54th CONFERENCE OF DIRECTORS GENERAL OF CIVIL AVIATION ASIA AND PACIFIC REGIONS

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AGENDA ITEM 6: TECHNICAL AND REGIONAL COOPERATION

IMPLEMENTATION OF THE ASIA PACIFIC AERONAUTICAL NETWORK, CRV

(Presented by the International Civil Aviation Organization)

SUMMARY

In 2013, the Asia-Pacific Region decided to study the most efficient way to implement a cross-border cost-effective telecommunications network for States. The first implementation has started and is scheduled for completion end 2017/early 2018 by Australia, Fiji, New Zealand and the United States. Given the low complexity of technically moving to CRV, and the necessity for all decision-makers to perform a realistic cost benefit analysis, APAC States and Administrations are urged to set and monitor a clear target of implementation for all in 2020.

IMPLEMENTATION OF THE ASIA PACIFIC AERONAUTICAL NETWORK, CRV

1. INTRODUCTION

1.1 In 2013, the Asia-Pacific Region decided to move ahead by tasking the APANPIRG CRV Task Force to study the most efficient way to implement a cross-border cost-effective telecommunications network for States.

1.2 After a survey of the telecommunications market and deeper studies, the operation promised to bring a number of benefits:

- Rationalization of a vast diversity of existing networks, heterogeneous and obsolescent technologies and siloed escalation processes into one common unified service, with a guaranteed level of service monitored by an APANPIRG body (CRV Operations Group) and a common escalation process designed to meet the aviation performance, safety and security requirements;
- A common solution brought to a number of regional deficiencies in terms of disrupted or unreliable aeronautical communications (Aeronautical Fixed Services) between States, with often no or little progress over a decade;
- A common solution enabling the Global Air Navigation Plan (GANP) with a secured IP-based network transporting payload such as sharing of ATS surveillance data, AMHS, Voice over IP, OPMET, or in the future FF-ICE, DATM on the top of SWIM; and
- For a majority of APAC States, a favorable cost benefit analysis compared to their legacy arrangements[1] – with the migration of voice communications onto CRV being an additional source of economies.

1.3 One of the challenges faced, and overcome, was the clear recognition that for some States including certain Pacific Islands, where terrestrial connectivity is often poor, the CRV services with a guaranteed quality of service (submarine or satellite connectivity) may neither be affordable nor constitute the solution immediately required. The response brought was twofold: integration of a number of States through PASNet, and for the others, a specific package[2] as an affordable stepping stone into CRV.

1.4 In the framework of the CRV program, coordinated over four years by the CRV Task Force and the ICAO Regional Office, eighteen Pioneer States joined hands to fund a common procurement and select a common service provider in 2016, relying on the ICAO Technical Cooperation Bureau procurement process in compliance with United Nations provisions.

1.5 After an evaluation process involving the eighteen Pioneer States and whose final outcome was agreed by the ICAO Contract Board at the end of 2016, PCCW Global Ltd's best and final offer was selected.

1.6 The CRV services are offered to all ICAO Asia Pacific and Middle East ICAO Member States, and potentially expandable to other stakeholders as envisioned in the GANP.

1.7 A State letter including the common package (forming the basis of the contract) was sent to those States in May 2017 by the ICAO Asia-Pacific and Middle East Offices.

1.8 The first implementation, designed as a proof of concept for the entire CRV, but targeting also the replacement of the obsolescent South Pacific Aeronautical Network (SPAN), has started and is scheduled for completion end 2017/early 2018 by Australia, Fiji, New Zealand and the United States.

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1 ICAO survey of costs of aeronautical international communication costs for 15 States in 2015
2 CRV package "D" consisting in a secured IPSec connectivity on the top of local Internet service provision

2. DISCUSSION

2.1 In 2016, the Region agreed with the Seamless ATM plan version 2 adopted by APANPIRG that "all ANSPs serving high density FIR should connect to CRV. ANSPs serving as Inter-regional Backbone Boundary Intermediate Systems should connect to the IP network infrastructure of other regions" by 7 November 2019.

2.2 Given the generalization of cross-border network operations (ATFM) and 4-D trajectory management required by the fast increasing density of traffic and supported by SWIM, 2020 should be the final operational capability date for all ANSP.

2.3 The question therefore for States is not whether they should move or not to CRV, but how and when.

How to join CRV?

2.4 The steps to take by a State are as follows: liaise with PCCW Global Ltd, select the desired service from the common package (peers, bandwidth, package), and sign a contract. The contract signed shall be based on the common package, and any variation, including from the common price schedule should be recorded as such in the order form. The service offered is end to end and the State does not have to contract with a local loop provider ("last mile").

2.5 The State/ANSP should participate in the APANPIRG CRV Operations Group which is the oversight group for CRV since a sound coordination between ANSP is required before the establishment of any contract.

2.6 The common package was designed as a sound basis for national contracts, but allows also some flexibility to cope with a number of local factors: national laws, local loop providers[3], etc. However the optimizations sought for should remain in the spirit of the common package.

