Economic Impact Assessment and Select Recommendations

Dissimilar Technical Regulatory Requirements Impacting Cross-Border Transfer of Aircraft

A study prepared for the
Aviation Working Group by SGI Aviation

A · W · G
AVIATION WORKING GROUP

SGI AVIATION

Agenda

- Summary
- Aircraft Leasing
- International transfers
- Legal framework
- Certification/Safety objective scales
- Quantitative analysis method
- Qualitative analysis method
- Input
- Output
- Assessment
- Findings
- Recommendations

Summary

Summary (1/4)

Costs of dissimilar requirements

Safety is a **universal objective** for the regulation of air transport

Means by which this is achieved vary between jurisdictions. This causes **dissimilar aviation safety requirements**

These differences particularly surface when aircraft are **transferred** from one jurisdiction to another

Present study estimates that these dissimilar requirements **cost** over US$ 7 Billion over a 20 year period, as follows::

US$	per transfer	annual	20 years
Direct costs	263 K	251 M	5.002 B
Downtime losses	123 K	118 M	2.284 B
Total	386 K	369 M	7.286 B

Summary (2/4)

Cause groups

The majority of these costs result not because of material safety differences, but because of:

- **Dissimilar requirements** intended to meet **similar safety objectives** (58%);
- **Duplication** of work (20%);
- **Non-safety instigated differences**, such as airspace architecture (15%).

Only 7% is a direct result of **different safety objectives**.

Summary (3/4)

Universal harmonisation

Key to reducing such costs is (further) **universal harmonisation** of requirements and their application. This will increase level of safety as a result of:

- Increased multi-jurisdictional cooperation between aviation safety oversight organisations
- Reduced duplication of work;
- Freeing up of limited global rulemaking resources to focus on critical areas

Summary (4/4)

23 recommendations

A qualitative assessment of the effects of the dissimilar requirements leads to 23 **findings** and as many **recommendations**.

The latter are referred to the following policy makers, in the following numbers:

- ICAO: 12
- ICAO + states: 1
- States: 6
- US + EU: 1
- FAA + EASA: 1
- FAA + EASA + other states: 2

Aircraft Leasing

Growth in leasing

Operating leases and operator ownership

Trends (jet transport aircraft)

Operating leases become increasingly important.

Share has grown to 32% in 2009 and still growing.

Share of leasing between operators is small and remains steady.

	Fleet total	Operating leases	Inter-operator leases
1989	8,915	7%	2%
1998	11,953	25%	2%
2009	19,604	32%	< 1% *

* international transfers only

Definitions

Operating leases: leasing company owns an aircraft and leases it to an operator, who has operational control. Typical duration is several years

Inter-operator leases: leasing between two operators. Typical duration is shorter, anything between one flight day and one year

International transfers

The transfer as crystallisation point

Transfers reveal regulatory-induced inefficiencies

Rationale

The majority of regulatory-induced inefficiencies become apparent when an aircraft is transferred from one jurisdiction to another.

The transfer can therefore be regarded as the **crystallisation point** of the underlying inefficiencies.

While certain costs and losses arising from the transfer process are acceptable consequences of international trade, others are not, going far beyond what is necessary to maintain the highest aviation safety standards.

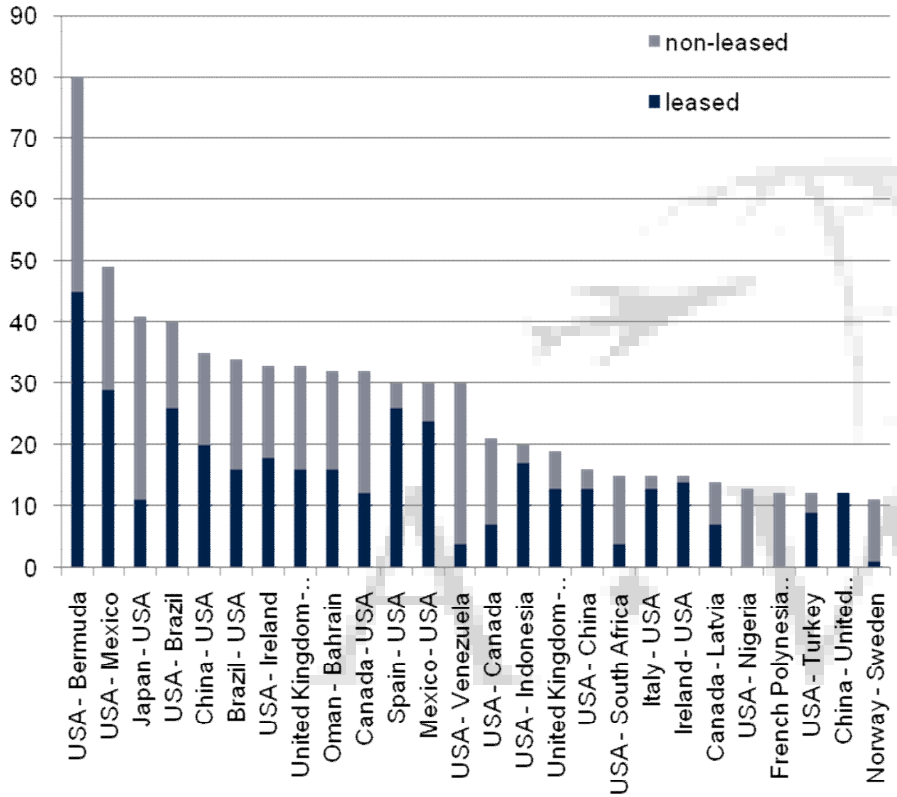
Study approach

1. Determine number of transfers
2. Analyse who 'owns' the transfers
3. Collect from those 'owners' data on regulatory-induced issues associated with transfers
4. Collect data on direct costs and downtime losses from the 'owners'. This is the **quantitative analysis** of inefficiencies.
5. Determine effect of those issues. This is the **qualitative analysis**.

