REPORT

FIRST PANS-OPS WORKSHOP

(Lima, Peru, 13 to 16 September 2016)

Information provided by the IFPP Panel member

An explanation was provided on the activities, composition, and operation of the Instrument Flight Procedures Panel (IFPP), as well as of the processes followed for the development of new IFP criteria, timelines, and the distribution of tasks among its members.

An explanation was also given of the existence of several Task Forces engaged in the development of procedure monitoring requirements, the analysis of limiting surfaces, quality assurance, chart symbology, as well as operations dealing with the interpretation of procedures by pilots.

Information was provided on the issues to be covered by the upcoming amendments in 2018, such as:

- RNP AR departures;
- Updating of the RNP AR Procedure design manual (Doc 9905);
- VSS – Clarification and application.

The analysis of an issue by the IFPP may take up to 7 years until a new amendment to Doc 8168 and the corresponding documents is introduced, which may result in failure to properly meet the needs of the industry. Accordingly, the States normally seek provisional solutions, based on the experience gained by States with a recognised global air navigation capability, such as the United States (FAA) and European Community member countries (EUROCONTROL and EASA).

Recommendation
Inasmuch as possible, to seek regional harmonisation (SAM) in the use of documentation developed by States of recognised capacity in global air navigation, such as the United States (FAA) and European Community member countries (EUROCONTROL and EASA), while waiting for ICAO documentation.

Database coding

The importance of publishing the Coding Table was discussed and it was recognised that the descriptive text of a procedure does not contain information that is sufficiently clear and objective to be inserted in the database of the aircraft navigation system. All the States participating in the workshop applied the Coding Table to the procedure.

The recommendation is to publish an AIC with detailed information about the Table, on how to access the Table, on the responsibility of the provider to produce such coding, and on any parameter that is different from, or more complex than, the standard and is not contained in the Coding Table.

It would be interesting if a regional harmonised coding table were to be submitted at the next workshop. In this regard, Brazil could send the AIC and its Coding Table to the Group to be used as a basis for discussion in order to define a harmonised regional coding table.

A matter for discussion is the change that would be required in the procedure development software that already has a harmonised coding table. The Secretariat suggested that an agenda item be included for the next workshop on coding tables.

Action by Panel members		
Suggested action	**Responsible party**	**Date**
Send the AIC and the Coding Table to the Panel members (e-mail)	Brazil	Upon completion of the final version of the AIC/Coding Table
Comments on the AIC and the Coding Table sent by Brazil	All	PANS-OPS /2 workshop

Changes in the denomination of approach procedures (Circular 336)

The Secretariat presented the changes effective on 1 December 2022 and the tasks to be taken into account for the transition with regard to changes, the designation of procedures in the charts, and the notes on requirements to be included in the charts. The States also took note of the processes for the development of a transition plan and the assessment of the impact of the proposed changes on all stakeholders.

Recommendation
That States, when implementing the changes foreseen in Circular 336, take into account the processes for the development of the transition plan and the impact assessment, and publish an AIC on this issue, in coordination with all stakeholders.

Procedure validation processes

The training modules of Aerolineas Argentinas for ground- and flight-validation pilots were shown in this presentation. This was considered important because it showed a professional course with detailed standard procedures for validating instrument procedures.

These validations are done in simulator and in real flight. The meeting felt that the validation process used by the airline was very useful, and recommended it use by all the airlines in the Region. Note was taken of the importance of data assessment and encoding, and of training requirements and contents of the ground validation IFP Package.

After data documentation, the simulator flight is prepared. The importance of having highly reliable data on the runway and other infrastructure was analysed. It was noted that the flight must be validated "*on course" / "on path*" and that the coded path must be compared with the actual stable flight path, without

fix and segment "*bypassing*". The issue of segments was also addressed. These must be long enough to allow for slowing down and changing altitude as needed. Lateral and vertical transition must also be stable to avoid autopilot disconnect.

The participants took note of the importance of assessing each segment, the banking angle, the descent rate, the flyability of the segment, and finally the position of the aircraft with respect to the runway, and others, such as the "*TAWS Caution*" or "*Warnings*", interception courses and angles.

