Performance Based Navigation

LAN Experience

Capt. Christian Staiger

LAN's PBN milestones

- Yr. 1987, first B767 delivered to LAN.
- Yr. 2000, first Airbus aircraft delivered to LAN.
- Yr. 2006 (8 years late) LAN gets the European B-RNAV ops.approval.
- Yr. 2006, Jan 17, first RNAV Approach in Santiago airport, flown by LAN.
- Yr. 2006, Oct. 20, first RNAV Validation flight Punta Arenas using comercial aircraft.
- Yr. 2006, 11 RNAV approaches and 2 RNAV STAR procedures published.
- Yr. 2007 LAN gets the European P-RNAV ops. Approval.
- Yr. 2007 6 June, first RNP Approach in La Serena airport, flown by LAN.
- Yr. 2008 6 June, first RNP Approach in Cuzco airport, flown by LAN using the A320 simulator in CAE, SCL.

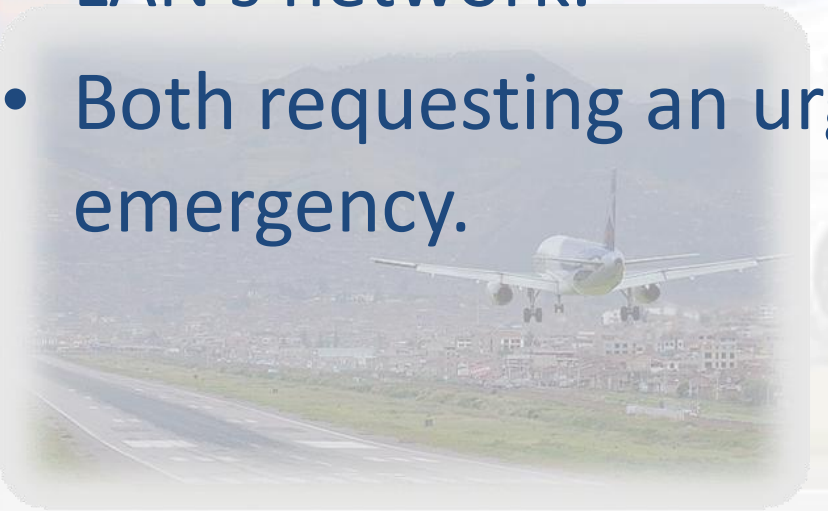
La Serena and Cuzco two different airports

- Airport location: Peru
- Airport elevation: 10860 ft.
- IFR Daylight operations only.
- RWY10 used for departure Only.
- RWY28 served by two IFR approaches, ending in visual circling maneuvers.
- App. Minimums often higher than actual weather conditions.
- Airport served by 10 to 15 flights every day, during daylight operations.

- Airport location: Chile
- Airport elevation: 480 ft.
- IFR operations H24.
- RWY 11 served by VOR/DME approaches with a VDP located 4,5NM to the RWY end.
- RWY29 only VFR.
- App. Minimums often higher than actual weather conditions.
- Airport served by 3 to 4 flights every day.

La Serena and Cuzco what they have in common.

- Both served by LAN A320 family fleet.
- Both the most cancelled-flight airports in LAN's network.
- Both requesting an urgent RNP Fashion emergency.



Cuzco Project

- On 2007 a partnership was established to provide Cuzco with an RNP solution.
- IATA selected Naverus to develop RNP Procedures.
- DGAC Peru accepted the challenge.
- LAN decided to upgrade its fleet to meet RNP- AR standard.