Aircraft transfers 2007-2008-2009

State combinations (EU member states divided)

Combinations with 11 or more transfers



Observations

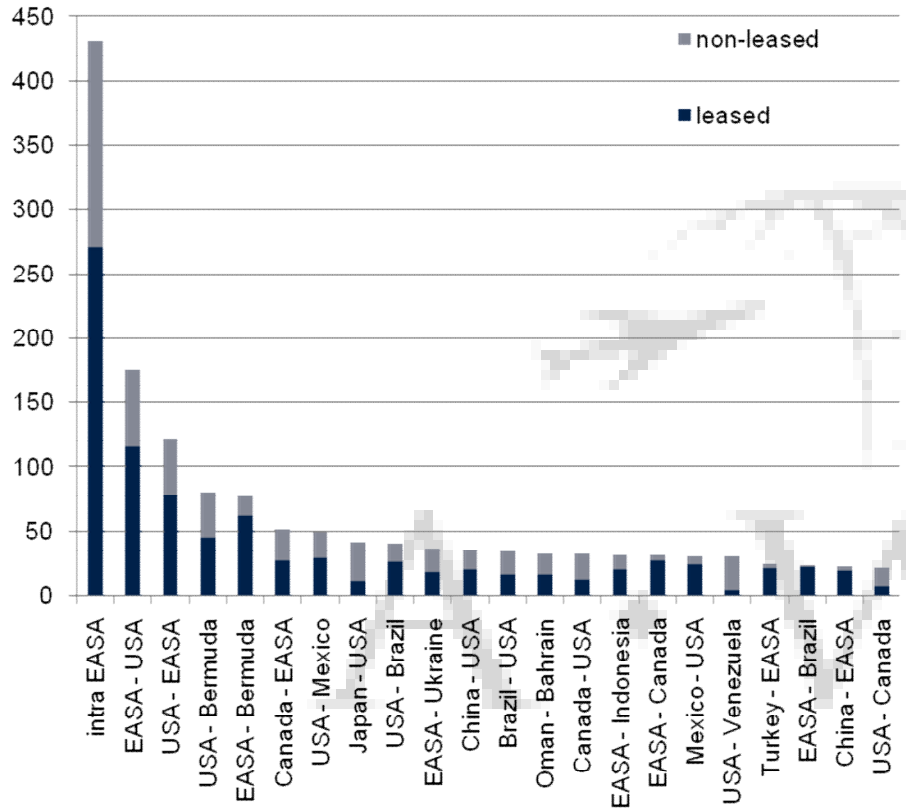
USA involved in 20 out of 26 combinations. This is partly because USA serves as 'transitioning register'.

Bermuda has an attractive legal system to owners and has concluded many ICAO Article 83 bis arrangements.

Aircraft transfers 2007-2008-2009

State combinations (EU member states united = EASA)

Combinations with 21 or more transfers



Observations

EU as single jurisdiction involved in 12 out of 22 combinations.

US also involved in 12 out of 22 combinations.

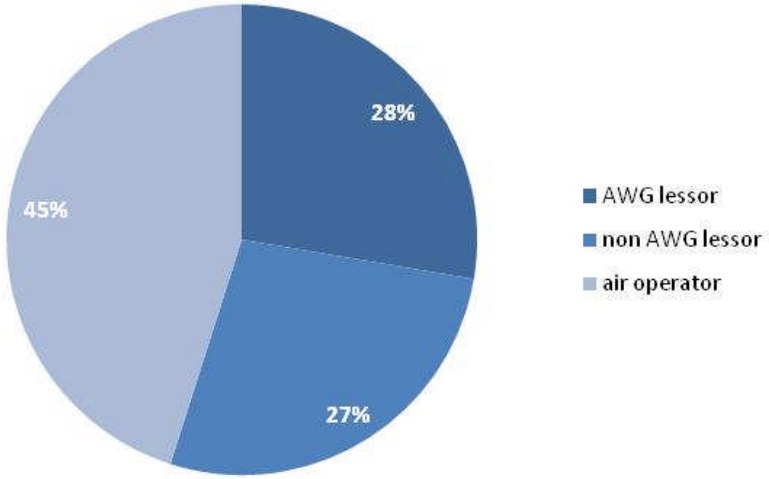
Intra-EASA accounts for 15% of all international transfers.

EASA-US transfers and v.v. take another 10%.

Aircraft transfers 2007-2008-2009

Lessors central role in international transfers

Distribution among lessors /operators



AWG lessors are lessors that are member of the Aviation Working Group

Observations

The lessors, collectively, have more international transfers than air operators.

AWG members represent just over half of all lessor transfers and 28% of all transfers.

Legal framework

Legal framework (1/4)

Chicago Convention – the legal basis for international civil aviation

Chicago Convention

Art. 33 – Recognition of certificates and licences

Certificates of airworthiness and certificates of competency and licences issued or rendered valid by the Contracting State in which the aircraft is registered **shall** be recognized as valid by the other Contracting States, provided that the requirements under which such certificates and licences were issued or rendered valid are equal to or above the minimum standards which may be established from time to time, pursuant to this Convention.

Observations

While Article 33 is primarily directed at day-to-day operations, the same principle of mutual and multilateral recognition of certificates is employed in Annex 8 when an aircraft is **transferred** from one State's registry to another:

3.2.4 When an aircraft possessing a valid Certificate of Airworthiness issued by a Contracting State is entered on the register of another Contracting State, the new State of Registry, when issuing its Certificate of Airworthiness ***may*** consider the previous Certificate of Airworthiness as satisfactory evidence, in whole or in part, that the aircraft complies with the applicable Standards of this Annex through compliance with the appropriate airworthiness requirements.

The word 'may' however gives states freedom not to accept CoA's from other states.

Legal framework (2/4)

ICAO's opinion on multilateral recognition

High-Level Safety Conference 2010

ICAO considers **multilateral recognition** of certificates and licences to be a basic foundation of international civil aviation.

In ICAO's view, multilateral recognition facilitates the free flow of states' aircraft and pilots throughout the world.

The organization observes, however, that many states require certificate holders to comply with additional, similar obligations through sets of **dissimilar requirements** that increase the administrative and financial burden for certificate holders, without any significant added safety value.

Observations

Leading states have concluded **bilateral** agreements for accepting aeronautical designs and products (BAAs – Bilateral Airworthiness Agreements, BASAs – Bilateral Aviation Safety Agreements).

This study recognizes the observation by ICAO and provides a quantitative and qualitative analysis for the dissimilar requirements associated with transferring aircraft from one jurisdiction to another

Legal framework (3/4)

ICAO's universal safety oversight audit programme

USOAP

The provision in Article 33 that certificates need only be accepted when the requirements under which they were issued are equal to or above the minimum standards, created a common need for states to establish same.

This, plus indications that not all states complied with ICAO SARPs plus accident investigations which identified inadequate supervision by states, led ICAO to implement its universal safety oversight audit programme (USOAP).

USOAP results confirmed that not all states comply with all SARPs, and at the same time provides a good overview of the states' compliance performance.

ICAO publishes **quick reference charts** for all audited states. Full reports are only published by ICAO with consent of the audited state. Many states have not given that consent.

Observations

The USOAP results may be used by states to determine when and when not to exercise their right not to accept a CoA by another state.

All states should be encouraged to have their USOAP report published.

