Getting to grips to “High Elevation Airport Operations” project

Presented by
Capt JP HOUDIN, Flight Ops Support Director

AIRBUS

高海拔机场运营 High Elevation Operation

8 Chapters to be developed
Airbus task sharing

1. Airport characteristics
2. AC (Advisory circulars) - Regulation
3. Airline experience / Safety analysis
4. Airsafety - Aircrew / Passenger
5. Aircraft and Engine characteristics
6. Aircraft and Engine design
7. Aircrew training
8. Approval process of HEAOps

A/P compatibility
EIYS

Legal dept

STLO

Medical

EV - STL

BS, BL – E - S

STO

S

Status of HEAOps project

Objective

- To prepare a **Airbus Reference document** dealing with High Elevation Airport Operations = **HEAOps**".
- Initiated by Airbus China Flight Operation Department, Captain J.P. Houdin:
  - Leads the building of a specific Document (name to be defined), and ensures regular updates,
  - Establish cooperation with selected worldwide HEA operators and Regulatory departments, (CAAC, EASA, ICAO)
  - Review all aspects links to High Elevation Airport Operations

Peter TIARKS Requirements:

''**Delivery**: The draft Document shall be delivered to ST by December 2013 (project duration estimated with 18 months)''

''Team composition, workload and cost

- The Airbus team will be composed of 8 Members from Airbus China who will have to allocate approximate 20% of their working time. (total of 21 man months) and M.Post from SEU and Larry ROCKLIFF both of them estimated workload of 10% (3.6 man months)
- The cost for travel for coordination meeting with the CAAC and Airlines will be covered in the AOP of each department
- Cost for events with CAAC and Airlines will be covered by Airbus China Government Affairs.''

PROGRESS STATUTS

- CAAC: CAAC review of AC121 pending, next meeting with CAAC Chengdu in May2013.
- Airbus: FEEDBACK Only Marketing dept in Toulouse, (SA, Cargo)
- ACSSO established cooperation with TBA and CCA in Chengdu (Ops feedback and flight data analysis), (still need to do with South US airlines)
- Operational visits in China to explain the performance and A/C mod's
- Growing demand for HEA Operation development – Airline request more support

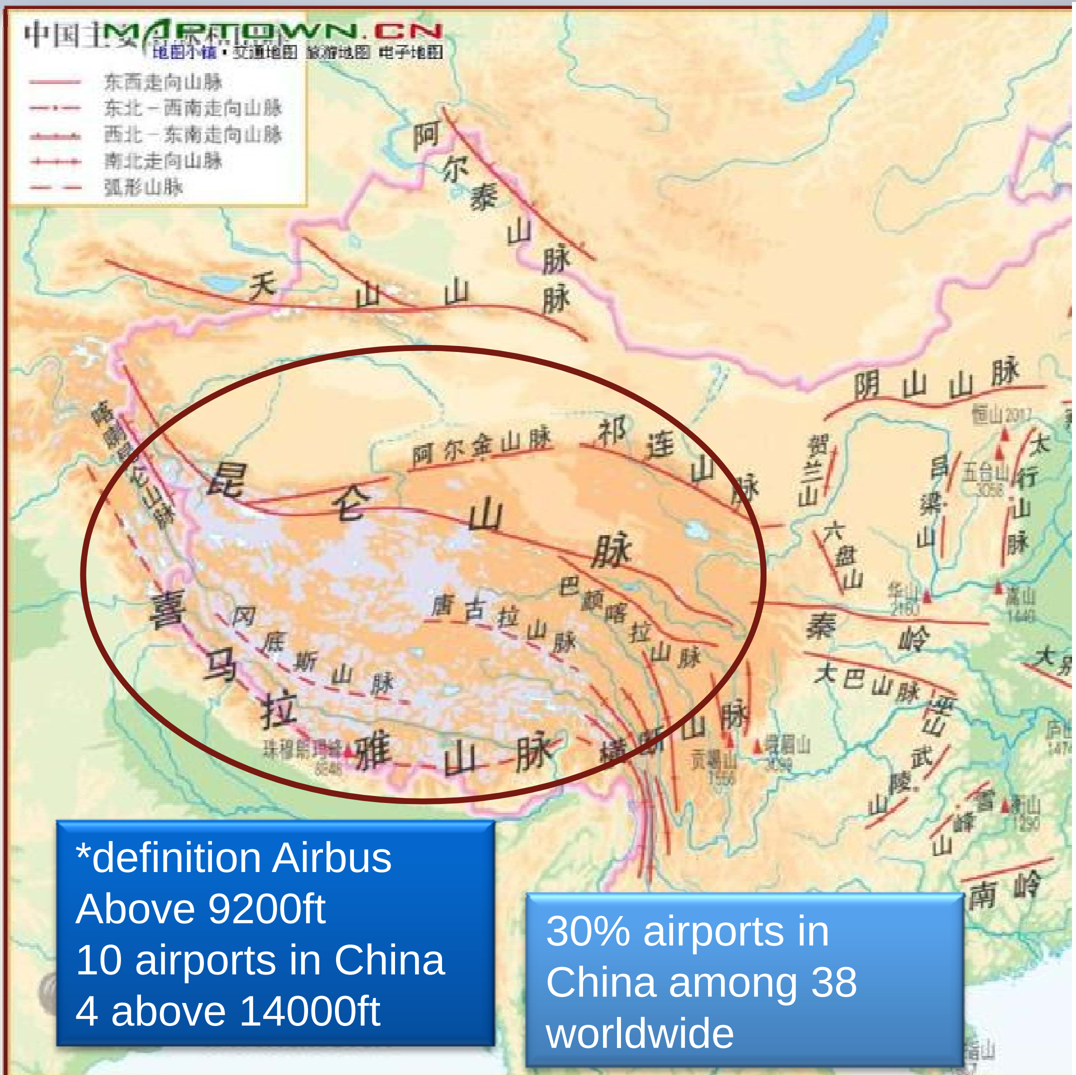
Topics of the Document

Working Group Team Member

	Topics of the Document	Working Group Team Member
1	**Airport characteristics** Terrain, weather (Dry, Hot, Cold), accessibility, alternates – Worldwide map	JP/HOU Maggie
2	**AC (Advisory circulars) - Regulation** Airworthiness involvement	J.P/ BO Juan /CAAC
3	**Airline experience / Safety analysis**	a) Airbus MIA with FAA b) B.Delprat with CAAC, CSC, TBA
4	**Airsafety - Aircrew / Passenger** New area / Medical aspects	B.Delprat and YANG Zhigang
5	**Aircraft and Engine characteristics** Atmosphere and Aerodynamics, Air speed,	STL (JR?, Steve?, Majun)
6	**Aircraft and Engine design**	Eric VR,YANG Zhigang
7	**Aircrew and Ground staff training** • Take off and landing, Flying technique • RNP-AR Approach, • flight envelop, in-flight failures,	Larry ROCKLIFF + Jp HOUDIN,
8	**Approval process / HEAOps Requirements** • Aircraft • Aircrew • Airports	SC (**M.Sherf**)/M.Post from SEU

AIRBUS

High Elevation Airport Worldwide Distribution



*definition Airbus
Above 9200ft
10 airports in China
4 above 14000ft

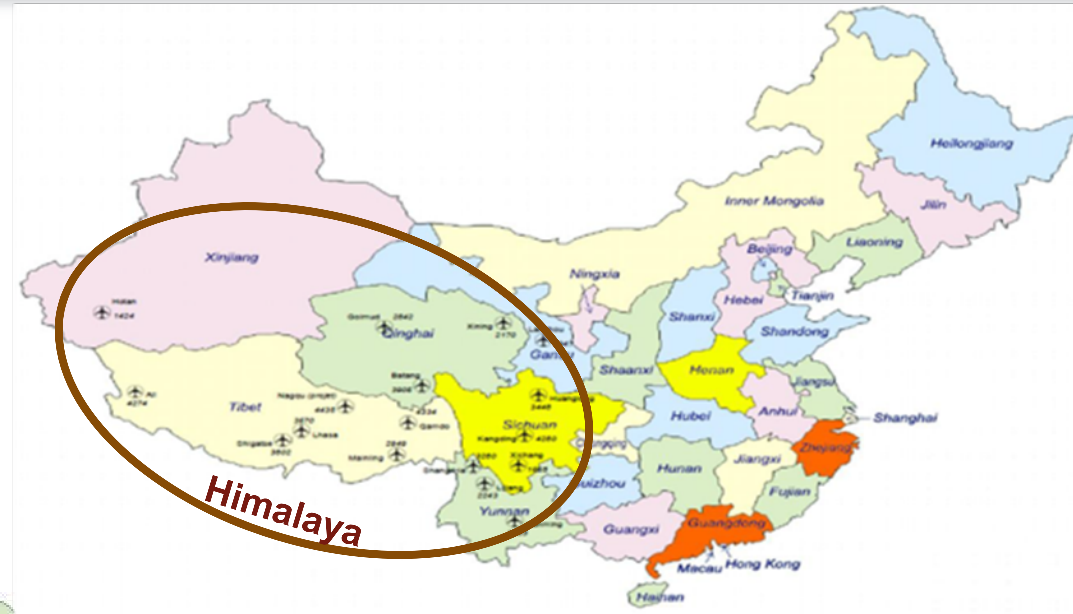
30% airports in China among 38 worldwide