It was deemed advisable to assess the procedures with vertical guidance up to the DA, verifying the *full stop landing* and the *missed approach*. The question was raised as to whether the *missed approach* with one engine inoperative was assessed since, in this case, operators need to create their escape routes, etc.

Human factors were also analysed in terms of the complexity and information contained in the chart, as well as the workload involved in each segment.

The last stage consists in documenting if the procedure is ready for the implementation stage. This documentation is harmonised with that applied by Argentina and may be used as an example for the other SAM States.

Recommendation
That SAM States consider the adoption of documentation on ground and flight validation of procedures, similar to that applied by Argentina.

Flight validation

The workshop analysed the importance of flight validation, although it recognised that in case flight validation was not possible, the flight simulator could be used to check the "*flyability*" of the procedure. One of the core issues in this type of validation is the quality and level of detail of the scenario used in the simulator.

In accordance with Doc 9906, flight validation is required in the following circumstances:

a) the "*flyability*" of a procedure cannot be determined by other means;
b) the procedure requires mitigation for deviations from design criteria;
c) the precision and integrity of terrain and/or obstacle data cannot be determined through other means;
d) the new procedures differ significantly from the existing procedures; and
e) for PinS procedures for helicopters.

If the procedure requires mitigation for deviations from the design criteria, or the integrity and precision of terrain and obstacle data cannot be determined through other means, or the new procedures differ significantly from the existing ones, it is advisable to conduct a flight validation check.

Mention was made of the advisability for the aircraft and the crew to be certified for checking the "*flyability*" of the procedure, which is not always the case.

In any case, the workshop felt that these issues should continue to be analysed in order to define a harmonised process for the Region.

Ground validation

It was felt that ground validation process should always be carried out, as indicated in Doc 9906. The implementation of quality assurance processes is considered essential for the procedure design process.

Regarding simulator validation of an RNP AR procedure, there are differing opinions. This is a matter that should continue to be studied by the Group.

Action by the Panel members		
Suggested action	**Responsible party**	**Date**
Determine in which cases should validation and simulator flights be carried out, based on Doc 9906 and the best international practices.	All	PANS-OPS 2 workshop

Visual RNAV procedure

The workshop took note of existing regulations, their application, as well as the publication and coding of these procedures, through examples. The examples showed the difference between conventional visual approaches and RNAV visual approaches, which permit the use of waypoints instead of geographical locations, altitude and speed indications, which are useful for the ATC and the crew, and vertical guidance in some cases.

This helps to reduce unstable visual approaches. Taking into account that most accidents occur in the approach phase, this type of procedure can help reduce the rate. For this type of implementation, CDM between the authority and the operators must be applied starting in the design phase.

Pilots emphasised the ideal point at which visual conditions should be known in order to perform the RNAV visual procedure. The workshop considered this matter to be very important and that warranted further discussion. One possibility would be to establish an MSA or a point at a given altitude in a STAR at which the VMC condition should be assured.

The operators understand that the use of RVFP is basically to ensure a stabilised approach. In this sense, it is advisable to make this decision at a position close to the airport. However, it was felt that the RNAV visual approach was the most appropriate on runways that lacked instrument approach at an airport, in order to ensure the safety of the operation at that airport.

It was also noted that the ATC must be trained in the use of RVFP and can also permit interception of the RVFP at a point other than the starting point, but must not provide vectoring to the aircraft at the beginning of an RF segment.

The pilots and IFALPA delegates attending the meeting noted that the work mix (instrument references in the cockpit and visual references from outside the cockpit) increases pilot workload if compared with a manual visual flight. However, it is recognised that there are more destabilised approaches in fully manual approaches. Consideration should be given to the possibility of having this application available provided specific training is given for this type of approach.

Regarding lateral and vertical guidance, it enhances safety, but consideration should be given to whether the increased workload in the cockpit is manageable and acceptable for the crew and the operator in some cases.

In this regard, a small working group should be established to consider mitigating measures that could be part of a guide for the implementation of visual RNAV, taking into account IFALPA's *Briefing 15ATSB Lima03*.

The Secretariat proposed to work on this matter through TELECONs and prepare a draft discussion paper for the SAM/IG/19 meeting, which could be discussed by a TF within the PBN Group, with a view to developing an acceptable guide on the use of visual RNAV approaches.