Legal framework (4/4)

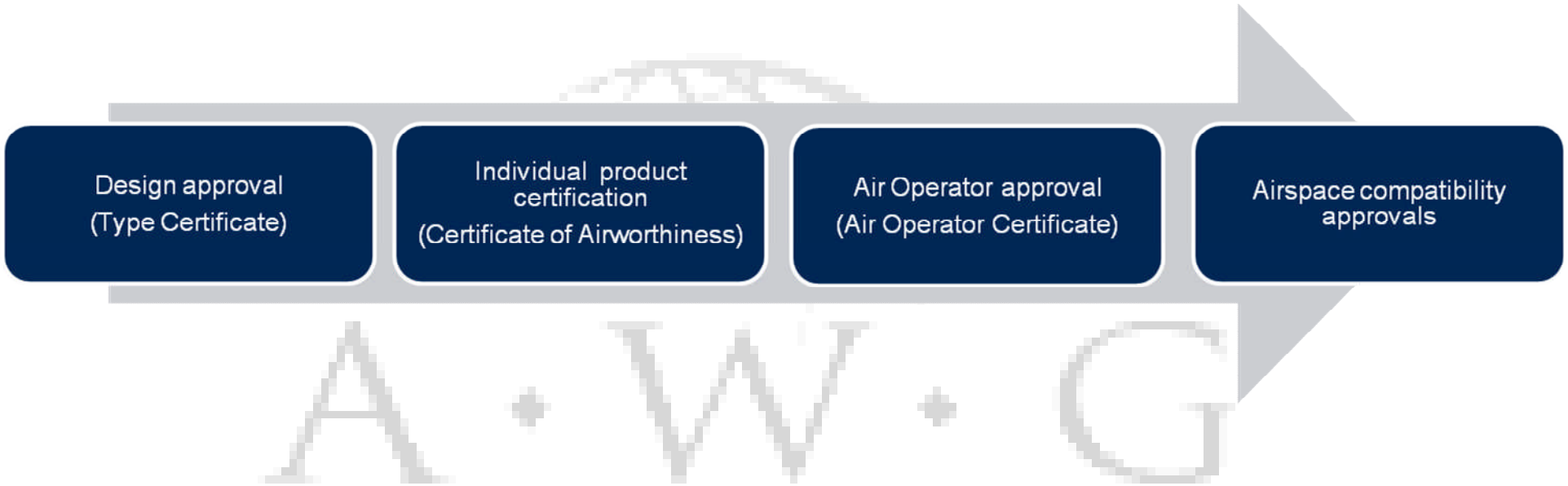
Example of an ICAO USOAP status chart

Level of Implementation of the Critical Elements of a Safety Oversight System										
Critical Element	1 = Not Implemented 10 = Fully Implemented ■ = States' Level of Implementation □ = Global Average									
	1	2	3	4	5	6	7	8	9	10
Primary Aviation Legislation	□	□	□	□	□	□	□	□	□	■
Specific Operating Regulations	□	□	□	□	□	□	□	□	□	■
State Civil Aviation System and Safety Oversight Function	□	□	□	□	□	□	□	□	■	□
Technical Personnel Qualification and Training	□	□	□	□	□	□	□	□	□	■
Technical Guidance, Tools and the Provision of Safety-Critical Information	□	□	□	□	□	□	□	□	■	□
Licensing, Certification, Authorization and Approval Obligations	□	□	□	□	□	□	□	□	□	■
Surveillance Obligations	□	□	□	□	□	□	□	□	■	□
Resolution of Safety Concerns	□	□	□	□	□	□	□	□	■	□

Certification scale
Safety objective scale

Stages of certification (1/2)

Four successive stages must be completed before transport aircraft can be operated



Stages of certification (2/2)

Typical certificates/approvals and their frequencies

	Subject	Certificate	Frequency
Design approvals	**Aircraft type; engine type**	Type certificate	Once per aircraft or engine variant.
	Other design approval: Designs other than complete aircraft or engine; repairs	e.g. STC, TSO, PMA, repair approval	Once per design or repair.
Individual product certification	**Individual aircraft**	Certificate of Airworthiness	Once each on: •manufacture; •airworthiness review; and •international transfer.
	Individual component	Certificate of Conformity; Authorised Release Certificate	Once each on: •manufacture; and •completion of off-aircraft maintenance.
Instruments and equipment required for operation	**Circumstances of operation**	Air Operator Certificate	Once each on: • introduction of aircraft type; and • change in regulations.
	Area of operation (airspace compatibility)	Special Approvals (OpSpec)	Once each on: • introduction into specific area of operation; and • change in regulations.

Safety objective scale (1/2)

Dissimilar requirements

Four variables

The **safety objective scale** ranks the different requirements as per the safety aim that the difference is intended to meet, as follows:

- Duplications
- Differences arising from varying safety objectives
- Differences arising from same objective but differing means of implementation
- Non-safety instigated regulatory differences

Safety objective scale (2/2)

Safety objective scale elaborated

Variable	Examples
Duplications – national requirements of state of import and export are identical (or at least) similar but re-checks are required by state of import	Extra maintenance check
Differences arising from varying safety objectives – reflects safety objectives unique to a state	US retroactive requirement for Class D cargo compartment fire suppression
Differences arising from same objective but differing means of implementation – identical safety objectives are implemented with different detailed requirements	National requirements for issue of a Certificate of Airworthiness
Non-safety instigated regulatory differences – differences resulting from conceptually different approach to meeting aviation safety and efficiency	Different concept of airspace use

Quantitative analysis method

Quantitative analysis method (1/8)

Transforming AWG input to global figure for next 20 years

Process steps

1. Determine elements for **optimal transfer**
2. Identify transfer-related, regulatory-induced cases of dissimilar requirements ('issues') that go beyond the optimal transfer
3. For each such issue, quantify:
   - Direct costs;
   - Downtime losses
4. Extrapolate to non-AWG transfers
5. Project for next 20 years