ICAO	City	Country	Province	Elev (ft)
SPRF	San Rafael	Peru	Puno	14422
ZUBD	Qamdo, Bangda	China	Tibet AR	14219
ZUKD	Kangding	China	Sichuan	14042
ZUAL	Gunsa, Ali	China	Tibet AR	14022
VI66	Fukche	India	Jammu & Kashmir	13700
SPVI	Vicco	Peru	Pasco	13461
SLLP	El Alto, La Paz	Bolivia	La Paz	13314
SLCN	Charaña	Bolivia	La Paz	13294
SPNP	Ventilla, Puno	Peru	Puno	13123
SLPO	Potosi	Bolivia	Potosi	12923
ZLYS	Yushu/Batang	China	Qinghai	12812
SPIY	Kauri	Peru	Cuzco	12795
SLCC	Copacabana	Bolivia	La Paz	12595
SPJL	Puno Juliaca	Peru	Puno	12552
ZURK	Shigatse, Heping	China	Tibet AR	12475
SCKP	Coposa	Chile	Tarapacá	12467
SLOR	Oruro	Bolivia	Oruro	12146
TJ0E	Murgab	Tadjikistan	GBAO	11962
ZULS	Lhasa Gonggar	China	Tibet AR	11713
SPHY	Andahuaylas	Peru	Apurimac	11706
SASQ	La Quiaca	Argentina	Jujuy	11414
ZUJZ	Jiuzhai Huanglong	China	Sichuan	11312
SPJJ	Jauja Francisco Carle	Peru	Junin	11034
VNMA	Manang	Nepal	Gandaki	11000
SPZO	Cuzco	Peru	Cuzco	10860
ZPDQ	Deqen Shangri-la	China	Yunnan	10761
VILH	Leh	India	Jammu & Kashmir	10682
KLXV	Leadville (Lake Co)	United States	Colorado	9927
SKIP	Ipiales San Luis	Colombia	Nariño	9740
ZUNZ	Mainling,Linzhi	China	Tibet AR	9675
SETU	Tulcan Luis A Mantilla	Ecuador	Carchi	9649
SLSU	Sucre	Bolivia	Chuquisaca	9527
VNLK	Lukla	Nepal	Sagarmatha	9334
ZLGM	Golmud	China	Qinghai	9324
VNST	Simikot	Nepal	Karnali	9246
SEQU	Quito Mal Sucre Intl	Ecuador	Pichincha	9228
SELT	Latacunga Cotopaxi Intl	Ecuador	Cotopaxi	9207

AIRBUS

High Elevation Airport Worldwide Distribution

South America	>9200 ft
Peru	8
Bolivia	6
Ecuador	3
Others	3



China	>9200 ft
Tibet	5
Qinghai	2
Sichuan	2
Yunnan	1

37 airports are above 9200 ft, 30 are located in South America and China

11 new airports will be built between 2011-2020 in Tibet region

Bangda, the world highest altitude airport

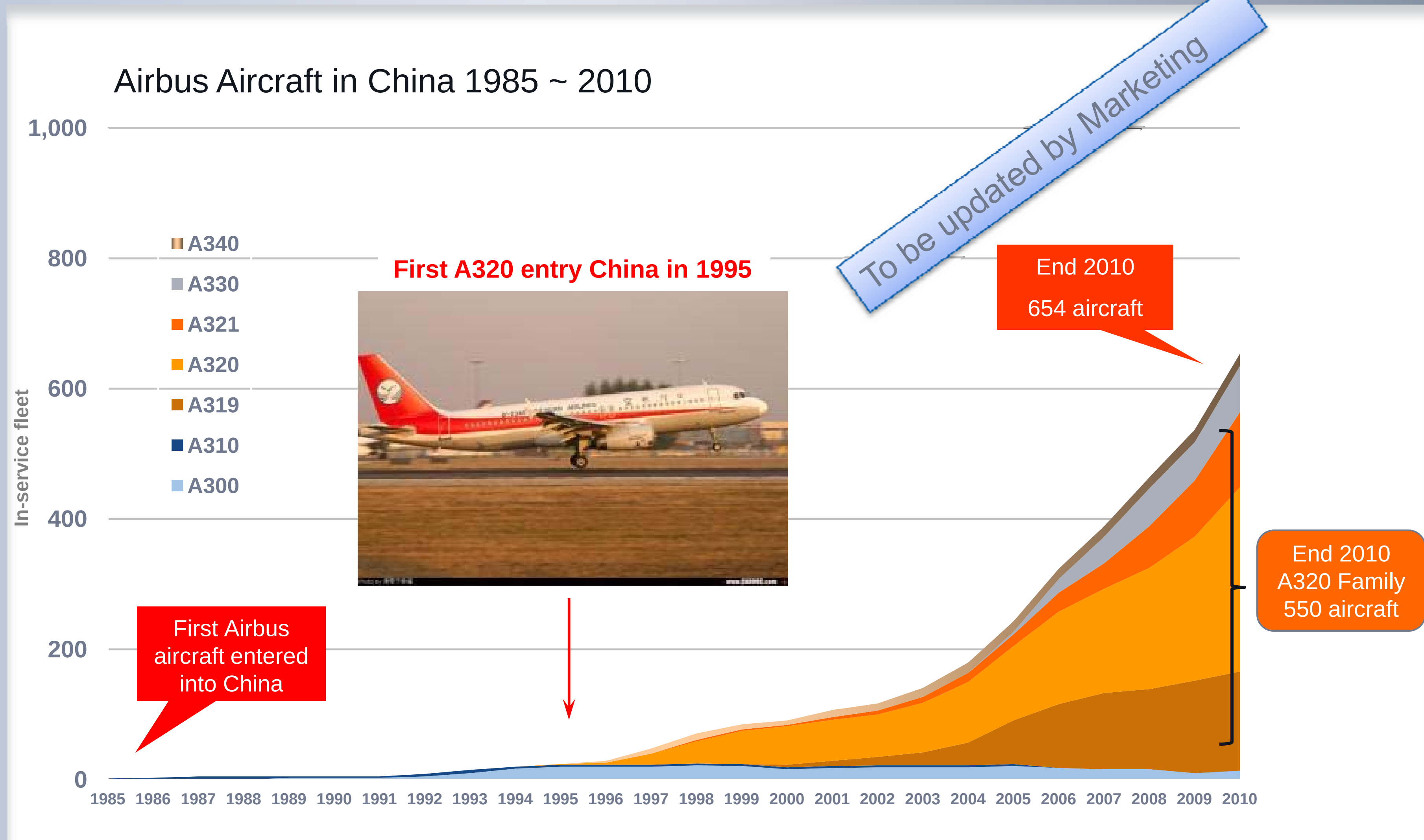
A319 sharklet with CFM56-5B7
124 passengers at 95 kg each
2% fuel conservatism
CAAC domestic flight profile
5% airway allowance
85% annual wind

Bangda
Elevation : 14,213 ft
Runway length : 4,200 m
Temperature : 10°C
Takeoff assuming no limiting obstacles

A319 is in operation with RNP in Ali, Bangda, Lhasa, Linzhi, Yushu, Huangshan, Lijiang, Pangzhihua, Xining, Yanji
Over 80% operations in Tibet are by A319
Over 94% operations in Tibet are by A319+A330

A319 has excellent takeoff performance and range capability from Bangda

Airbus, from a new comer to a major player



Airbus aircraft are preferred for Tibet operations

OAG, Aug., 2009

	Flights/week	Airline	AC Type
LAX-CTU：	28	CSC	A319
	42	CCA	A319
	21	CCA	A330
	2	CCA	757
LAX-CTU-PEK：	7	CCA	A330
PEK-LXA：	7	CCA	A330
BPX-CTU：	6	CCA	A319
BPX-LXA：	1	CCA	A319
LXA-CKG：	7	CSC	A319
	7	CCA	A319
	7	CSN	A319
	7	CSN	A333
	7	CSZ	A319
LXA-XIY：	7	CHH	A319
	14	CES	A319
LZY-CTU：	12	CCA	757
LZY-KMG：	7	CES	737
LXA-DIG-KMG：	7	CES	737
LXA-KTM：	5	CCA	A319

To be updated by Marketing

Market Share	
A319:	68%
A330/A333:	18%
737:	7%
757:	7%

Airbus tacked about 86% of HEA operation

AIRBUS

Airbus aircraft are preferred for Tibet operations

OAG, Jan., 2010

	Flight/week	Airline	AC Type
LAX-CTU：	21	CSC	A319
	20	CCA	A319
	7	CCA	A330
LAX-CTU-PEK：	7	CCA	A319
BPX-CTU：	6	CCA	A319
BPX-LXA：	1	CCA	A319
LXA-CKG：	7	CSC	A319
	3	CCA	A319
	7	CSN	A319
LXA-XIY：	3	CES	A319
LZY-CTU：	4	CCA	757
	3	CCA	A319
LXA-KTM：	3	CCA	A319

To be updated by Marketing

Market Share

A319:	88%
A330:	8%
757:	4%

In winter, A319 tacked about 90% of Tibet market

AIRBUS

South America Airbus operation

High Elevation Airports

Airports with Elevation > 9,200ft

Airport_IATA	Airport_ICAO	Airport_Name	Country	Elevation	A319/A330 Ops.
LTX	SELT	LATACUNGA/COTOPAXI	Equador	9206	N/A
UIO	SEQU	QUITO / MARISCAL SUCRE INTL	Equador	9228	A319 and A330
TUA	SETU	TULCAN	Equador	9636	N/A
IPI	SKIP	IPIALES / SAN LUIS	Columbia	9740	N/A
LPB	SLLP	LA PAZ / EL ALTO INTL	Bolivia	13313	A319
POI	SLPO	POTOSI	Bolivia	12913	N/A
SRE	SLSU	SUCRE	Bolivia	9527	N/A
JAU	SPJJ	JAUJA	Peru	11034	N/A
JUL	SPJL	JULIACA	Peru	12552	A319
CUZ	SPZO	CUZCO	Peru	10860	A319

* A319s have been operated in UIO, LPB, JUL, and CUZ, and A330s in UIO only.

