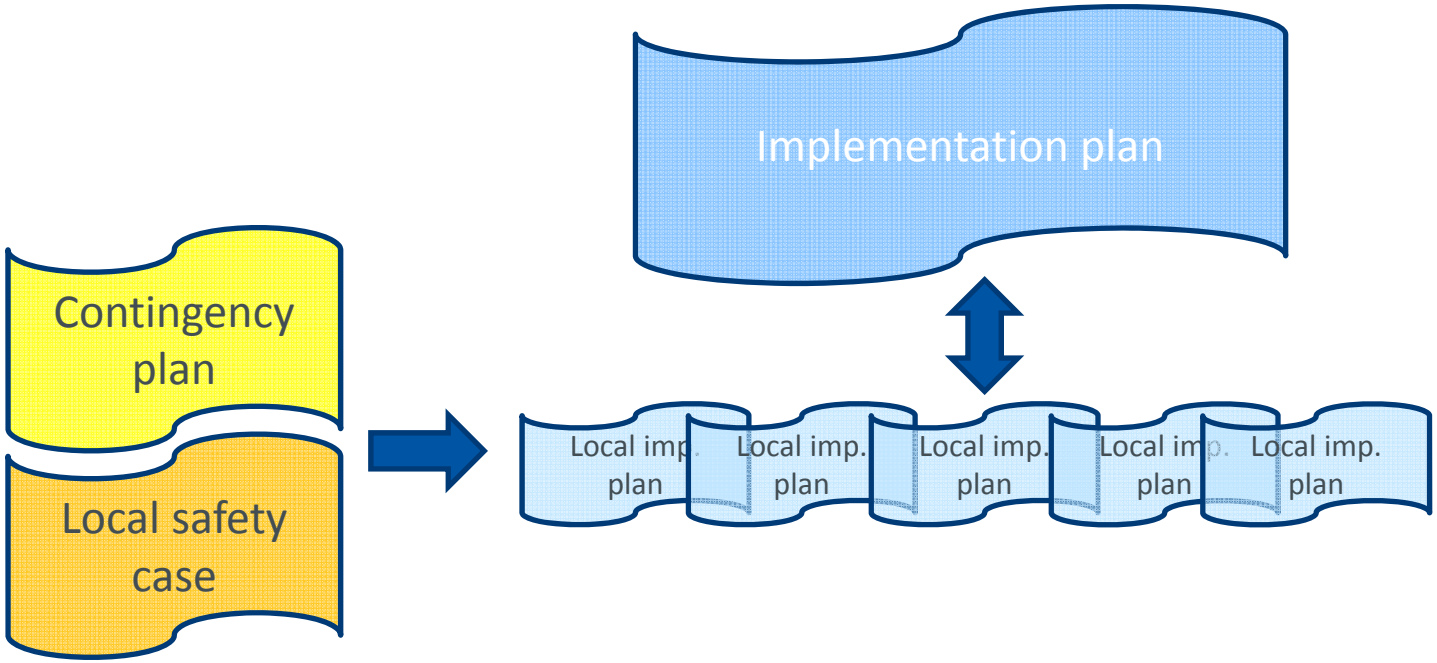
The local safety case in 12 steps



Local implementation plan

- CRV Implementation plan
  - Task of CRV Task Force
  - Guidance to:
    - implement the connection of a CRV User to CRV in a safe manner
    - expedite the migration of applications (avoid cost of double infrastructure as much as possible)
    - implement contingency steps stemming from the contingency plan at each CRV user's interface
  - 1st iteration will be done in 2016
  - May need refinements early 2017 based on final offer of selected provider
- Will need a local implementation plan
  - Tailored to the context of a CRV User
  - Task executed by CRV User based on CRV Implementation plan

Local implementation plan



OVERVIEW OF THE TENDER PACKAGE

Overview of the tender package

- "The International Civil Aviation Organization (ICAO) […] intends to select, on behalf of the future CRV Users, the best and final offer for **delivering, on a turnkey basis, safe, secure and reliable transportation network services of the Common Regional Virtual Private Network (CRV) of Asia/Pacific Region envisaged in the ICAO CNS/ATM concept.**"

Overview of the tender package

- To procure services
- Not equipment
- Uses the UN framework to select the best and final offer
  - ICAO procurement code
  - Procedures: fair and transparent process of evaluation
  - E-procurement tool
- ICAO will not be or represent the customer
- CRV Users (States/Administrations/Organizations) are the customers of the selected provider

Overview of the tender package

- Terms and conditions
  - Terms and Conditions will generally be used during the contracting and execution stages. In this case the Individual Service contract will be signed between the Supplier and the CRV User.
  - ICAO Terms and Conditions will only be used in the exceptional case where ICAO would procure the services on behalf of a CRV User. In this case the Individual Service contract will be signed between the Supplier and ICAO.
- Terms of Reference
  - Background and objectives of the project
  - Specifies the services to be delivered
  - 6 annexes
  - Determines responsibilities
- Instructions To Tenderers
  - Gives necessary instructions to the tenderers for the sealed tender process
  - 6 annexes
  - Price schedule, restrictions on services, evaluation criteria, study case, safety schedule
- Individual Service Contract
  - An annex to Instructions to tenderers, which will become an important piece after the contract is awarded

Overview of the tender package

- Pioneer States will form the evaluation committee that will rank the different bids
- Technical 60% – financial 40%
- In the Sealed Tender evaluation, the scoring of the commercial proposal is based on the total cost of services (initial and recurrent costs) over 10 years

ICAO

THANK YOU