The workshop also analysed the benefits of this type of approach in terms of safety and improved TMA capacity and flow management, tactical airspace management, and separation of airport flows with converging paths. Logically, the avionics capacity of the aircraft is critical for taking advantage of these procedures. In VFR thresholds, these procedures help to avoid CFIT, and to reduce runway excursions.

The workshop deemed it important to harmonise publications, since not all charts clearly establish the requirements for their use. Likewise, it should be possible to encode the data in the NavDB and States must ensure the flyability of these procedures.

Action by the Panel members		
Suggested action	**Responsible party**	**Date**
Develop a guide for the implementation of the RNAV visual procedure, taking into account the mitigation measures required to avoid the issues mentioned in IFALPA's *Briefing 15ATSB Lima03*	All	SAM/IG/19

Interpretation of some navigation requirements

RNAV1/RNP/1 in SIDs/STARs

The workshop discussed the surveillance and alerting requirements to be met for the use of these navigation specifications. It also reviewed the tables contained in Doc 8168 Vol. II for RNAV procedures with GNSS.

It was clear that the separation between any combination of tracks with RNAV-1 or RNP- 1, or RNP APCH, or RNP AR APCH, could be reduced down to 7 NM, and down to 5 NM with RNP-1 or RNP APCH or RNP AR APCH. All RNAV-1 and RNP-1 specifications can be used up to the FAF/FAP, as established in Docs 8168 and 9613.

The majority of South American TMAs do not have the coverage or the geometry for using DME/DME to support RNAV-1 and, therefore, the use of this navigation specification is based on GNSS alone. Consequently, the workshop concluded that there was no need to consider RNP-1 alone in a setting without ATS monitoring. This conclusion is based on the fact that Doc 9613 establishes that monitoring and alerting requirements could be met through an on board navigation system capable of NSE

monitoring and alerting (for example, RAIM or FDE algorithm), plus a lateral navigation display (for example, CDI indicator) enabling the flight crew to monitor the FTE. When PDE is assumed to be insignificant, the requirement is met because NSE and FTE are monitored, which leads to TSE monitoring.

The adoption of RNAV-1 or RNP-1 at the PBN STARs and SIDs allows procedures to be used by more users, taking into account that there are still airlines that do not have RNP-1 in their operational specifications.

Recommendation
That SAM States use RNAV-1 and RNP-1 in PBN SIDs/STARs, even in non-radar environments, since RNAV-1 is used exclusively with GNSS.

RNAV-1 and RNP-1 in RNAV/ILS approaches

The workshop took note that some States used the RNP APCH specification in RNAV/ILS procedures. Taking into account the need for a larger number of users to be in a position to use RNAV/ILS procedures, and considering that RNAV-1 and RNP-1 navigation specifications can be applied up to the intermediate segment, the workshop concluded that RNAV-1 and RNP-1 should be used as navigation specifications in RNAV/ILS procedures.

Recommendation
That SAM States use RNAV-1 and RNP-1 in RNAV/ILS procedures, including non-radar environments, since RNAV-1 is used exclusively with GNSS.

Advanced RNP (A-RNP)

This specification permits the application of RF and precision values between 1 and 0.3 NM. The use of this application could be considered at airports that have problems with DEP minima due to issues related to obstacles, noise, or others, which can be resolved with an RF Leg/or the application of values lower than 1 NM and down to 0.3 NM.

There is no ICAO SARP yet dealing with the application of the RNP AR specification for DEP, although some States have already applied these criteria for take-offs. SARPs for take-off could be ready by 2018. Peru has experience in the application of this specification for take-offs.

Recommendation
That SAM States study the application of A-RNP at airports that have problems with DEP minima for reasons related to obstacles or aeronautical noise, which can be resolved with an RF Leg and/or values of less than 1 NM and down to 0.3 NM.

ATC gradient

The ATC gradient concept was developed in order to:

a) Allow for steeper climb gradients, facilitating the use of CCO;
b) Reduce the number of published charts through the use, in the same chart, of a minimum climb gradient allowing for obstacle clearance, as well as an ATC gradient that provides a continuous climb, flying "above the STAR"; and
c) Give more flexibility to operations, where the ATC would be responsible for maintain the separation between aircraft that applied the minimum climb gradient and aircraft conducting arrival procedures.