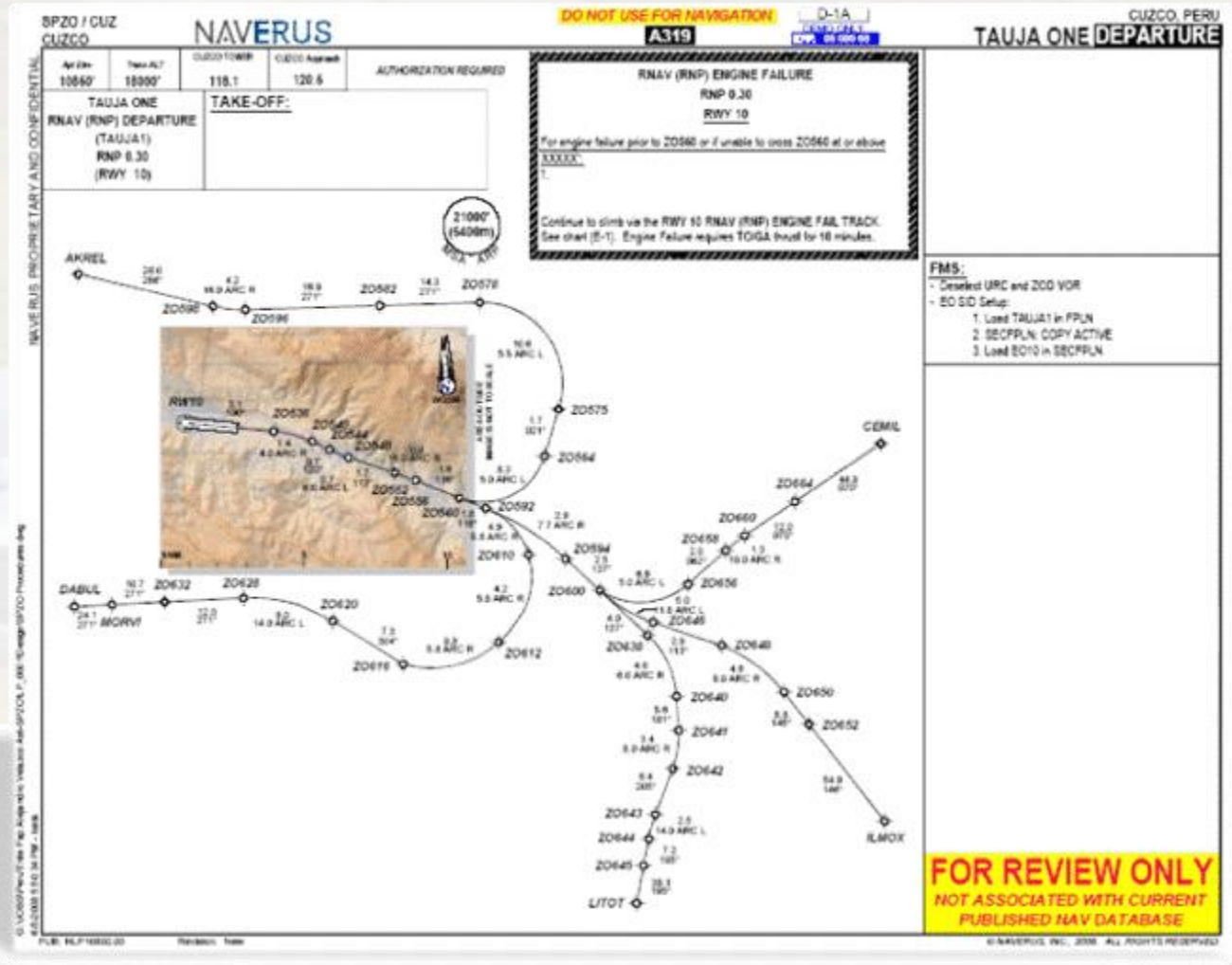
Cuzco project Partners

Cuzco

- RWY 28 RNP Approach.
- RWY 10 RNP Departure.
- RWY 10 RNP One engine Out Departure procedure.