1

South America flights

High Elevation Airports

Number of Flights of A319 and A330 (2005-2011)

Sum of number of flights per month	Column Labels							
Row Labels	2005	2006	2007	2008	2009	2010	2011	Grand Total
319	**1136**	**2370**	**7264**	**8919**	**12039**	**11571**	**12013**	**55311**
JUL		296	1067	1346	1560	1440	1431	7140
CUZ	257	1483	4757	5709	7500	7376	7054	34136
LPB	879	287	519	399	690	493	429	3694
UIO		304	921	1466	2289	2263	3099	10341
330	**111**	**189**	**261**	**257**	**266**	**43**		**1127**
UIO	111	189	261	257	266	43		1127
Grand Total	**1247**	**2559**	**7526**	**9176**	**12304**	**11614**	**12013**	**56439**

AIRBUS

China Airport Statistics

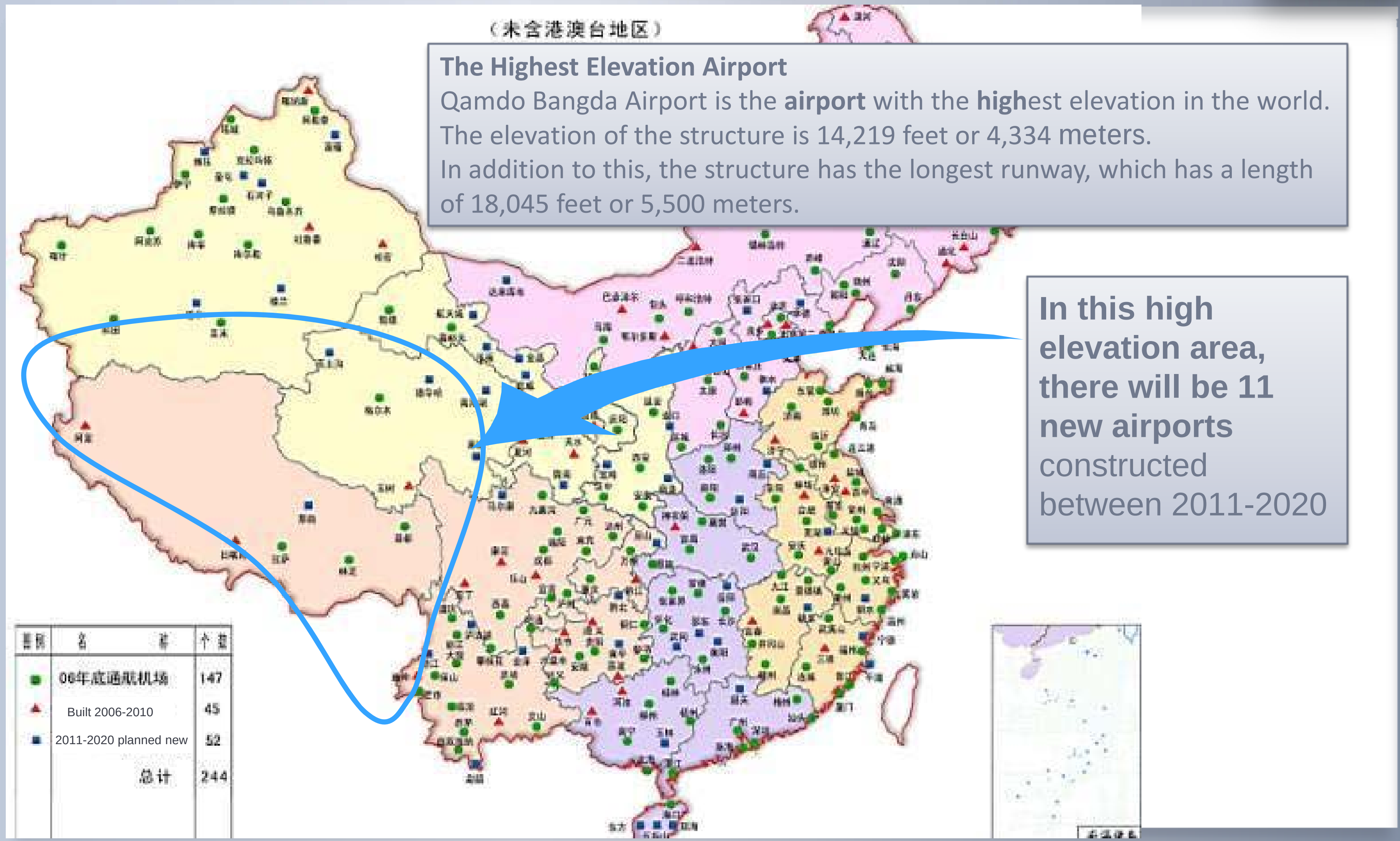
High Elevation Airports

ICAO	City	Elev (ft)	Take-off procedures type	Landing procedures type	Type of A/C	Number of flights /year /A/C	Average T (˚C)	Min T(˚C)	Max T(˚C)	Visibility (m)	Precipitations	Wind speed	Wind direction	obs
ZUBD	Qamdo (Bangda)	14219												
ZUKD	Kangding	14042												
ZUAL	Gunsa, Ali	14022												
ZLYS	Yushu/Batang	12812												
ZURK	Heping	12475												
ZULS	Lhasa Gonggar	11713												
ZUJZ	Jiuzhai	11312												
ZPDQ	Deqen Shangri-la	10761												
ZUNZ	Mainling Linzhi	9675												
ZLGM	Golmud	9324												

waiting for data from CAAC
Requested in june 2012 request

High Elevation Airport characteristics

Chinese projects



The Highest Elevation Airport

Qamdo Bangda Airport is the **airport** with the **high**est elevation in the world. The elevation of the structure is 14,219 feet or 4,334 meters. In addition to this, the structure has the longest runway, which has a length of 18,045 feet or 5,500 meters.

In this high elevation area, there will be 11 new airports constructed between 2011-2020

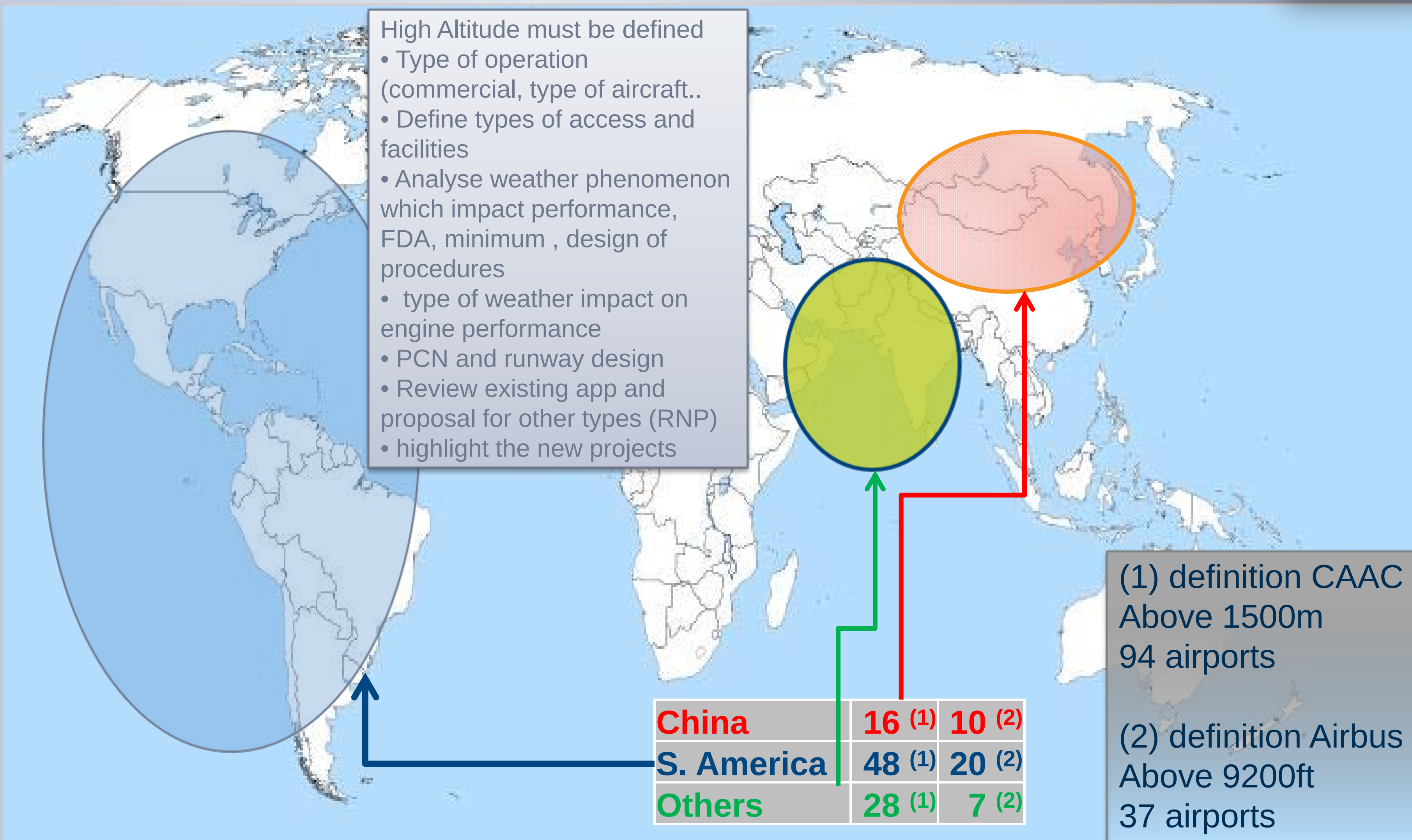
On Nov. 23, Daocheng Yading Airport, the world's highest civil airport at an elevation of 4,441 meters, welcomed the first landing of an Air China Airbus A319 passenger aircraft, registration B-6226. The aircraft then took off again and made test flight successfully in the airport' airspace, marking that the world's highest civil airport is going to be put into operation soon.