Observations

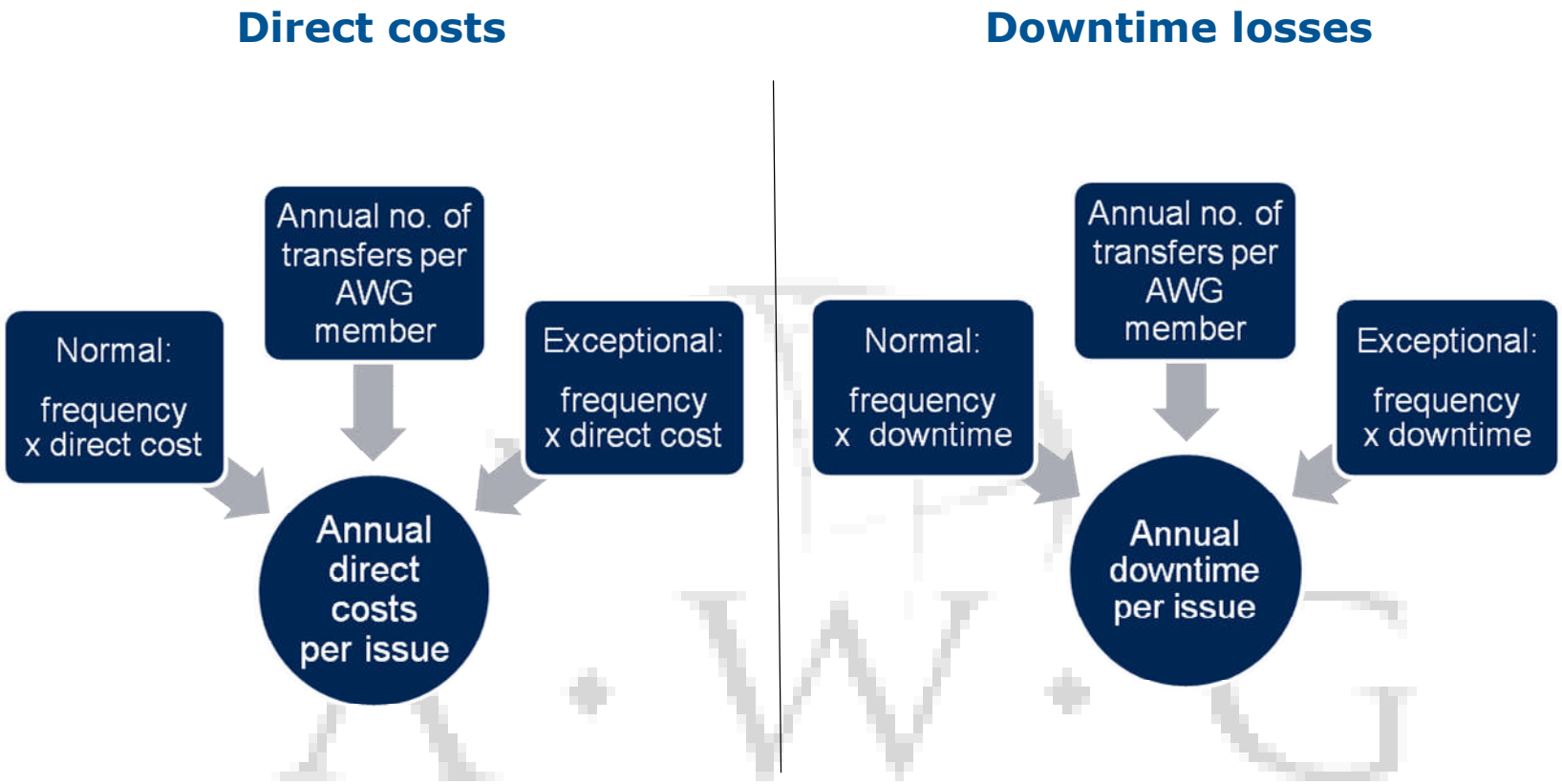
Steps 2 and 3 are based on input from AWG members

Quantitative analysis method (2/8)

Optimal transfer elements

Quantitative analysis method (3/8)

Determining annual direct costs and downtime losses per regulatory issue

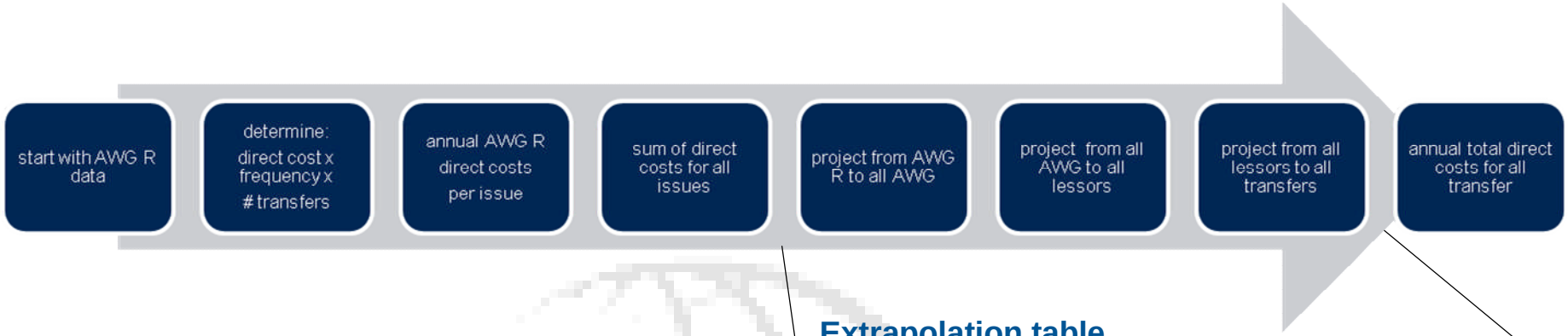


Quantitative analysis method (4/8)

Determining total of all direct costs for AWG representative members

Quantitative analysis method (5/8)

Annual total of all direct costs – entire process, including extrapolation



Extrapolation table

	Increase (annual number of transfers)	Ratio of increase	Cumulative ratio
AWG R to all AWG	231 to 264	1.14	1.14
AWG to all lessors	264 to 524	1.98	2.27
All lessors to all transfers	524 to 954	1.82	4.13

Legend

AWG R: those AWG members that provided data (covers 87.5% of all transfers by AWG members)

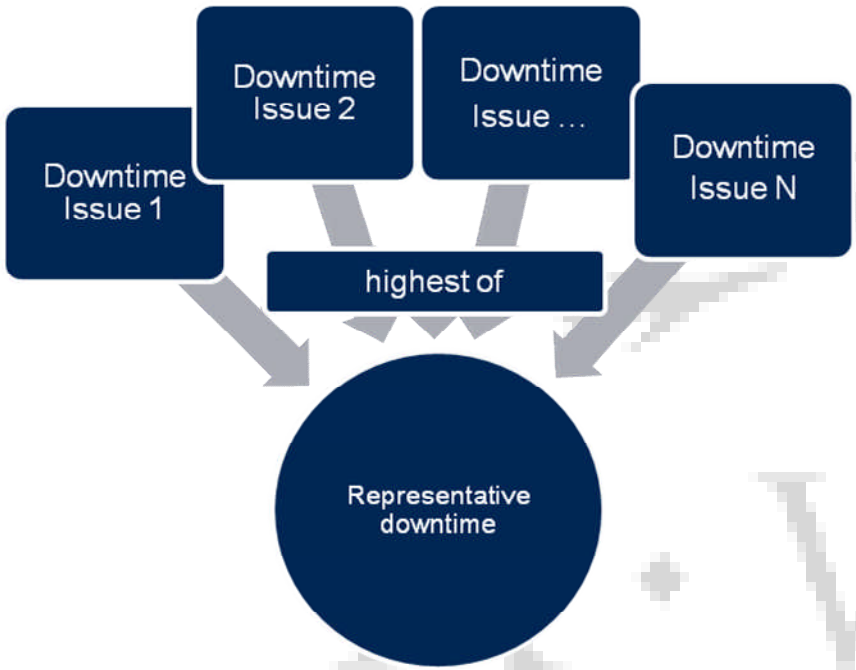
All lessors: covers all transfers by all leasing companies

All transfers: covers all international transfers

Quantitative analysis method (6/8)

Determining total of downtime

Process step



Observations

To determine total of downtime, the downtimes per issue can not be simply summed, as more than one issue can be addressed simultaneously.