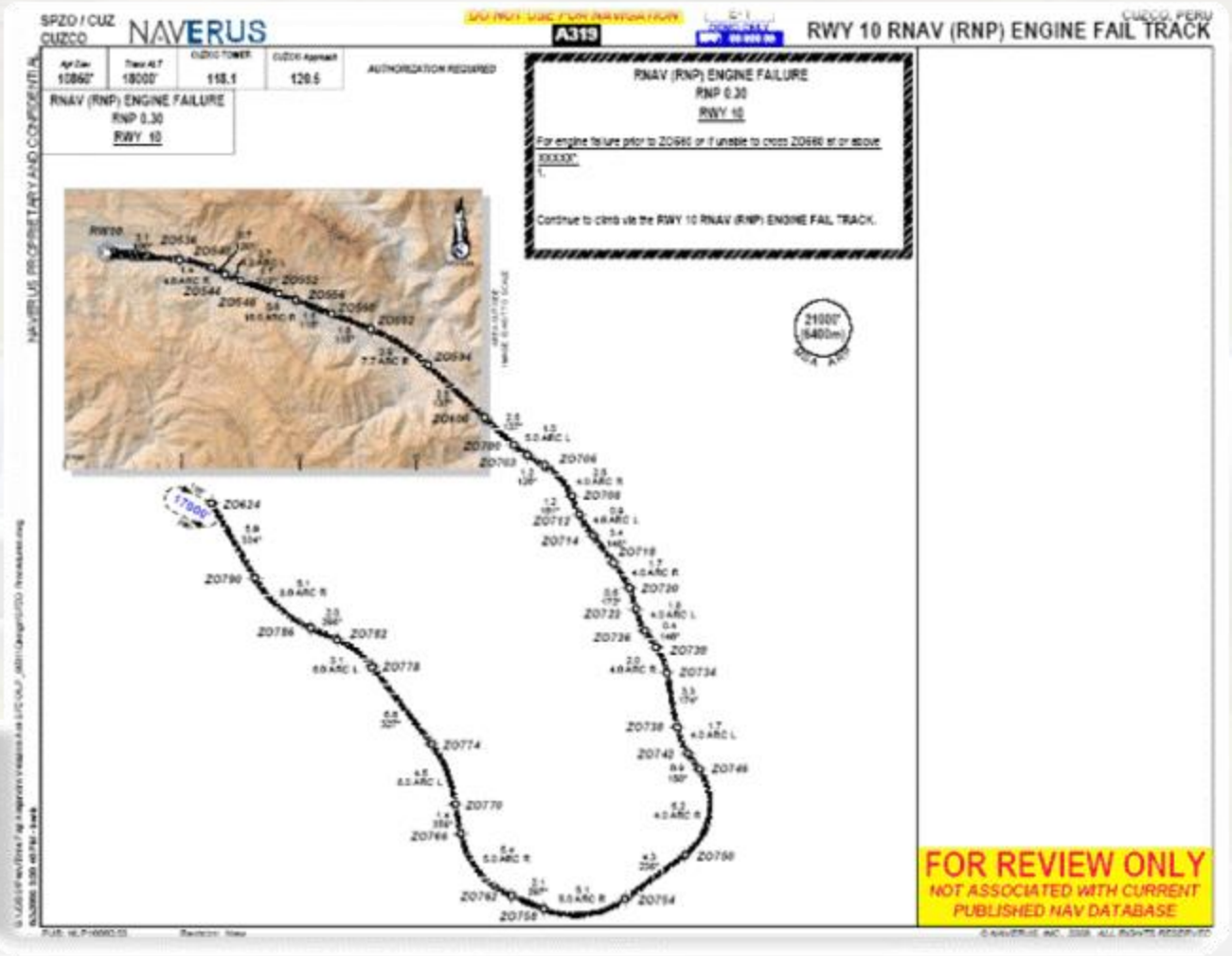
Cuzco

- RNP Departure.
- Provision for 5 exit gates, depending on flight destination.