Located 50 km from Daocheng County of the Tibetan Autonomous Prefecture of Garze, southwest China's Sichuan Province, the regional airport is a 4C-class airport, with a 4,200-meter-long runway and four tarmcs. The 4,441-meter-high airport has surpassed Tibet Changdu Bangda Airport which is at an elevation of 4,334 meters, becoming the highest civil airport in the world.

The airport, which has completed the construction on August 29, 2012, is expected to be put into operation in May 2013. After the operation of the airport, it will take only one hour for tourists flying from Chengdu, the capital of Sichuan Province to Daocheng.

High Elevation Airport characteristics
Worldwide map

High Elevation definition



High Altitude must be defined
- Type of operation (commercial, type of aircraft..
- Define types of access and facilities
- Analyse weather phenomenon which impact performance, FDA, minimum , design of procedures
- type of weather impact on engine performance
- PCN and runway design
- Review existing app and proposal for other types (RNP)
- highlight the new projects

China	16 (1)	10 (2)
S. America	48 (1)	20 (2)
Others	28 (1)	7 (2)

(1) definition CAAC
Above 1500m
94 airports

(2) definition Airbus
Above 9200ft
37 airports

Regulation

Authorities involvement (EASA-CAAC-FAA) ICAO

CAAC Flight Standards Department

Advisory Circular

AC No: AC－121－21

Issuing Date: March 2, 2007

Initiated by: Operations Management Division

Approved by: Jiang Huaiyu

High Elevation Airport Operation Regulation for Air Carriers

1. Purpose

1.1 As the further extension of CCAR－121, this advisory circular is issued to provide guidelines for air carriers (hereinafter "airlines") who apply for high elevation airport operation and implement safety management at high elevation airport.

1.2 This advisory circular is issued to assist CAAC in approving and supervising high elevation airport operation.

Federal Aviation Administration

Memorandum

Date: May 26, 2006

To: Manager, Seattle Aircraft Certification Office, ANM-100S

From: Manager, Transport Airplane Directorate, ANM-100

Prepared by: Clint Jones, ANM-150S

Subject: INFORMATION: Equivalent Level of Safety Finding for High Altitude Landing Operations for Boeing 737 Model Airplane (FAA Project Number TD0770SE-T)

Memo No.: TD0770SE-T-S-1

Reg. Ref.: §§21.21(b)(1); 25.841(a),(b)(6), &(b)(8); 25.1309(c); and 25.1447(c)(1)

Background

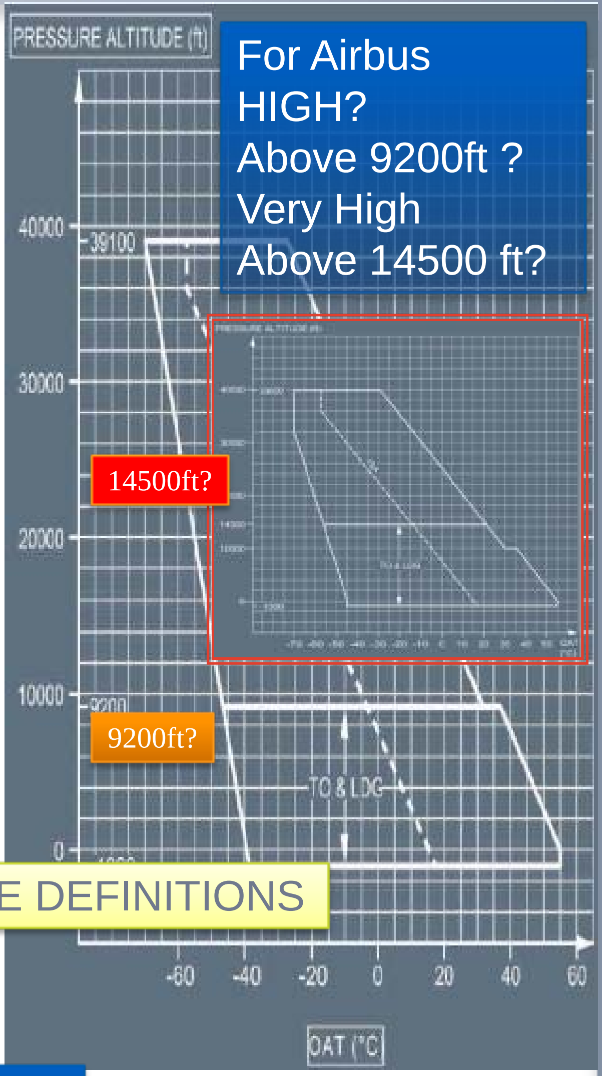
In accordance with the provisions of § 21.21 (b)(1), Boeing submitted a request for an equivalent level of safety to the requirements of § 25.841(b)(6) when applied to the 737-600/-700/-700C/-800/-900 take-off and landing operations at airports with field elevations between 8,000 feet and 14,500 feet. Boeing wishes to obtain approval for takeoff and landing operations at airports with elevations up to 14,500 feet and to do so without activation of the 10,000 feet cabin altitude warning. Boeing has designed a dual limit cabin altitude warning system that they believe will provide an equivalent level of safety (ELOS) to the requirements of § 25.841 (b)(6). Boeing documentation calls this the High Altitude Operation system.

Applicable regulation(s)

§§ 21.21(b)(1); 25.841(a),(b)(6), and (b)(8); 25.1309(c); and 25.1447(c)(1)

Regulation(s) requiring an ELOS

§ 25.841(b)(6)



For Airbus HIGH?
Above 9200ft ?
Very High
Above 14500 ft?

Very High	CAAC Above 8000 ft 10 airports
High 4922ft 1500m	CAAC Above 4922 ft 5 airports

We need TO STANDARDIZE THE DEFINITIONS

Proposal: HIGH from 10000ft to 15000ft

CAAC

High Elevation Airports includes General High Elevation Airports and Very High Elevation Airports

Very High Elevation Airports

\> 8000 ft (2438 m)

General High Elevation Airports

\> 4922 ft (1500 m)

AIRBUS

Increasing number of

high elevation airports built or planned

in China in recent years, especially in the Xizang Province.

Safety issue :

high altitude operations are more challenging.

October, 28-29, 2004 : Seminar on High Elevation Airport Operation Management and Support, held by CAAC in Chengdu, with regional administration offices and airlines.

CAAC Advisory Circular

AC-121-21, March2, 2007

High Elevation Airport Operation Regulation for Air Carriers

CAAC Advisory Circular
Entry requirements

Airline

- Required experience different if the airline is based or not at high elevation
- Staff skills related with very high elevation operations

Aircraft

- Respect of the flight envelop
- Special oxygen needs
- Technical specifications for very HE (CP, engines, self start capability)

Pilot

- Age
- First officer
- Training
- Captain

Airlines operations management

- Establish a specific manual based on the CAAC-AC
- Adapt the operations management

More details : see *CAAC Advisory Circular_detailed.pptx*
or *CAAC AC HEA.pdf*

CAAC Advisory Circular
Operational requirements

Aircraft maintenance

- 120min ETOPS Standards

Dispatch

- Weather
- Dispatch department
- HEA Operations
- TOW
- Real-time
- Dispatch training

Aircraft performance analysis

- TOW
- V1 / VR / V2
- Landing
- Scheduling
- EOSID procedure
- HEA Operations

Crew training

- Pilots
- Captain at VHEA : experience in line with CCAR 121.469
- Cabin crew : syllabus adapted for HEA Training incorporated to the annual training

Demonstration flight

- Required for all aircrafts at very high elevation airport
- Below, CAAC decides whether it is necessary or not

Aviation sanitation

- Oxygen
- Crew health recommendations at very high elevation
- Contingency plan for plague

More details : see *CAAC Advisory Circular_detailed.pptx* or *CAAC AC HEA.pdf*

Airline experience / Safety analysis

1 History of airline operating at HEA

2 Safety reports

3 Performance reports

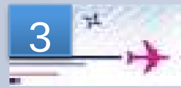
4 Commercial reports

5 Participation airlines

Comments:
- REVIEW OF experience
- PERFORMANCE
- SYSTEMS,
- SAFETY

Questions:

AIRBUS



Airline experience / Safety analysis

We need FDA to ISSUE Operating Rules

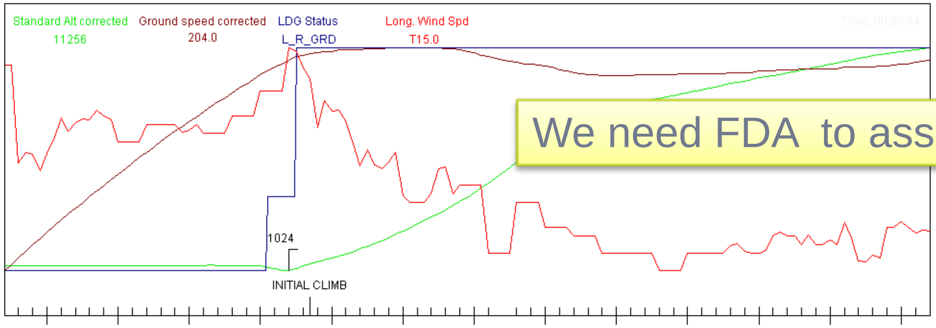
Normal Rotation

V_R

Liftoff

35ft

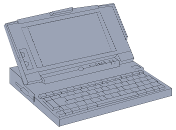
An A319 taking off with a rotation rate that is 1 deg/s slower than normal can result in a 4 to 5 knot liftoff speed increase.