Regarding this application, the workshop concluded that the operations section of airlines could have difficulties to analyse the use of both gradients, taking into account that the trend is to assess the steeper gradient. This may result in the need for a lower take-off weight and thus a reduction in aircraft payload. This factor gets worse when the published gradient does not correspond to the FL restriction shown in the chart, taking into account that the aircraft will always comply with the FL restriction, regardless of the published gradient.

The workshop felt that, in order to include an ATC gradient in the chart, it would be advisable to previously conduct CDM between users and the ATC, and should be limited to domestic airports, taking into account that a smaller number of users might facilitate the dissemination of specific procedures for the use of such gradient. Although this publication of the gradient was aimed at reducing the number of charts, consideration should be given to whether it would be convenient to use two charts with different restrictions for the same departure, with a view to enhancing situational awareness of controllers and pilots.

In case the climb requirement is too stringent, consideration should be given to the possibility of aircraft flying below the recommended altitude in certain cases. In this case, it would be advisable to have two SID charts. It is clear that it will be the airspace concept that will define this possibility, together with the feasibility study for this type of concept.

Recommendation
That SAM States, when applying the ATC gradient, take into account the following: a) To be applied only at domestic airports; b) Prior CDM process among stakeholders; c) Assess the convenience of publishing different charts to enhance situational awareness of controllers and pilots;

Identification of SIDs/STARs

The workshop discussed the issue concerning the designation of SIDs and STARs, taking into account that, in some cases, the methodology set forth in Annex 11 could increase controller and pilot workload and become a threat to safety. The application of the first "*waypoint*" of the STAR and the last waypoint of the SID to designate them in accordance with Annex 11 is a practice that enhances situational awareness of pilots, in the case of airports with a reduced number of SIDs and/or STARs. However, at airports with a more complex operational environment, with a large number of SIDs and STARs, the application of the transition concept makes it easier for the pilot to apply the procedure authorised by the

controller, and the ATCO does not need to memorise a significant number of SIDs/STARs. Accordingly, the workshop concluded that the airspace planner must assess the best way of designating SIDs/STARs through a CDM process with all stakeholders.

Another matter under consideration was the designation of SIDs that used the same designation for different thresholds in parallel runways. The suggestion was to use a different name for each threshold of parallel runways in order to avoid any confusion to the pilot.

Another issue discussed at the workshop was the chart for RNP AR approach with transitions, with many intermediate fixes (IF). Pilots feel comfortable with that display. The situational awareness of pilots and controllers is enhanced. Besides, it is possible to reduce the number of published charts. However, the graphic representation of the charts must be assessed, taking into account that the use of many transitions could render the information unclear. FAA examples were used.

An important point is the fact that the ATC database in automated systems could result in a very complex display if the ATC decides to display approaches on a screen.

Recommendation
• The airspace planner should assess the best way of designating SIDs/STARs (with or without transition) through CDM with all stakeholders; • SAM States should apply the concept of transition in RNP AR procedures that have many intermediate fixes (IF), assessing their impact on the graphic representation in the chart and any possible problem in automated ATC systems.

Public/tailored RNP procedures

When addressing this issue, an explanation was given of two RNP AR drafting criteria:

a) Public criteria of Doc 9905;

b) Criteria tailored to the characteristics of the operational environment and user needs/capabilities.

Regarding aircraft/operator approval criteria, these may be:

a) *Generic*: applied to procedures in which the public drafting criteria of Doc 9905 are applied. In such cases, approval is sufficient to use any RNP AR procedure published under the public criteria of Doc 9905;

b) *Specific*: applied to procedures in which drafting criteria have been adapted to the operational environment and/or user needs/capabilities. Specific approval for an airport or threshold (*tailored*). In this case, coordination between PANS-OPS experts and aircraft and operator approval inspectors is needed, as well as the publication of drafting and approval criteria.