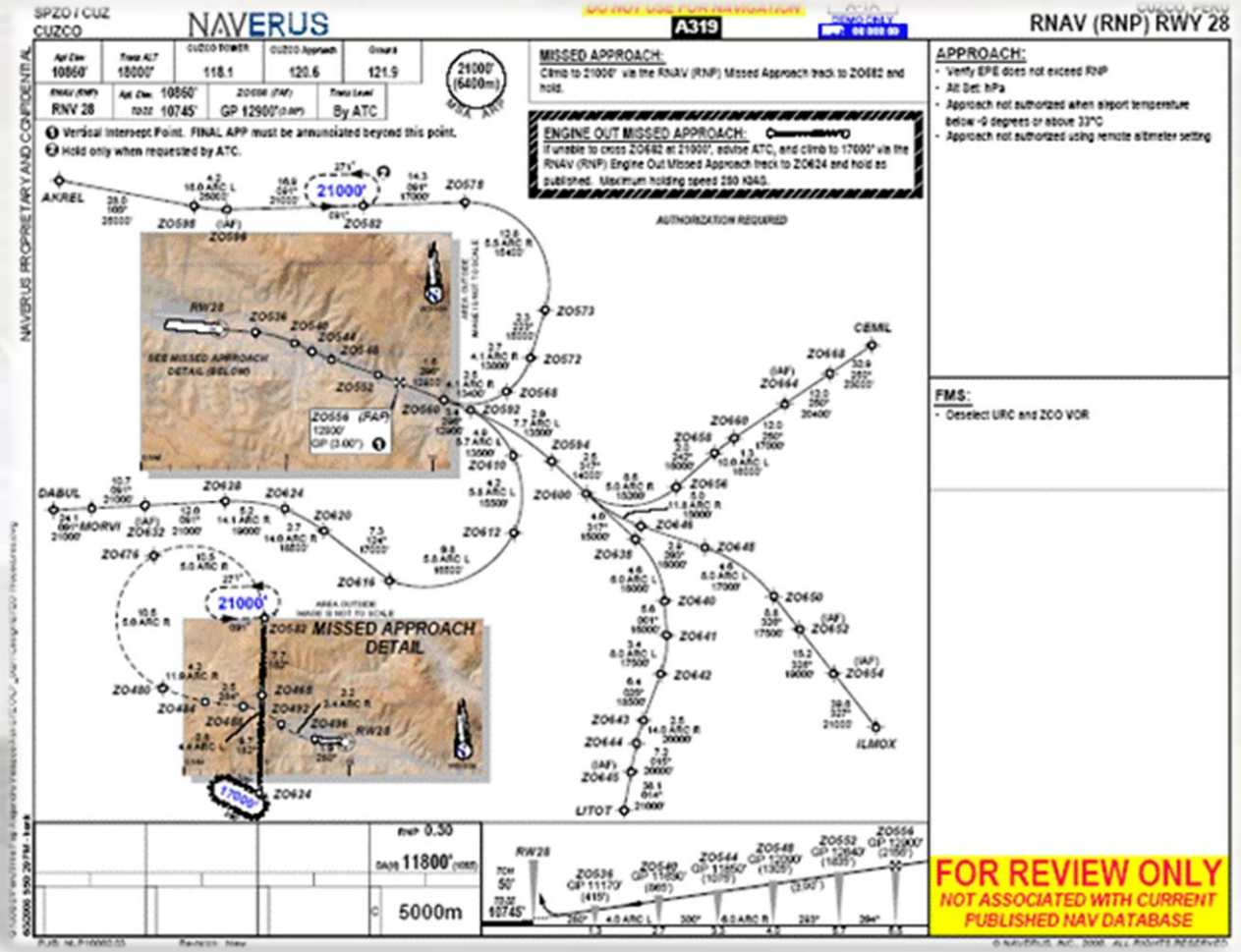
Cuzco

- RNP Engine failure track.
- Provision to end at IAF for the RNP APP.
- Based on actual A319 performance.



Cuzco

- RNP Approach RWY28.
- Provision for 5 entry gates, depending on flight origin.
- RNP 0.30.
- Based on tailored RNP design criteria.
- Provides a DA lower than actual IFR App's.
- Provides both, normal and failure condition Go-Around track.



La Serena Project

- On 2007 a partnership was established to provide La Serena with an RNP solution.
- LAN requested DGAC to develop RNP Procedures.
- DGAC Chile accepted the challenge.
- LAN decided to upgrade its fleet to meet RNP- AR standard.