1024 - Tire Limit Speed Exceedence

airfase

We need FDA to assess pilot performance vs speed computation



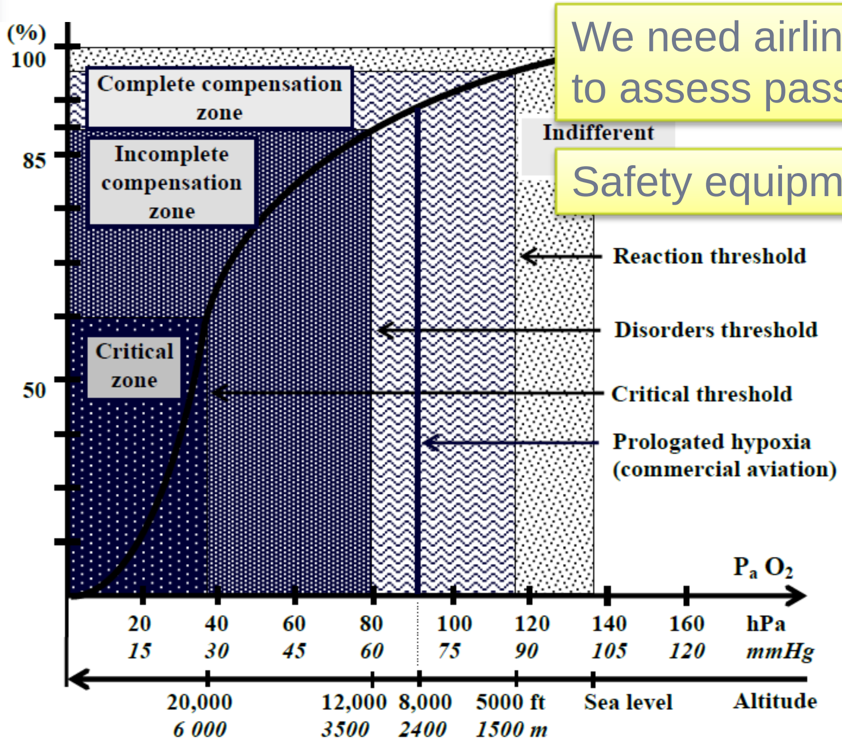
We need quick FDA process to take rapid repair decision

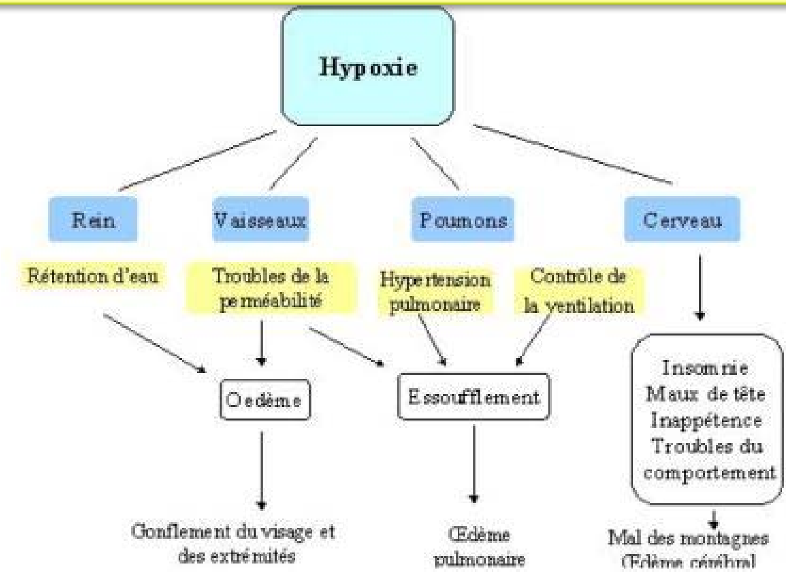
Dispatch

Cabin crew training should take into account hypoxia knowledge

We need airline experience and medical analysis to assess passenger and crew behaviour

Safety equipments could be required on board or at the airport





- 8,000 ft to the threshold of prolonged hypoxia and without excessive fatigue;
- 12,000 ft for the threshold for use of oxygen in all conditions. The threshold of 8,000 ft is that of civil aviation. The threshold of 12,000 ft is that of military regulations (STANAG 3198 AMD) and is quoted in the FAR regulations (Part 91, Part 121 & Part 135).

AIRBUS

5

Aircraft and Engine characteristics

Atmosphere and Aerodynamics, Air speed,

1 Take off performance

2 In flight performance

3 Landing performance

4 Mission payload capability

5 Information and training

6 System failure

7

Comments:
- REVIEW OF experience
- PERFORMANCE
- SYSTEMS,
- SAFETY

Questions:

AIRBUS

- **起飞 Take off**

压力高度
Pressure altitude ↗

起飞距离
TOD ↗

爬升梯度
Climb Gradients ↘

→ 最大起飞重量
MTOW ↘

- **着陆 Landing**
  - 空中着陆距离 **IFLD**

压力高度
Pressure altitude ↗

- 空中着陆距离
IFLD

→ 空中着陆距离
IFLD ↗

复飞 Go Around

发动机推力
Engine Thrust ↘

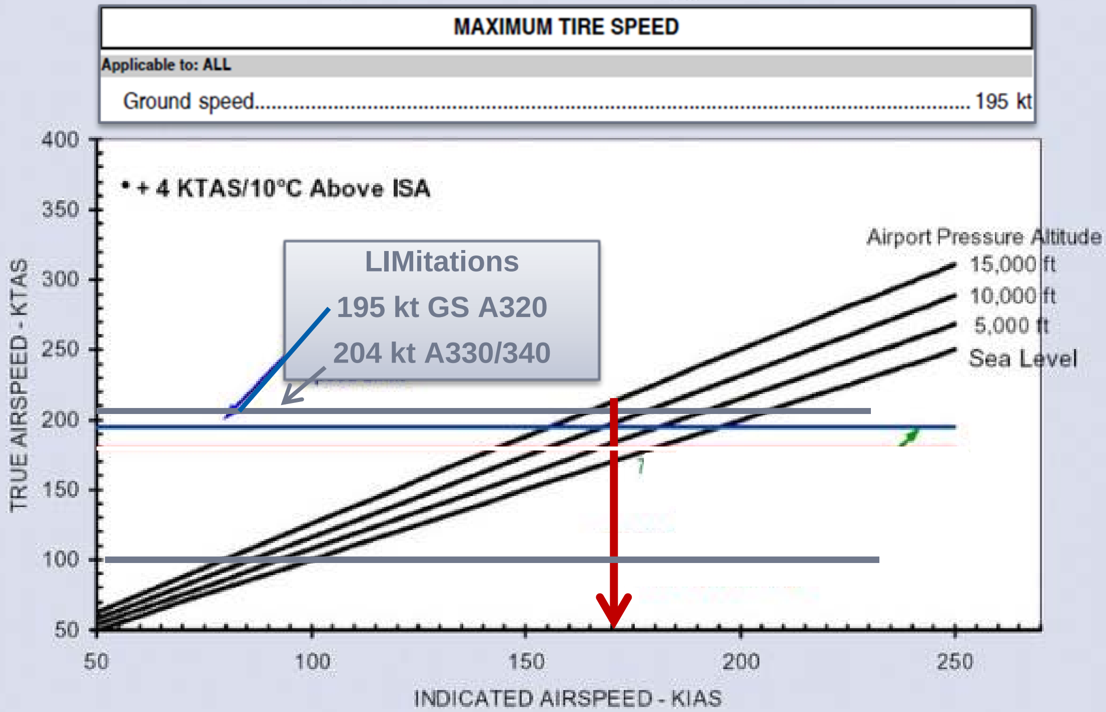
→ 爬升梯度
Climb gradient ↘

5

Aircraft and Engine characteristics

Atmosphere and Aerodynamics, Air speed,

True Airspeed Effects at High Altitudes



Example:
-Code 5 is tire speed limit
- 204kt GS = 170 IAS

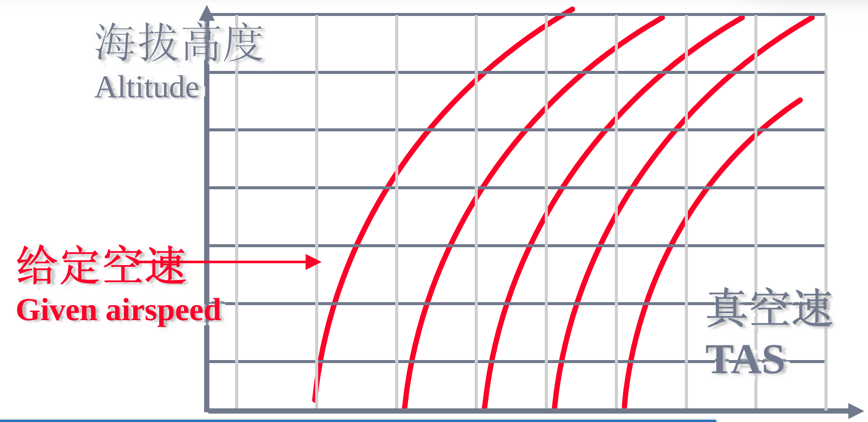
MTOW(1000 KG) codes V1min/VR/V2 (kt)	VMC LIMITATION	Tref (OAT) = 2 C Tmax (OAT) = 31 C	Min acc height 1336 FT Max acc height 2058 FT	Min QNH alt 13049 FT Max QNH alt 13771 FT

LIMITATION CODES:
1=1st segment 2=2nd segment 3=runway length 4=obstacles
5=tire speed 6=brake energy 7=max weight 8=final take-off 9=VMU