For the sake of this study, the highest downtime for any of the quantifiable issues is assumed.

To convert effect of downtime from days into dollars, average lease rates are used.

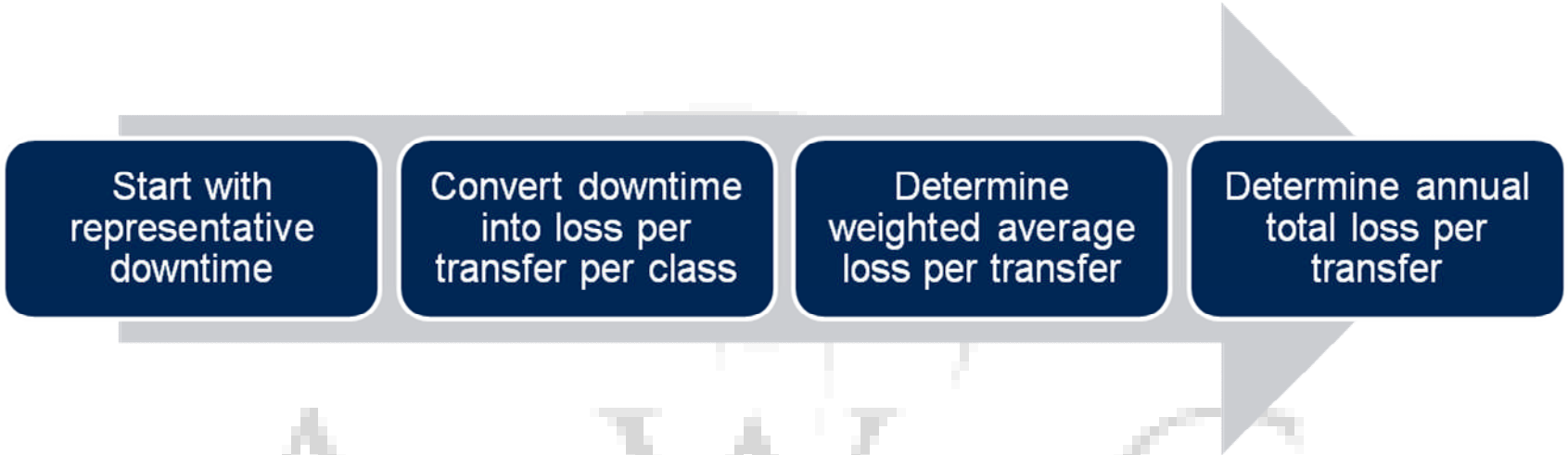
Representative lease rates are assumed for:

- Regional Jets;
- Narrow Bodies;
- Wide Bodies.

and weighted using actual fleet distribution

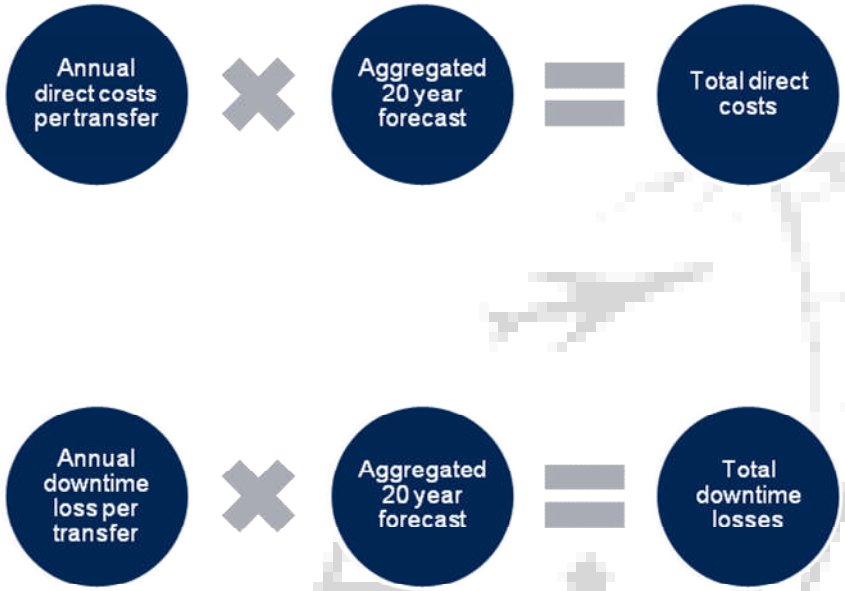
Quantitative analysis method (7/8)

Projecting downtime losses to all transfers



Quantitative analysis method (8/8)

Projecting for the next 20 years



The aggregated 20 year forecast uses a two-step Economic Projection Model.

Step 1 determines the growth in costs, expressed in nominal US$, based on:

- fleet growth predictions by manufacturers;
- constant inflation (2%);
- constant proportion of operating leases (32%);
- average operating lease term (7 years).

Step 2 converts the nominal cash flow to present value US dollars, using the Weighted Average Cost of Capital (WACC) of the industry.

Qualitative analysis method

Qualitative analysis method (1/2)

Dissimilar requirements

Process steps

1. Identification of issues: same as for the quantitative analysis
2. Each issue was ranked according to two scales:
   - **Certification scale**
   - **Safety objective scale**
3. Determine 'root cause' for each issue and propose improvement

Qualitative analysis method (2/2)

Overview

The 29 dissimilar requirements ('issues'), ranked per stage of certification and the safety objective scale

		Safety objective			
		Duplication	**Different safety objective**	**Different means**	**Non-safety insitigated**
Stage of certification	**Design approvals**	• Validation of modifications	• Major type certification differences • Ozone converter • Ice detection system	• Type III exits • 60 min battery power • Different cabin safety requirements	• Metric altimeters • Local language exit signs
	Individual product	• Maintenance check for export • Maintenance check for import • Recertification of components • Recertification of off-wing engines		• Maintenance programme diverging requirements • Different interpretations • Delays by authorities • Test flights by authorities • Age limit upon import	• Export approval • Article 83bis • Local language exit signs
	Operational certification		• Ozone converter • Cargo fire suppression	• Different cabin safety requirements • DFDR • CVR • Fixed ELT • Video camera	
	Airspace compatibility				• Metric altimeters • FM immunity • ELS/EHS • VHF 8.33 spacing • Datalink

Input

Input data (1/2)

Both generic and specific data were obtained

Generic

Generic input data consists of:

- Numbers of international transfers of aircraft
  - Source: Ascend database
- Lease rates
  - Source: Ascend database
- Fleet growth projections
  - Source: 4 major aircraft manufacturers
- Aviation safety regulations
  - Multiple sources

Specific

Specific input data was obtained:

- By means of two **questionnaires** completed by AWG members
- Interviews with 7 AWG members (representing 98% of AWG transfers)
- Consultation meetings

Input data (2/2)

Questionnaires

Subjects canvassed	Response rate	Application
Questionnaire 1: • Number of transfers • Typical duration of a transfer • Reasons for extended duration	Questionnaire 1: 98%.	Questionnaire 1 yielded data for the qualitative analysis

Questionnaire 2:
• Distinguished between three scenarios:
  • 'optimal'
  • 'typical' cases of inefficiency
  • 'extreme' cases of inefficiency
• For all scenarios obtained data on:
  • frequency
  • direct costs
  • downtime
	Questionnaire 2: 87.5% ('AWG R')
	
	Note: these response rates relate to transfers by AWG members
		Questionnaire 2 yielded data for the quantitative analysis

Output

Output (1/4)

Annual direct costs AWG R

Input data on reasons for extended duration (quest. 1) identified 29 areas of dissimilar requirements; 25 of which could be quantified with data from quest. 2.