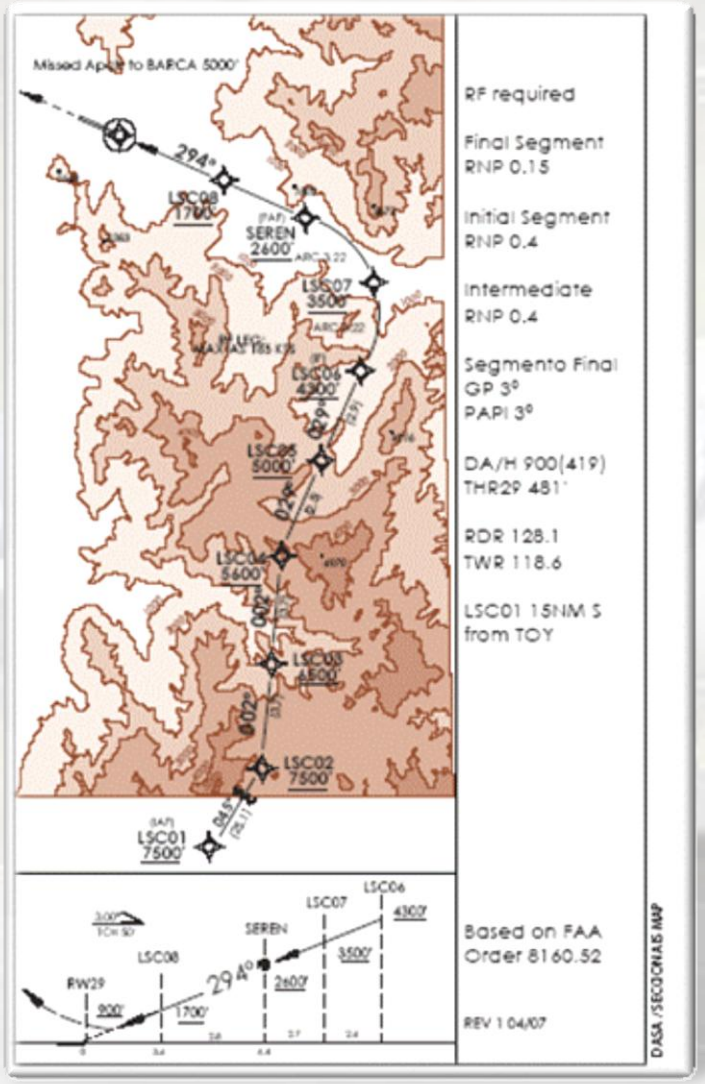
La Serena project Partners

La Serena

- RWY 29 RNP Approach.

La Serena

- RNP Approach RWY29.
- Provision for 2 entry gates, depending on flight origin (North or South).
- RNP 0.40/0.15.
- Based on FAA Order 8160.52 RNP design criteria.
- Will provide a DA around 250 ft. AGL.
- 15 flights.