Regarding the publication of public and tailored RNP AR procedures in the AIP, the workshop recalled that the SAM/IG/17 meeting established, as a general rule, that procedures, whether public or tailored,

should be published so that all users that have equipped aircraft and approved operations may use these procedures, which have proven more efficient and safe, and to enhance situational awareness of air traffic controllers and pilots. Nevertheless, the workshop expressed its concern in those cases in which a pilot/aircraft that is not approved for a tailored procedure uses such procedure, becoming a clear threat to safety. Peru, for example, has published tailored procedures for the Cuzco airport, without the Coding Table, to prevent non-approved users from using such procedures without the corresponding approval. In this regard, the workshop concluded that a more in-depth analysis of this matter would be required.

The workshop also received information about special procedures that differ from standard procedures, in accordance with *FAA Order 8260.60*. These are procedures that contain criteria or parameters that are different from the standard, and the user must meet the established requirements, which are developed by the State or an authorised third party. This is not published.

Action by the Panel members		
Suggested action	**Responsible party**	**Date**
Develop a harmonised regional system for publication of tailored RNP AR procedures.	All	PANS-OPS/ 2 workshop

Minimum altitudes of SIDs

The workshop took note that the minimum climb gradient is the one that ensures obstacle clearance, and that the minimum climb gradient of the aircraft is calculated before take-off of the aircraft based on many factors, such as: aircraft type, engine type, runway length, temperature, etc., taking into account that aircraft do not have a "gradient meter". In this sense, the crew has no way of ensuring that the aircraft will meet the minimum gradient in case of interruption of the climb by the ATCO, severe turbulence, etc. Accordingly, the workshop considered that, as an additional safety mechanism, minimum altitudes should be inserted in the SIDs, in critical segments on account of obstacles, so that the pilot may monitor such altitude with the FMS.

The recommendation is to keep the climb in the SID until exceeding the obstacle clearance level before ending the SID en route or in the airway.

Recommendation

That SAM States:

a) Publish, as an additional safety mechanism, the minimum altitudes in the SIDs, in critical segments on account of obstacles, to allow the pilot to monitor such altitude through the FMS;
b) Establish the proper connection between the SIDs and the ATS route network to ensure obstacle clearance.

Level segments to intercept the ILS glide slope

Whenever possible, it is advisable to use level segments in the intermediate approach so that the aircraft may lose power and get ready for an ILS approach procedure, ensuring interception of the glide slope "below the path". If a level segment is not possible, then a reduced slope in the intermediate segment is needed, at least, to allow the aircraft to lose power. Likewise, interception of the glide slope "below the path" shall be ensured.

Recommendation
That SAM States: a) Whenever possible, use level segments in the intermediate approach so that the aircraft may lose power and get ready for an ILS approach procedure, ensuring interception of the glide slope "below the path"; b) If a level segment cannot be established, then a reduced slope in the intermediate segment should be used to allow the aircraft to lose power. Likewise, interception of the glide slope "below the path" shall be ensured.

Publication of RNAV SIDs/STARs and conventional SIDs with similar paths on the same chart

There may be some confusion with the symbology or designation, and there is also the issue of the design, which is different for each. Therefore, it seems best to publish the conventional data separately from PBN.

Elimination of publication of procedures on paper

The workshop cited the following advantages to be derived from the release by the State of aeronautical publications only by electronic means:

a) Monthly updates of aeronautical publications.
b) Savings in the publication of procedures and in aeronautical publication updates, since a significant expenditure in printing and paper is avoided.
c) Expeditious publication of procedures and updating of aeronautical publications, taking into account that the AIRAC publication date could be complied with by inserting the procedure in the web, considering that the information is already known to users and is available to database providers.

However, in accordance with Annex 15, it was felt that there should be a copy of the AIP available at least at ARO/AIS offices. Likewise, in case of contingency, it is advisable for the ATS to have a hard copy of the AIP. Users wishing to keep charts in hard copy should print them or hire a specific company, like Jeppesen, Lido, etc.

Recommendation
That SAM States assess the possibility of eliminating or substantially reducing publications on paper, especially the AIP, including air navigation procedures (routes, STARs, SIDs, IAC, etc.), with a view to allowing monthly updates, savings in printing/paper, and more expeditious publication and updating of such publications.