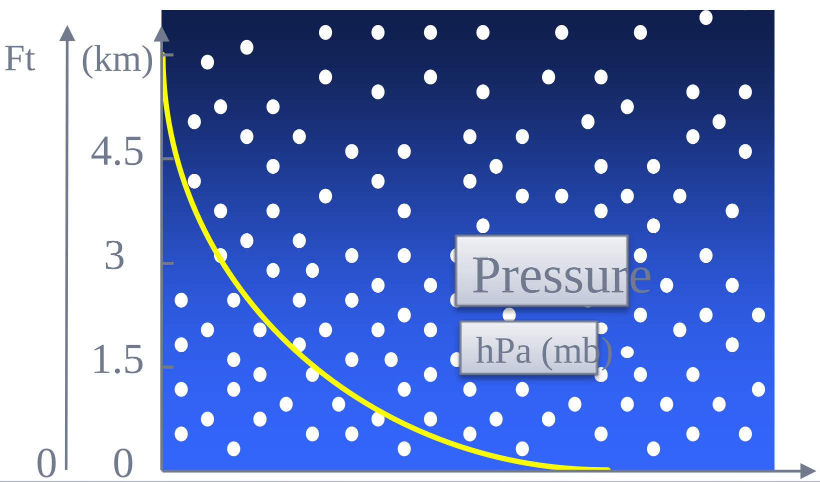
Min V1/VR/V2 = 98/98/99
CHECK VMU LIMITATION
Correct. V1/VR/V2 = 0.3 KT/1000 KG

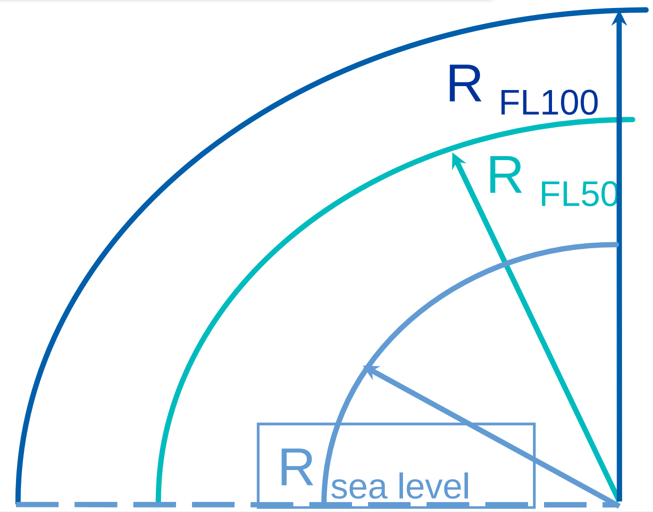
在给定的空速情况下真空速(TAS)随高度的增加而增加.

Flying at a given airspeed leads to increase the A/C TAS with Altitude increase.

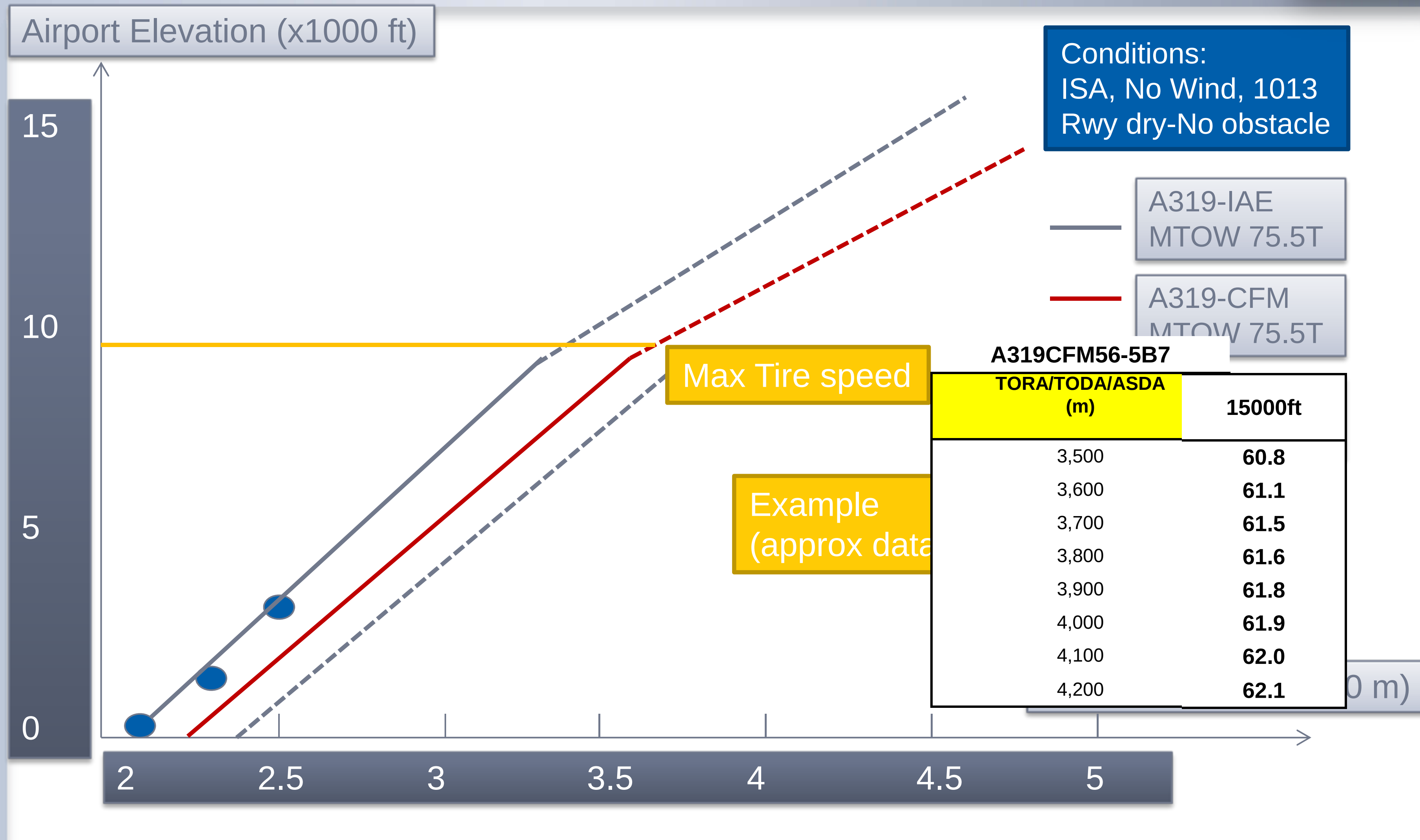


- 对于相同的空速，转弯半径随着压力高度的增加而增加。
- For the same airspeed, radius of turn increase with pressure altitude increase.





5 Required Runway length vs Airport Elevation



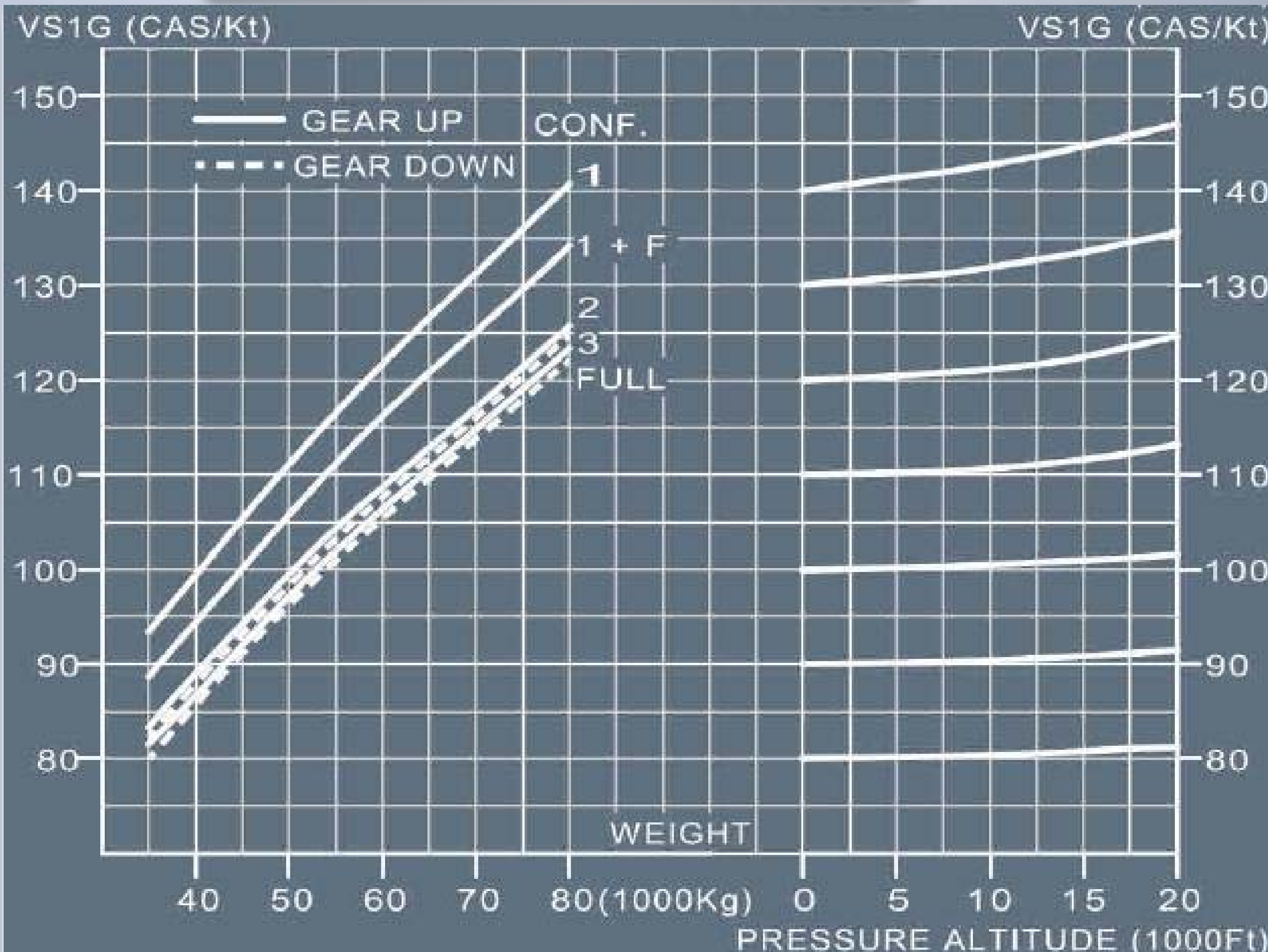
A319CFM56-5B7

TORA/TODA/ASDA (m)	15000ft
3,500	**60.8**
3,600	**61.1**
3,700	**61.5**
3,800	**61.6**
3,900	**61.8**
4,000	**61.9**
4,100	**62.0**
4,200	**62.1**