La Serena


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Image © 2007 TerraMetrics
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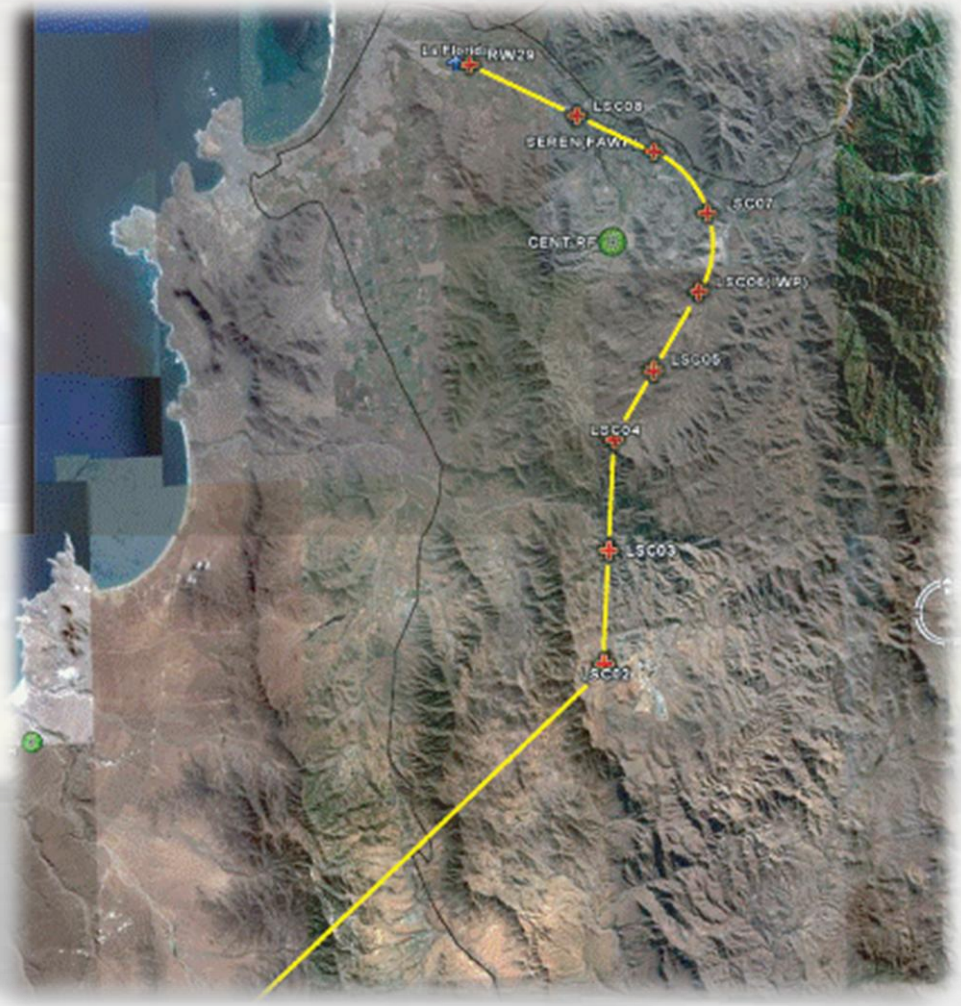
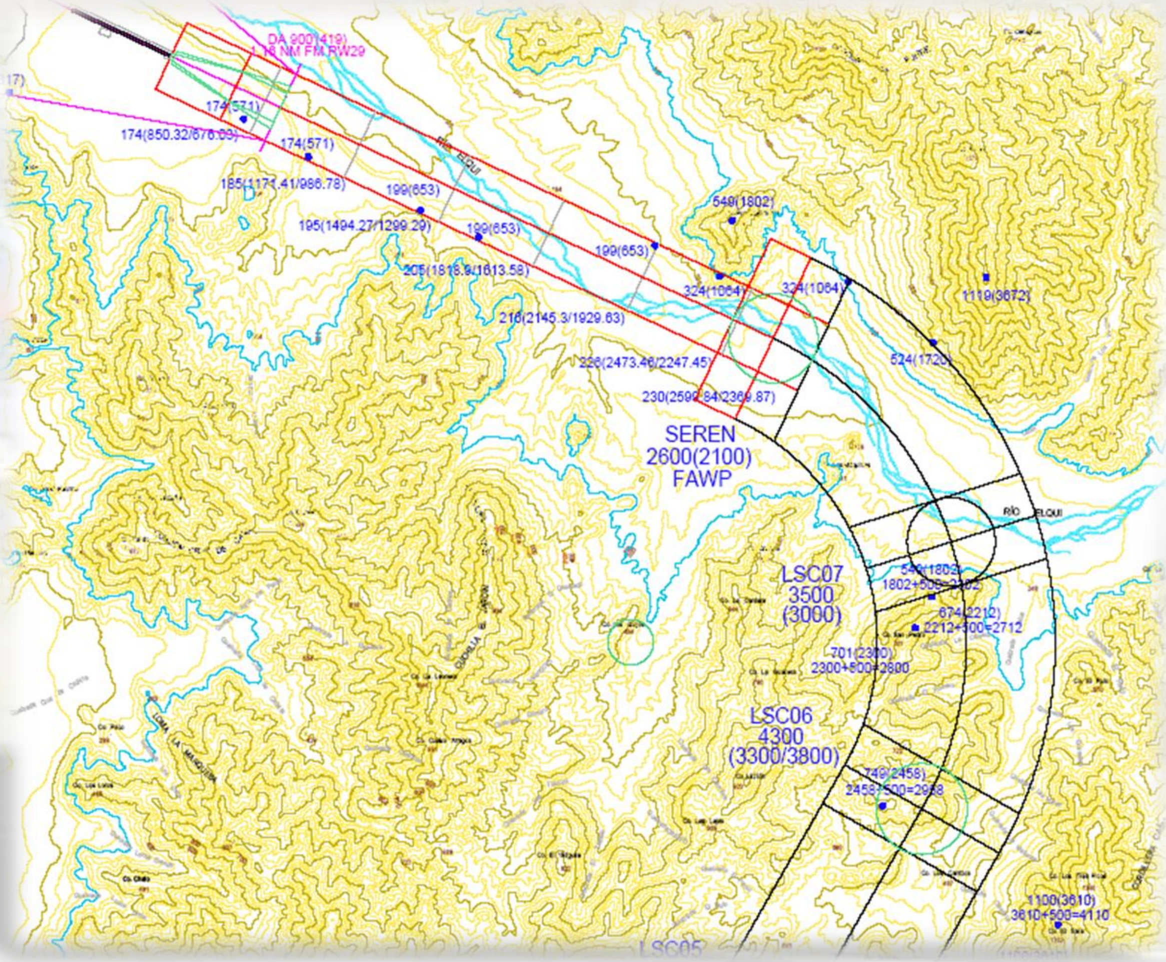
La Serena