Creation of a working group to assess the publication in OCA or OCH charts

According to Annex 6, paragraph 4.2.8.1, the State of the Operator shall require that the operator establish aerodrome operating minima for each aerodrome. Paragraph 4.2.8.2 of Annex 6 contains the parameters to be taken into account in establishing such minima, including OCH/OCA. Accordingly, it is the operator and not the State that must establish the MDA/MDH.

Likewise, Doc 9365, in item 2.1.1, states the following: "*A ceiling or vertical visibility limitation for the decision to continue the approach to land is normally not applied since a safe flight path to DA/H or MDA/H is assured by procedure design*".

Furthermore, the definition of Aerodrome operating minima in Doc 9365 does not establish "ceiling" as one of the parameters to be considered.

> ***Aerodrome operating minima:*** *The limits of usability of an aerodrome for:*
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> *a) take-off, expressed in terms of runway visual range and/or visibility and, if necessary, cloud conditions;*
> *b) landing in precision approach and landing operations, expressed in terms of visibility and/or runway visual range and decision altitude/height (DA/H) as appropriate to the category of the operation;*
> *c) landing in approach and landing operations with vertical guidance, expressed in terms of visibility and/or runway visual range and decision altitude/height (DA/H); and*
> *d) landing in non-precision approach and landing operations, expressed in terms of visibility and/or runway visual range, minimum descent altitude/height (MDA/H) and, if necessary, cloud conditions.*

Some States have expressed that they continued to publish ceilings for instrument approach in their approach charts. In this sense, the workshop concluded that the OCA/OCH should be published and that the MDA/MDH and ceiling should not be published, with a view to harmonising this publication throughout the Region.

Recommendation
That SAM States publish the OCA/OCH in instrument approach procedures and **not** publish MDA/MDH and ceiling, in accordance with ICAO documentation (Annex 6, Doc 8168, and Doc 9365), to ensure harmonisation in the SAM Region.

Application of CCO/CDO techniques at airports with low traffic volume

It was noted that, although a "natural" climb with no restrictions may exist at airports with a low traffic volume, it is convenient to develop optimised procedures to account for possible crossings between arrivals and departures (more direct procedures with altitude restrictions or longer procedures with no restrictions).

As to arrivals, depending on the operational scenario, it is more convenient to authorise the approach direct to the IAF, from a distance of approximately 200 NM from the airport, especially if there are no terrain and obstacle issues. This direct approach to the IAF would allow the pilot to calculate the ideal point of descent, taking the IAF as a reference, and request it from the ATCO. However, the ideal solution is to develop the corresponding STARs and SIDs, trying to apply CCO/CDO techniques within the possibilities of the scenario under consideration.

Recommendation
That SAM States: a) Publish an AIC and/or instruct air traffic controllers to authorise the approach direct to the IAF from a distance of approximately 200 NM from the airport, especially if there are no terrain and obstacle issues, in order to allow the pilot to calculate the ideal point of descent, using the IAF as a reference, and request it from the ATCO. b) Develop the corresponding STARs and SIDs, trying to apply CCO/CDO techniques within the possibilities of each scenario under consideration.

Temperature equation with respect to ISA

The workshop analysed a presentation on the incidence of temperature on the altitude indicated in the procedure design. It analysed a difference in the way this equation was expressed in Vol. I compared to Vol. II, as identified by a group of designers of Aerolíneas Argentinas.

The presentation showed the difference, which could affect the result of the equation. The error lied in the formulation of the equation in Vol. I of Doc 8168, PANS-OPS. In this regard, it suggested using the same formula as in Vol. II, which had a well-formulated mathematical expression.

Likewise, some examples were given of the incidence of temperature on the RNP AR design, giving designers the possibility of clarifying any doubts.

Support material for understanding changes in phraseology – Amendment 7 to Doc 4444

The Secretariat informed of a link to Headquarters containing support material for better understanding the changes in phraseology introduced by Amendment 7 to Doc 4444 concerning SIDs and STARs . The website address is:

http://www.icao.int/airnavigation/sidstar/Pages/CHANGES-TO-SID_STAR-PHRA-SEOLOGIES.aspx

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