Possible challenges

2.7 A number of challenges may be faced by States in implementing CRV.

2.8 In three cases, States face difficulties linked to their national telecommunications regulatory frameworks. Solutions are being looked for with PCCW Global Ltd and were identified in one case already.

2.9 Another hindrance often mentioned is the cybersecurity. In terms of cybersecurity, PCCW Global Ltd is ISO 27001 certified, and provisions have been taken in the design of the network and operating procedures in compliance with the latest standards of industry. For example, sound network configuration management procedures and the use of MPLS tunneling allow to isolate CRV users from any other PCCW Global Ltd customer. Generic Routing Encapsulation (GRE) allows to implement the need to know principle between ANSP connected to CRV. CRV is physically isolated from Internet. In addition, a common escalation process between CRV users may be triggered by any security event. This escalation process is at the core of the training planned to be delivered.

2.10 It is however recognized that, as per Annex 17 SARPS and ICAO ATM Security Manual, States and ANSP have to implement security controls as required by their own risk assessment and mitigation strategy. The common approach alluded to above and being documented in the Security Management Plan and Contingency Plan will help States to assess and collect the evidences required at the national level. The need to know principle allows focusing the scope of the threats on the peers, which are in most cases already connected through legacy communication means, which does not dramatically increase the risk emerging from CRV operations compared to the

3 For the sake of reliability and physical path diversity, the CRV package A requires two different local loop service providers

situation prevailing before CRV. The gap may therefore essentially dwell in the fact that IP technology is standardized and security controls gained in the past from heterogeneous protocols used by ANSP do not apply anymore.

2.11 The development and acceptance of the safety assessment is another prerequisite legitimately mentioned by some States as a potential hindrance. A common CRV safety case was developed and is being further iterated in 2017 with PCCW Global Ltd as the design will be finalized with the proof of concept. Here again, the purpose is to serve the national SMS processes in place. Concretely, States can avail of the common operational service and environment description, the identification of operational hazards related to CRV operations, and the analysis of severities and mitigation strategy developed by the CRV Task Force. A guidance to develop a local safety case in 12 steps was also delivered by the Task Force.

2.12 Last but not least, the transition to CRV is a challenge that would constitute a brilliant case for game theory[4]. Brilliant, since the costs incurred and benefits generated for each individual player (potential CRV user) depend on the moves made by the others, and most notably by the neighbors (or "peers"). If State A is interconnected with States B, C, D and E, additional expenditures are incurred as long as States B, C, D and E have not transitioned to CRV, since A needs to maintain its costly connections with B, C, D and E and does not consume their new services. Over 10 years (CRV lifecycle), part of the benefits might even be eliminated by the procrastination of the peers. This initial perception by State A may be amplified by the usual and real difficulties in the region in planning and meeting the expected deadlines. If not clarified and understood (well informed players), this issue may even lead to the failure of CRV initiative. Another side effect is that States may want to excessively optimize the prices found in the common package, choose a lower package standard or not even join, relying on far too pessimistic assumptions as to their neighbors, scenario which would also prevent the full deployment of CRV.

2.13 Besides, the CRV model becomes even more cost efficient as States need more interconnectivity, since they would not need to create more interconnections as it would have been the case in the situation prevailing before CRV but marginally upgrade their access bandwidth and parameters. By requiring large scale exchanges between stakeholders along flows of traffic, the GANP B1 to B3 blocks precisely require this increase in interconnectivity. So the "danger area" lays definitely in the first few baby years of CRV, since the value for money of a same package for an individual player will grow over years and pull the initiative out of danger.

A clear trajectory

2.14 Therefore, as a mitigation, it is proposed **to set, and monitor, a clear trajectory for CRV implementation. The recommended convergence time is three years, meaning that all States would need to make their cost benefit analysis and decide to join CRV in 2018, and implement at the latest at the end of 2020**. This is consistent with the Seamless ATM objectives already adopted for high density FIR.

2.15 Technically, estasblishing a connection to CRV is less difficult than implementing a new ATM system for example. From this angle, the two years left for budget planning, training, safety and security assessments and go live seem somewhat realistic.

2.16 In terms of setting the trajectory, the CRV Operations Group maintains a CRV implementation table which records the intentions of the States. As regards the monitoring, the CRV Steering Committee has started the monitoring of contracts, and will report the actual dates of implementation to APANPIRG through CRV OG and CNS SG.

4 The game theory may be defined as "the study of mathematical models of conflict and cooperation between intelligent rational decision-makers" (*Source: Wikipedia*)

3. ACTION BY THE CONFERENCE

3.1 The Conference is invited to:

a) Note that the CRV, a cross-border cost-effective telecommunications network for APAC States, enables the Global Air Navigation Plan and Seamless ATM objectives and would mitigate a number of current deficiencies in ANS communications;

b) Note that common arrangements on cybersecurity and safety issues have been taken that will help ICAO Member States to meet their obligations while implementing CRV;

c) Urge APAC States and Administrations to set and monitor 2020 as the target for CRV implementation for all ASNP, to optimize each individual cost benefit analysis, and note that failing this, pessimistic assumptions might threaten the roll-out of CRV initiative.

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