La Serena


DA 900(419)
1.18 NM FM RW29
174(571)
174(850.32/676.03)
174(571)
185(1171.41/986.78)
199(653)
195(1494.27/1299.29)
199(653)
199(653)
205(1818.9/1613.58)
549(1802)
324(1064)
324(1064)
216(2145.3/1929.63)
226(2473.46/2247.45)
230(2596.84/2369.87)
1119(3672)
524(1720)
SEREN
2600(2100)
FAWP
LSC07
3500
(3000)
LSC06
4300
(3300/3800)
1100(3610)
3610+500=4110

LAN commitment with RNP

- As we need to improve access to some airports, RNP is envisaged as the best solution.
  - RNP avionics upgrade.
  - RNP procedures requested and/or proposed were needed.
- Within the CNS/ATM program.
  - ADS-B (22 aircraft already equipped with ADS-B out)

LAN commitment with RNP

- We currently have an All-FMS equipped fleet.
  - B767 (Non-GPS and GPS)
  - A340 (FANS and GPS)
  - A320 Family (GPS and RNP AR)
- Future fleet
  - B777F
  - B787

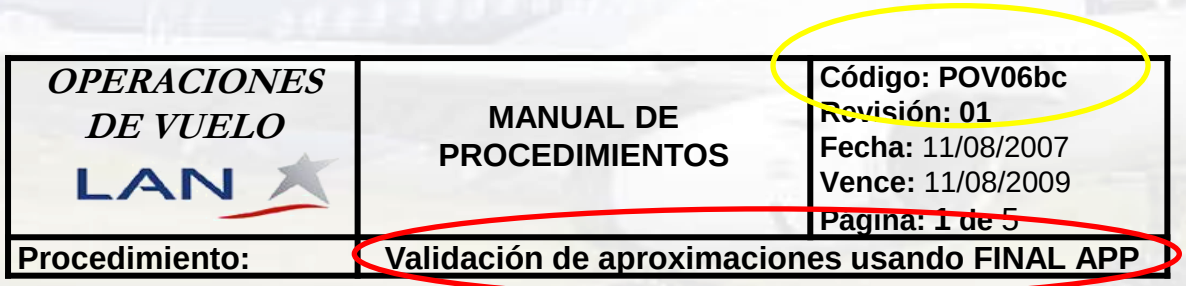
Nav Database Integrity

- ISO procedure designed for Nav Database integrity.
- Each AIRAC cycle the Nav Database is revised for changes affecting LAN´s operations.
- A “sticker” is inserted in the diskettes used for database loading.

OPERACIONES DE VUELO LAN	**MANUAL DE PROCEDIMIENTOS**	**Código:** POV05bc **Revisión: 05** **Fecha:** 22/08/2007 **Vence:** 22/08/2009 **Página: 1 de 6**
Procedimiento:	**Actualización Bases de Datos de Navegación**	