Direct costs are as indicated here, in US$ 1000

Dupl: Duplications

Diff 1: Differences arising from varying safety objectives

Diff 2: Differences arising from same objective but differing means of implementation

Diff 3: Non-safety instigated regulatory differences

Dissimilar requirement	type	costs Normal	costs Exceptional	Duplications	Diff 1	Diff 2	Diff 3
Validation of modifications	Dupl	4390	1129	12489			
Maint. check for export	Dupl	578	90				
Maint. check for import	Dupl	798	1371				
Recertification of components	Dupl	809	2794				
Recertification of offwing engines	Dupl	54	476				
Ozone converter	Diff1	827	393		4147		
Ice detection system	Diff1	548	0				
Cargo fire suppression	Diff1	2302	77				
Type III exits	Diff2	2043	64			35194	
Different cabin safety requirements	Diff2	2750	0				
60 min battery power	Diff2	3207	683				
DFDR	Diff2	1103	126				
CVR	Diff2	1074	84				
Fixed ELT	Diff2	3963	28				
Video camera	Diff2	3147	37				
Maintenance programme	Diff2	4235	1439				
CoA inspections	Diff2	4067	1735				
Delays by authorities	Diff2	945	910				
Test flights	Diff2	2593	960				
Local language exit signs	Diff3	1346	513				8952
Metric altimeters	Diff3	1111	13				
FM immunity	Diff3	425	32				
ELS/EHS	Diff3	1632	150				
VHF 8.33 spacing	Diff3	509	44				
Datalink	Diff3	705	2472				

Output (2/4)

Direct costs projection

Projection of annual AWG R data to all transfers and over 20 years

Total direct costs (US$)	AWG R	All AWG	All lessors	All transfers	Per transfer	Aggregated over 20 years
Multiplicative factor	1	1.14	2.27	4.13		
Factor base: annual number of transfers	231	264	524	954		
Duplications	12.5 M	14.2 M	28.4 M	51.6 M		
Different safety objective	4.1 M	4. 7 M	9.4 M	17.1 M		
Different means	35.2 M	40.1 M	79.9 M	145.3 M		
Non-safety instigated	9.0 M	10.2 M	20.3 M	37.0 M		
Total				**251 M**		
No. of transfers				954		
Total per transfer					**263 K**	
Aggregated over 20 years						**5.002 B**

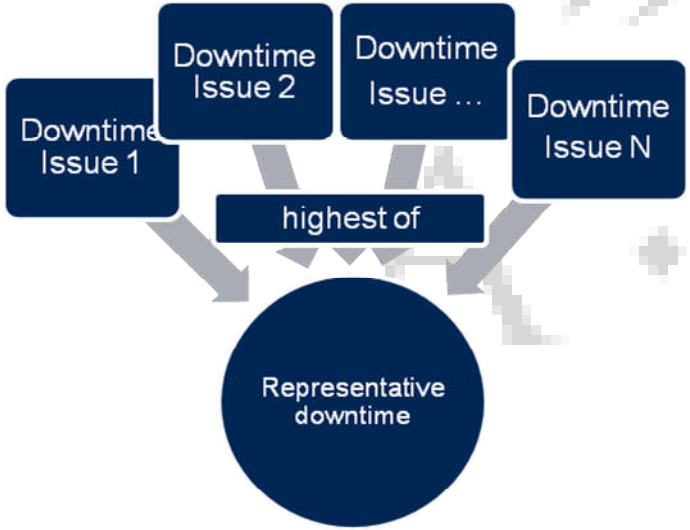
Output (3/4)

Annual downtime loss – AWG R

Downtime losses in days.

As explained, and illustrated below, the downtime used in further calculations is the highest of all average downtimes ,

which is 11.47 days.



Dissimilar requirement	type	days	days
		Normal	Exceptional
Validation of modifications	Dupl	6.32	10.37
Maintenance check for export	Dupl	1.36	1.00
Maintenance check for import	Dupl	3.19	4.46
Recertification of components	Dupl	**11.47**	3.43
Recertification of offwing engines	Dupl	0.12	0.81
Ozone converter	Diff1	0.22	0.41
Ice detection system	Diff1	0.36	0.00
Cargo fire suppression	Diff1	1.00	0.11
Type III exits	Diff2	0.43	0.45
Different cabin safety requirements	Diff2	4.51	1.17
60 min battery power	Diff2	0.43	0.15
DFDR	Diff2	0.91	0.15
CVR	Diff2	0.82	0.04
Fixed ELT	Diff2	1.97	0.04
Video camera	Diff2	1.82	0.05
Maintenance programme	Diff2	5.33	1.17
CoA inspections	Diff2	5.14	2.32
Delays by authorities	Diff2	1.12	2.61
Test flights	Diff2	1.53	0.88
Local language exit signs	Diff3	4.41	1.75
Metric altimeters	Diff3	0.53	0.31
FM immunity	Diff3	0.33	0.26
ELS/EHS	Diff3	0.90	0.29
VHF 8.33 spacing	Diff3	0.31	0.25
Datalink	Diff3	0.93	0.97

Output (4/4)

Downtime projection

Projection of annual AWG R data to all transfers and over 20 years

	RJ	NB	WB	Totals	Aggregated over 20 years
Lease rate per day (US$)	4,853	8,066	21,642		
Number of days per transfer	11.47	11.47	11.47		
Average loss per transfer (US$)	55,669	92,520	248,231		
Fleet percentage (%)	17	59	24		
Average loss per transfer per aircraft group (US$)	9,464	54,587	59,575		
Weighted average loss per transfer (US$)				**123,626**	
No. of transfers				954	
Annual total (US$)				**117.9 M**	
Aggregated over 20 years (US$)					**2.284 B**

Assessment

Assessment (1/7)