5

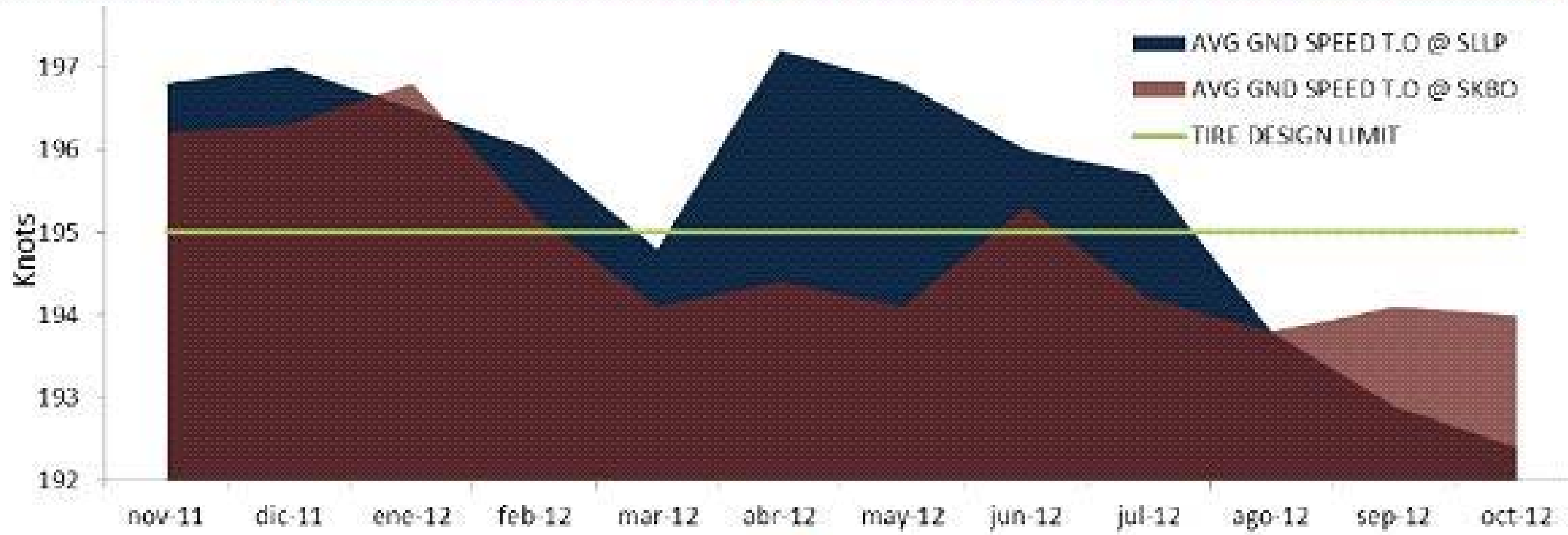
Aircraft and Engine characteristics

Atmosphere and Aerodynamics, Air speed,



An increased limit from 195kt to 197kt or a new tire design would reduce significantly the revenue lost

October 2012 | Wheel's overspeed events during Take Off L12M



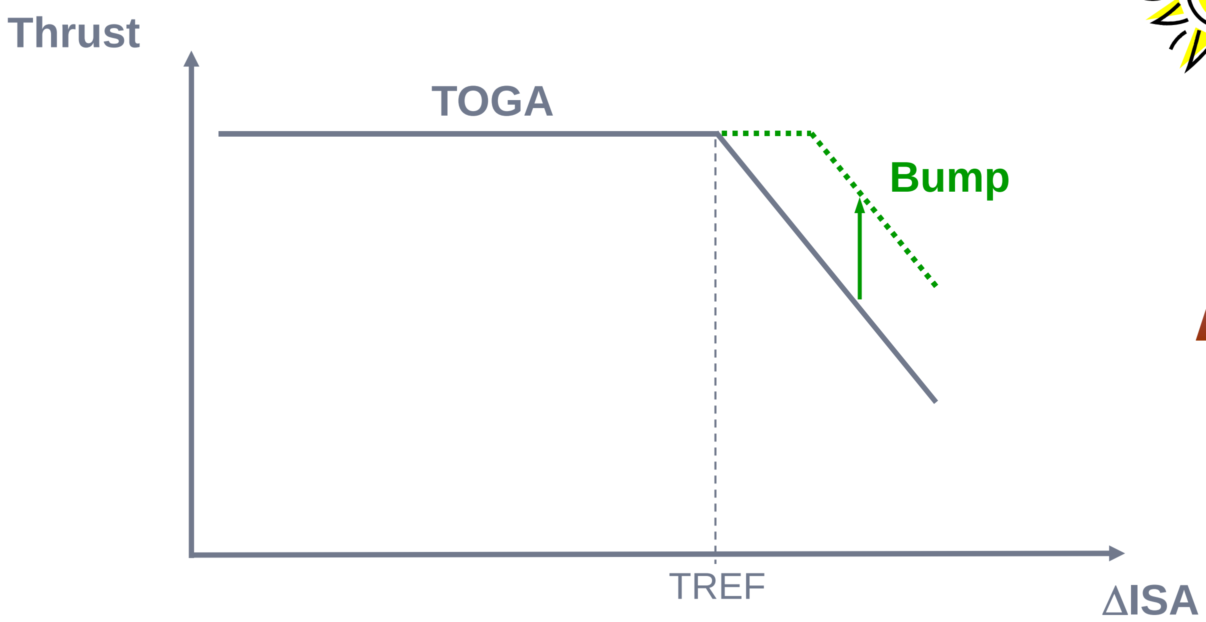
Corrective actions after this kind of events **increases revenue lost** as well as preventive actions.

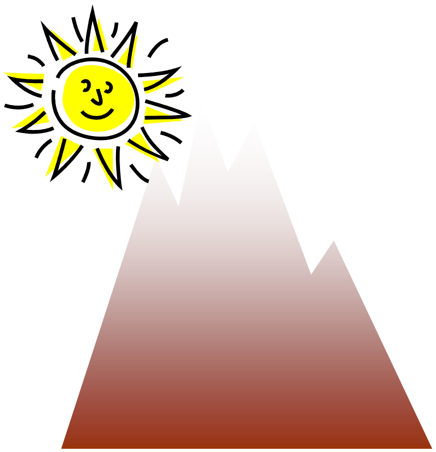
Avianca has reduced those events in SKBO by changing the **rotation technique policies**, and **aircraft take off configuration,** but for flights departing **from SLLP** it has been necessary to **reduce the payload** capacity (**~2 TON**)

Performance Benefit

Bump option is effective for hot and/or high conditions

- Bump option increases TOGA thrust rating (up to 10%)





AIRBUS

A319 has more RNP ops approvals ……

Airport list of RNP AR in China - A319

Airport	Type	Design	Status
Bangda	**A319**	**Naverus**	**In operation**
Jiuzhai	A319	Naverus	In process
Lhasa	**A319**	**Naverus**	**In operation**
Linzhi	**A319**	**Naverus**	**In operation**
Yushu	A319	Naverus	In process
Huangshan	A319	Quovadis	In operation
Lijiang	A319	Quovadis	In operation
Panzhihua	A319	Quovadis	In process
Xining	A319	Quovadis	In process
Yanji	A319	Quovadis	In operation
Lhasa	**A330**	**Naverus**	**In operation**
Sanya	A330	Quovadis	In process