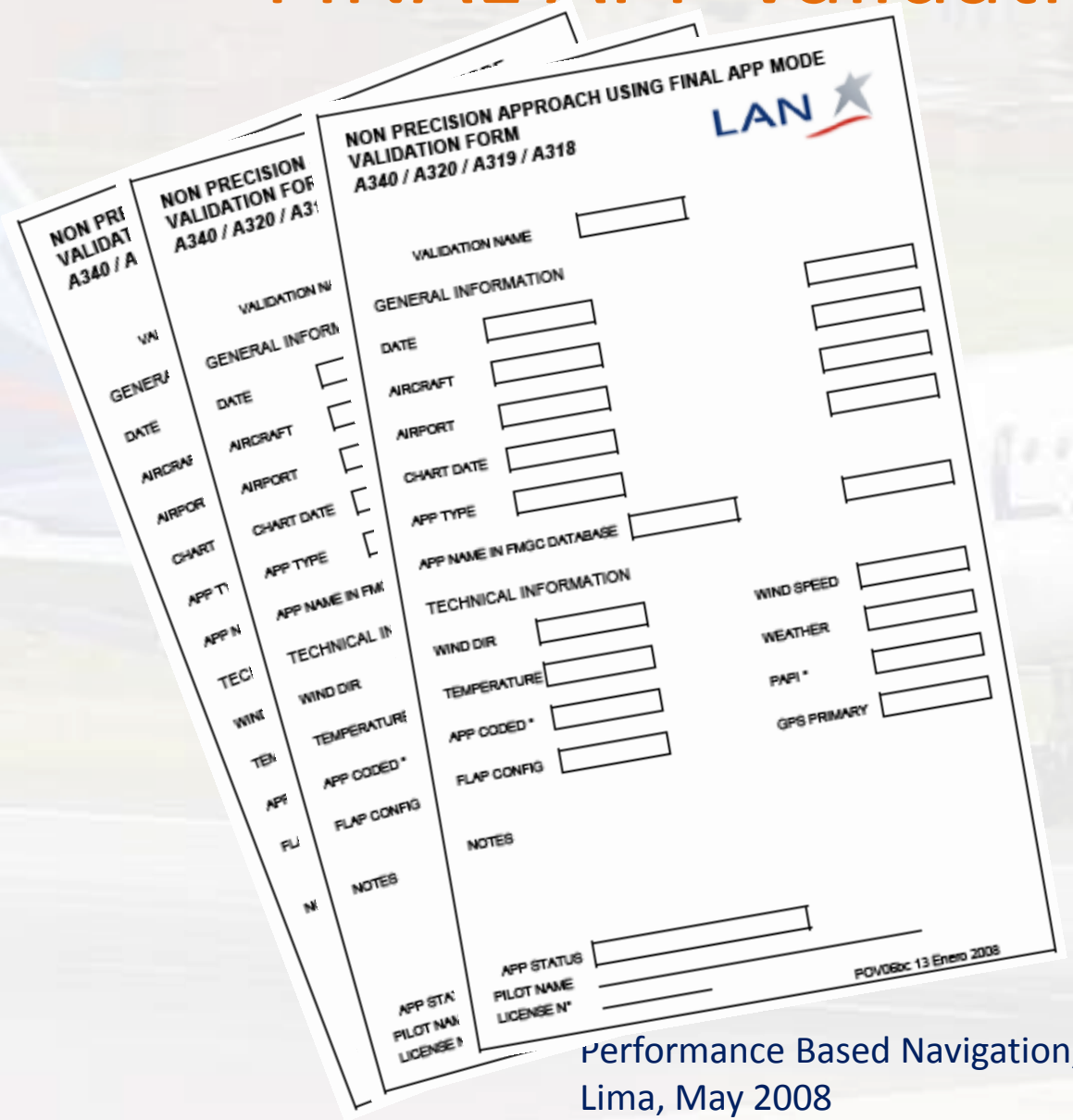
FINAL APP (VNAV Validation)

- ISO procedure designed to validate the use of FINAL APP mode (VNAV) for the Airbus fleet.
- All Non-Presicion Approach (including RNAV & RNP) validated.
- A list is published every cycle in the Route Manual on board.



OPERACIONES DE VUELO LAN	MANUAL DE PROCEDIMIENTOS	**Código:** POV06bc **Revisión:** 01 **Fecha:** 11/08/2007 **Vence:** 11/08/2009 **Pagina:** 1 de 5
Procedimiento:	**Validación de aproximaciones usando FINAL APP**	

FINAL APP validation form



RNP Operations

- Still different depending on aircraft type (Boeing / Airbus)
  - Same aircraft capability does not guarantee RNP AR ops approval.
- FAA Criteria Ops Approval?
- EASA Criteria Ops Approval?

What´s next?

- RNAV/RNP training for ab-initio Pilots / Flight Dispatchers / Air Traffic Controllers.
- RNAV/RNP training for IFR rating courses.

Questions?

Thank you

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