Overview direct costs

Different means: 58%

Duplication: 20%

Non-safety instigated: 15%

Different safety objective: 7%

Individual product: 39%

Design approvals: 31%

Operational certification: 20%

Airspace compatibility: 10%

Four issues could not be quantified

		Safety objective			
		Duplication 20%	**Different safety objective** 7%	**Different means** 58%	**Non-safety instigated** 15%
Stage of certification	**Design approvals** 31%	• Validation of modifications **US$ 22.8M / 9%**	• Major type certification differences (not quantified) • Ozone converter • Ice detection system **US$ 7.3M / 3%**	• Type III exits • 60 min battery power • Different cabin safety requirements **US$ 36.1M / 14%**	• Metric altimeters • Local language exit signs **US$ 12.3M / 5%**
	Individual product 39%	• Maintenance check for export • Maintenance check for import **US$ 12.3M** • Recertification of components • Recertification of off-wing engines **US$ 16.5** **Together: 11%**		• Maintenance programme diverging requirements • Different interpretations • Delays by authorities • Test flights by authorities **US$ 69.7M / 28%** • Age limit upon import (not quantified)	• Export approval (not quantified) • Article 83bis (not quantified) • Local language exit signs
	Operational certification 20%		• Ozone converter • Cargo fire suppression **US$ 9.8M / 4%**	• Different cabin safety requirements • DFDR • CVR • Fixed ELT • Video camera **US$ 39.5M / 16%**	
	Airspace compatibility 10%				• Metric altimeters • FM immunity • ELS/EHS • VHF 8.33 spacing • Datalink **US$ 24.7M / 10%**

Assessment (2/7)

Different means (58%)

Equipment requirements:

Major differences are between EU and US and primarily in area of cabin safety (e.g. Type III exits access)

No EU – US harmonization on these issues

CoA process:

Many states apply different import requirements, typically in following areas:

- Different technical interpretations by authorities;
- Delays by authorities;
- Test flight requirements;
- Dissimilar maintenance programme requirements.

The main underlying reason for these differences appears to be a lack of trust in the other state's capability to oversee continuing airworthiness.

Within the EU, and with the introduction of the Airworthiness Review Certificate, a mechanism exists for states to 'blindly' accept CoA's issued by another state

Age limit upon import

A recent development, proliferating in Asia and Africa. Rationale differs from state to state. Age limit is restricted to import and does not apply after.

The age limit requirement appears to be a political instrument to ban certain aircraft types or operations

Assessment (3/7)

Duplication issues (20%)

Validation of modifications:

Major issue between EU and US: US only accepts designs from 6 EU states. Conversely, acceptance by EU of US designs is tedious

Awaiting ratification of bilateral.

Recertification of components:

Wide variation between states with respect to:

- Mutual recognition of EASA Form 1 / FAA 8130-3 tag
- Different retention periods for maintenance records
- Required retention period for life-limited components
- Maintenance records in different languages
- Recertification of imported components
- Engines that became 'stateless'
- Inadequate level of oversight by authorities

All may lead to recertification of components

Main causes are:

- Harmonisation absent or ineffective
- Local and personal influences
- Suboptimal oversight capabilities

A possible solution would be the 'digital passport'. This would require a global standard for electronic recordkeeping.

Maintenance checks

Some authorities require out-of-phase checks for import

This is another example of the lack of trust between states

Assessment (4/7)

Non-safety instigated differences (15%)

Airspace compatibility:	
Direct result of different choices for airspace architecture	A fact-of-life, however, harmonisation of technical standards should be sought.
Local language exit signs:	
For exits, as opposed to other safety signs, words are required. Understandably, states require these words in their local language.	Solution is to accept symbols as an alternative to text. EASA and FAA have both accepted this, in different legal ways
Export approval (not quantified)	
The concept of the 'export CoA' is widely spread, yet there is no legal basis in the Chicago Convention and Annexes. Some export states do not issue these, whilst other states require these for import.	Export CoA's are considered a confirmation by a state of the airworthy state of an aircraft.
Article 83 *bis* (not quantified)	
Although intended for sharing safety oversight, and thus create efficiencies, many states are reluctant to use this option.	Transfers have failed because states are unable to transfer safety oversight

Assessment (5/7)

Differing safety objectives (7%)

Cargo fire suppression

US retroactive requirement for Class D cargo compartments, not adopted by Europe

Ozone converter

1980 US type certification and retroactive requirement that was adopted by Europe 23 years later and only for new types

Ice detection

Recent US type certification requirement, which will also become retroactive. No indication yet that it will be copied by EU

These three differences lead to differences in aircraft configurations, making aircraft subject to major modifications when being exported to a state with more demanding requirements.

Assessment (6/7)

Major type certification differences (not quantified)

Type certification harmonization

Over the past 35 years, the major manufacturing states have achieved a high degree of harmonization of their airworthiness codes. Current designs are accepted without major changes by virtually all states.

However, older aircraft types were certificated to different certification bases and have not been subject to a catch-up process, making international transferability prohibitively costly.

This harmonization success has greatly increased the international transferability of aircraft and is a good precedent for harmonization of standards for:

- Individual product certification
- Operationally required equipment certification.

Also, emerging manufacturing states should be encouraged to harmonize their airworthiness codes with those of US and EU.

Assessment (7/7)

Other issues

Accessibility of requirements:

Each state has developed its own set of regulations. Hence, large variety exists in:

- Structure;
- Accessibility to foreign users (local language; not published in website);
- Possible interpretations;
- Provision of detail, e.g. about import and export requirements and procedures

This leads in practice to surprises when transferring aircraft.

Future trends:

Possible future dissimilar requirements:

- fuel tank inerting systems;
- retroactive 16g dynamic seat testing;
- facilities for the disabled;
- Foreign Air Operator Certificates

Expanding ICAO Circular 95

AWG suggests that an international registry be maintained that lists all differences in safety regulations that may impact international transfers, particularly those for:

- individual certification of aircraft and other products; and
- operational certification.

ICAO's Circular 95, which lists the codes of airworthiness used for type certification by different States would form a good basis.

Findings

Findings (1/4)

Individual certificates (1/3)

1. Dissimilar requirements with respect to **individual certificates** (CoA, Form 1) account for 39% of direct costs.

2. Underlying reason is **lack of mutual recognition**, which manifests itself in various forms and by means of varying requirements, such as:

- the requirement by some states for a maintenance check of the 'C' type;
- the need to recertify components, for reasons explained earlier in this report and in Appendix 3;
- test flight requirements;
- the confusing requirements for retention of records for life-limited components; and
- other import requirements, such as inspections of aircraft and records, with the inherent problem of the state or inspector's personal interpretations of the regulations.

3. **Lack of a global standardised process** for export and import of used aircraft explain this high contribution. Local deviations and interpretations are commonplace. Chicago Convention allows, but does not require mutual recognition. Many states do not to accept such certificates at face value, but apply own methods of scrutiny to airworthiness. These methods vary widely and there is also a significant element of arbitrariness in their application.