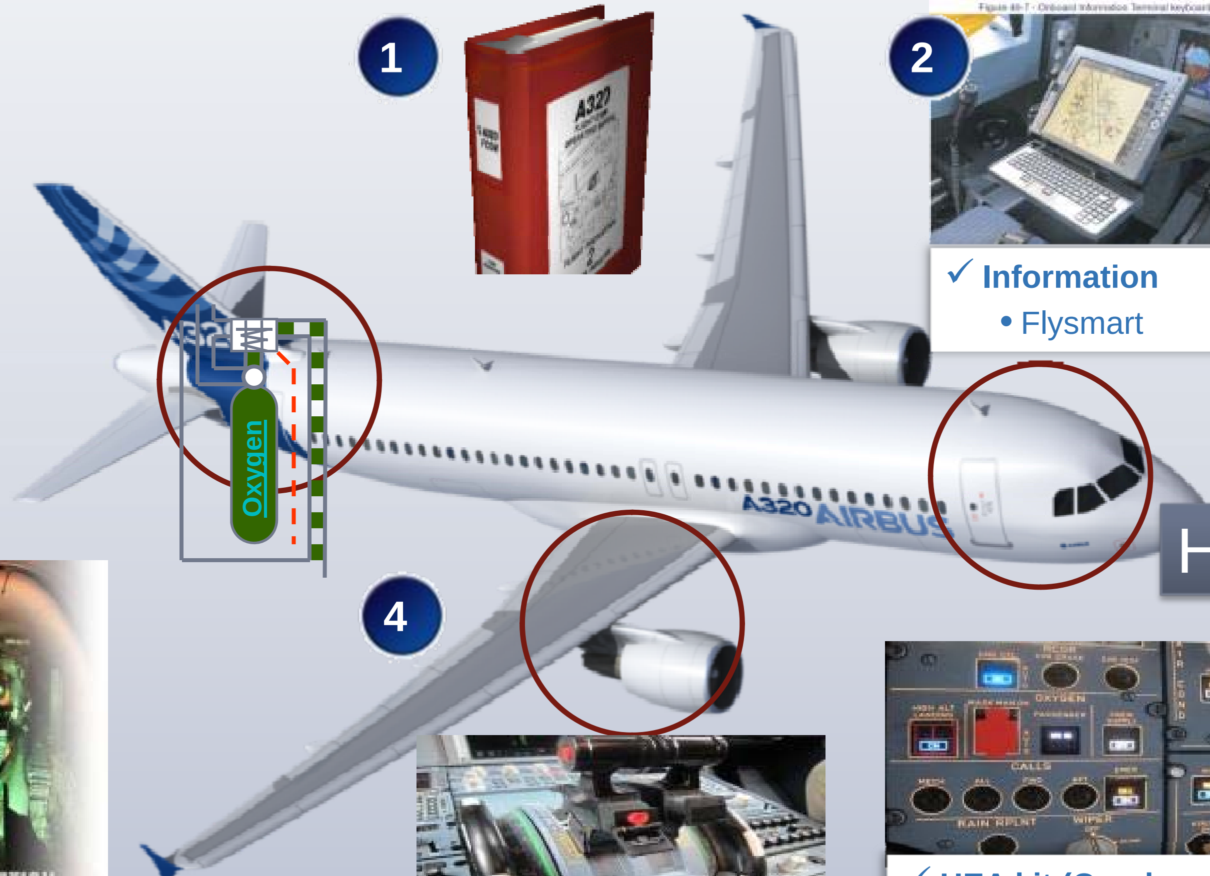
Airport list of RNP AR in China - 737-700

Airport	Type	Design	Status
Lijiang	B737-700	Jeppesen	In operation
Linzhi	B737-700	Jeppesen	In operation

…… and is operating on all of high altitude airports

6 Aircraft and Engine design – Customisation

Special design and equipments, new systems (FAN, ATSAW)



1

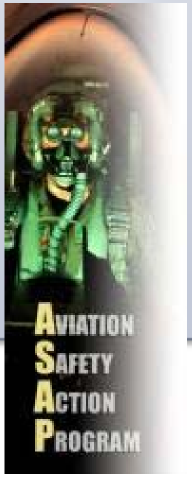
2

✓ **Information**
- Flysmart

3

✓ **Systems**
- FMGC (RNP-AR)
- FANS
- ATSAW
- FWC

HEAOps requests



4

5

✓ **Engines**
- FADEC
- BUMP

6

✓ **HEA kit (Overhead panel)**
- Pressurisation
- Oxygen

7

✓ **BRAKING**
- Brake fan
- Wheels

AIRBUS

6

Aircraft and Engine design – Customization

From Gijs TOORENAAR,Customization Account Director

Special design and equipments, new systems (FAN, ATSAW)

- High altitude operations depend much on the local airworthiness authorities requirements.
- For example, the CAAC requires a 55mn passenger oxygen supply in case of emergency decent. However, other high altitude configurations not in CAAC jurisdiction could have the basic 15 mn oxygen supply or the optional 22 mn.

  This also depends on the emergency descent possibilities.
- All Chinese high altitude configurations have the highest thrust engines installed but please note that other configurations could have engines with less thrust. This has to be calculated on a case by case basis.

For China,

- Increased design weights MTOW 70T, MLW 62.5T, MZFW 58.5T (WV 005)
- Certification for high altitude ops up to 14500 ft (this installs, amongst others, the switch NORMAL/HIGH ALT in passenger oxygen system)
- Extended duration of passenger gaseous oxygen system
- Highest thrust engine IAE or CFM
- CPC (SA)

Please note that the gaseous oxygen system is not retrofitable according the program policy note attached.

- Concerning the communications system, CES used to have 2 HF transceivers but this has changed to 1 HF and one SATCOM with cockpit voice interface.
- The dual advisory ice detection system could be useful.

Other configurations outside China include options as:

- Water/waste freezing protection for extended flight conditions
- 15 knots tailwind certification at landing
- 15 knots tailwind certification at take off

AIRBUS

6

Aircraft and Engine design

Special design and equipments, new systems (FAN, ATSAW)

Existing Mod's – To be updated

A319 / A320 / A321 Certification Status

Models	Airbus Modification	Maximum Altitude for Takeoff and Landing (ft)	System Change	Specific Procedure
320-111 320-211 320-212 320-231	Basic	8000	-	-
320-111 320-211 320-212	MOD 23871	9200	-	-
320-214 320-232 320-233	Basic	9200	-	-
320-231	MOD 23108 Or MOD 23109 Or MOD 23408	9200	-	-
320-231 (fitted with a 4-wheel bogie)	Basic	8000	-	-
320-231 (fitted with a 4-wheel bogie)	MOD 20127 MOD 21533	12000 (only JAA (1))	NO	YES (2)
320-232 320-233	MOD 25615	14100	YES (3)	YES (4) (Different procedures between JAA and FAA)
All A321 models	Basic	9200	-	-
All A319 models	Basic	9200	-	-
319-115 319-131 319-132 319-133	MOD 25615	14100	YES (3)	YES (4) (Different procedures between JAA and FAA)

(1) Due to the "EXCESS CAB ALT" warning, the FAA does not certify an extension above 9200 ft without a modification of the pressurization system.

(2) The DGAC certified operational procedures for operations above 9200ft, to clear the "EXCESS CAB ALT" warning when triggered.

(3) The CPCS design change prevents the "EXCESS CAB ALT" warning from triggering above 9200 ft. Moreover, a dedicated "HIGH ALT LDG" switch is embodied to prevent oxygen mask deployment.

(4) A specific procedure provides the new "EXCESS CAB ALT" warning setting in high altitude. It also specifies the use of the "HIGH ALT LDG" switch.

AIRBUS

Aircrew and Ground staff training

One day seminar split in Part A + B

Part A : Pilot Briefing

1 — 0900:1000 — Theory

2 — 1015:1100 — **Aicraft performance and systems review**

3 — 1115:1215 — Aircraft handling- flying techniques

1145:1315 — **Lunch/video**

Part B : Simulator exercise (A320 or A330)

4 — 1330:1830

- Each crew perform 2h (2 crews)

AIRBUS

Aircrew and Ground staff training

1 day training- 4h on ground, 2h simulator per crew

Theory

1. Airport design
2. Weather phenomenon
3. Medical aspects

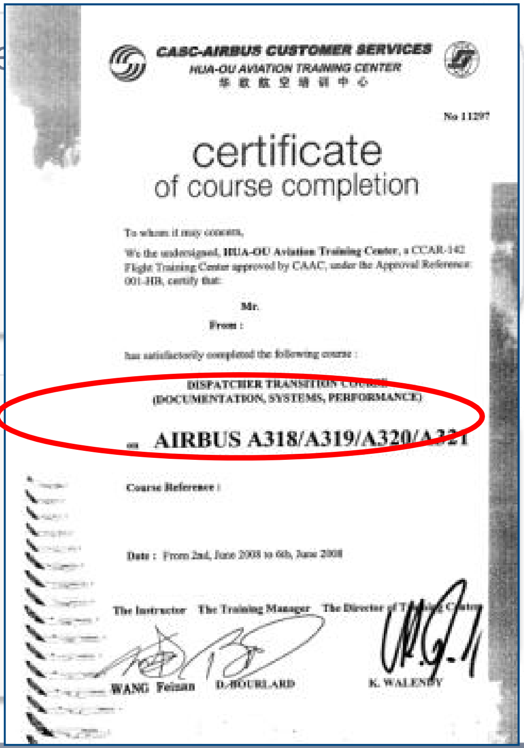
1. Loading envelop (Theory)
2. Multiple Errors or ZFW and T/O speeds
3. GTG to Weight and Balance

Performance

1. Decision Speed – Characteristic spee
2. Gradients all phase of flight
3. Use@doc (FCOM's, MEL)
4. Use of EFB
5. Flight preparation

Flying techniques

1. Rejected Take off –Tire speed
2. All Engine & OEO after T/O
3. In flight Shut down
4. S/F failures
5. Landing safe
6. Go around



CASC-AIRBUS CUSTOMER SERVICES
HUA-OU AVIATION TRAINING CENTER
华欧航空培训中心

No 11297

certificate
of course completion

To whom it may concern,

We the undersigned, HUA-OU Aviation Training Center, a CCAR-142 Flight Training Center approved by CAAC, under the Approval Reference 001-HB, certify that:

Mr.

From :

has satisfactorily completed the following course :

DISPATCHER TRANSITION COURSE
(DOCUMENTATION, SYSTEMS, PERFORMANCE)

on AIRBUS A318/A319/A320/A321

Course Reference :

Date : From 2nd, June 2008 to 6th, June 2008

The Instructor — The Training Manager — The Director of Training Center

WANG Feinan — D. BOURLARD — K. WALENDY

Check list to help the Airline for approval

SEAL OF APPROVAL

1

2

3

4

5

6

7

Operational evaluation of each HEA Ops procedure

- As required, development of specific flight crews procedures.
- Validation of the Navigation database.

Flight Operational Safety Assessment (FOSA)

The use of EASA certified HEA values alleviate the need for a FOSA.

Aircrew and Ground staff training

Operational documentation

Procedure charts, specific flight crew procedures, limitations.
Required equipment.

HEA monitoring program