Individual certificates (2/3)

4. **Maintenance records**:

- not all organisations properly control maintenance records of aircraft and components, and this is not always spotted by the responsible authorities
- there is a lot of confusion over the record retention requirements for life-limited components.

5. **Test flights**:
Made redundant by many systems available to test the equipment of modern aircraft on the ground. Type certificate holder only require a test flight in very limited number of instances. However, many states still require test flights to be conducted in a greater number of circumstances.

6. Current inter-state recognition of certificates is often not based on the Chicago Convention and its Annexes, which is a multilateral, binding, international agreement, but rather on **bilateral agreements** such as BAAs and BASAs.

7. ICAO's **USOAP** provides a unique source of data for gauging a state's performance in overseeing airworthiness.

8. For a transfer between EASA states, a valid **Airworthiness Review Certificate** is sufficient proof of airworthiness for the state of import.

Findings (2/4)

Individual certificates (3/3)

9. For imports into EU states, a **recommendation** submitted by a CAMO to the state of registry following an airworthiness review results in the issue of a CoA and an ARC. For imports into the USA, a similar process takes place, except that no ARC is issued. The recommendation to the FAA is submitted by an individual designated by the FAA, the Designated Airworthiness Representative.

10. There is no harmonised application of the **Export CoA**. Indeed some states do not issue them at all. In other cases, their function is ambiguous: are they meant to revalidate the CoA that was issued for an unlimited duration, or do they certify that an aircraft (or product) meets the design requirements of the state of import?

Different means – operational certification

11. Dissimilar requirements affecting **operational certification** (other than airspace compatibility) accounts for 16% of all direct costs.

12. In majority of cases of differing operational certification requirements, **date of effectiveness** and the **ranges of affected aircraft**, rather than technological substance

13. In some cases, the **technical specifications** differ.

Findings (3/4)

Design approvals

14. **Airworthiness codes** of the active aircraft manufacturing states are harmonised to a great extent. However, there are still variations in the detail that deserve further attention. Also, it is anticipated that emerging manufacturing states will not participate in the harmonisation efforts and new differences may develop, which is undesirable from the point of view of uniform global standards.

15. The **validation of design approvals** as an economic impact issue is relatively new. Traditionally, many states had no separate process for approving designs, other than type designs; they recognised modifications and repairs automatically or implicitly upon import of an aircraft.

16. With the advent of STCs, this has changed. In practice, this process, in which modifications and repairs by one jurisdiction are **validated** by another jurisdiction is unnecessarily tedious and bureaucratic. Its economic impact accounts for 9% of the total direct costs. The two jurisdictions primarily involved, the EU and the US, have not yet concluded a bilateral agreement.

17. An additional missing element is the **linking of bilateral agreements**.

Non-safety instigated

18. Different **airspace concepts** exist, leading to different requirements for airborne equipment to ensure airspace compatibility.

19. Many states require that **text exit signs** be translated into their local language. This has a significant economic impact because of the high frequency of occurrence. In Europe, the option of using symbolic exit signs has been introduced in the airworthiness code. The FAA recently introduced a policy to the same effect.

Findings (4/4)

Other

20. More and more states introduce **aircraft age limits** upon import. These limits are not based on data established by the type certificate holder or state of design and are not scientifically justified. They further ignore the aircraft ageing programmes and attendant maintenance programme amendments.

21. Although 157 states have ratified **Article 83bis** of the Chicago Convention, only about 40 states have actively engaged in 83bis arrangements.

Availability/accessibility of regulations

22. There is a large variety in availability and accessibility of **state import requirements**. Many states do not publish their import requirements at all.

23. In addition to differences, states currently file with the ICAO their varying requirements in relation to dangerous goods, called variations. The ICAO publishes these in the TI, where these standards are recorded. This effectively results in a **registry** for national requirements for the transport of dangerous goods by air. In addition, variations relating to regional airspace use are published by the ICAO.

Recommendations

Recommendations (1/2)

Dissimilar requirement	Report finding, with finding number from main report	Recommendation	Policy maker
Individual certificates • Export/import process • Test flight requirements	No globally harmonised standards (3, 5, 8, 10)	1 Develop standard process for export and import of aircraft	ICAO
		2 Introduce standard for the Export CoA	ICAO
		3 Develop format for authorised release certificate (Form 1)	ICAO
		4 Introduce global concept of airworthiness reviews upon import	ICAO
		5 Eliminate test flight requirements	ICAO
Individual certificates: • Maintenance checks • Recertification of components • Inspection of aircraft and records	Lack of mutual recognition by states (2, 6, 7, 9)	6 States to make use of USOAP results when determining inspection efforts for imported aircraft	States
		7 Encourage states to publish USOAP reports	ICAO
		8 Study the feasibility of transition from a system of bilaterals to a multilateral recognition system	States
Individual certificates – records	• Inadequate means of record control (4) • Confusing requirements for retention of records regarding life-limited components (4)	9 Formalise interpretation of 'back-to-birth traceability' and harmonise minimum retention periods for detailed maintenance records	EASA, FAA
		10 Accept aircraft and component records in electronic format	States
		11 Develop standard format for electronic recordkeeping of components	ICAO
Operational equipment	No globally harmonised standards for: • Applicability date (12) • Applicability range (12) • Technical specification (13)	12 Harmonise applicability dates, ranges and technical standards	ICAO

Recommendations (2/2)

Dissimilar requirement	Report finding, with finding number from main report	Recommendation	Policy maker
Design approval – validations	• Validation of designs is tedious (16) • More validations expected with emerging manufacturing states (14) • Bilateral linkage is missing (18)	13 Extend EU/US bilateral to include automatic recognition of basic STCs	EU, US
		14 Link bilateral agreements such that design approvals can be recognised through agreements with third states without further action	States
Design approval – airworthiness codes	• Differences remain in airworthiness codes, particularly regarding acceptable means of compliance (14) • Emerging manufacturing states may not be engaged in global harmonisation (14)	15 Continue airworthiness code harmonisation and expand to emerging manufacturing states	EASA, FAA, other states
		16 Expand harmonisation of airworthiness codes to include acceptable means of compliance	EASA, FAA, other states
Different airspace concepts	Different technical standards (18)	17 Facilitate harmonisation of technical standards of airborne airspace compatibility requirements	ICAO
Local language exit signs	States require text exit signs in native language (19)	18 Allow symbolic exits signs as an alternative to text exit signs	ICAO, states
Age limits upon import	States impose age limits upon import without airworthiness justification (20)	19 Recognise ageing aircraft programme from type certificate holder and/or state of design	States
		20 Discourage age limits upon import	ICAO
Article 83bis	Few states enter into 83bis arrangements (21)	21 Encourage use of 83bis arrangements	ICAO
Access to state import requirements	Many states do not publish their import requirements (22)	22 Create a registry for all import requirements	ICAO
		23 File all import requirements	States