Type Acceptance Report

TAR 19/21B/25 – Revision 2

EMBRAER ERJ 190 Series

TABLE OF CONTENTS

Executive Summary

New Zealand Type Acceptance has been granted to the Yaborã Indústria Aeronáutica S.A. (formerly Embraer) ERJ 190 Series based on validation of ANAC Type Certificate number EA-2005T13 and FAA Type Certificate number A57NM. There are no special requirements for import.

Due to the cancellation of the strategic partnership between Embraer S.A. and the Boeing Company Revision 2 of this report was raised to change the Type Certificate holder from Yaborã Indústria Aeronáutica S.A. back to Embraer S.A

Applicability is currently limited to the Models and/or serial numbers detailed in Appendix1, which are now eligible for the issue of an Airworthiness Certificate in the Standard Category in accordance with NZCAR §21.191, subject to any outstanding New Zealand operational requirements being met. (See Section 5 of this report for a review of compliance of the basic type design with the operating Rules.) Additional variants or serial numbers approved under the foreign type certificate can become type accepted after supply of the applicable documentation, in accordance with the provisions of NZCAR §21.43(c).

NOTE: The information in this report was correct as at the date of issue. The report is generally only updated when an application is received to revise the Type Acceptance Certificate. For details on the current type certificate holder and any specific technical data, refer to the latest revision of the State-of-Design Type Certificate Data Sheet referenced herein.

1. Introduction

This report details the basis on which Type Acceptance Certificate No. 19/21B/25 was granted in the Standard Category in accordance with NZCAR Part 21 Subpart B.

Specifically, the report aims to:

(a) Specify the foreign type certificate and associated airworthiness design standard used for type acceptance of the model(s) in New Zealand; and

(b) Identify any special conditions for import applicable to any model(s) covered by the Type Acceptance Certificate; and

(c) Identify any additional requirements which must be complied with prior to the issue of a NZ Airworthiness Certificate or for any subsequent operations.

2. Aircraft Certification Details

(a) State-of-Design Type and Production Certificates:

Manufacturer:	EMBRAER S.A.
	Yaborã Indústria Aeronáutica S.A. transferred TC 2005T13 to Embraer S.A. on January 01,2022.
	Embraer S.A. transferred TC 2005T13 to YABORÃ INDÚSTRIA AERONÁUTICA S.A. on 31 January 2020.
	Empresa Brasileira de Aeronáutica S.A. (prior to 19November 2010)
Type Certificate:	EA-2005T13
Issued by:	Agencia Nacional de Aviacao Civil (ANAC)
Type Certificate:	A57NM
Issued by:	Federal Aviation Administration (FAA)
Production Approval:	Production approved according to COP ANAC E-7203-01 (Embraer S.A., Brazil)
	Yaborã Indústria Aeronáutica SA (COP ANAC E-2020 01-01) manufactured the aircraft models listed in Type Certificate Data Sheet EA-2005T13-28 Sheet 01 between January 27, 2020 and December 31, 2021. Yaborã manufactured S/N 19000773, 19020028 to 19020040, and 19020042 to 19020062.
	Yaborã Indústria Aeronáutica S.A. (COP E-2020 01-01) from 27 January 2020.
	Embraer S.A. (COP E-7203-01) authorised under licence agreement to manufacture the ERJ 190-100 ECJ and ERJ 190-100 IGW, dated 11 December 2008

(b) Models Covered by the Part 21B Type Acceptance Certificate:

(i)	Model:	ERJ 190-100 STD / LR / IGW / ECJ / SR
	MCTOW:	47,790 kg (105,358 lb) (STD) 50,300 kg (110,892 lb) (LR and SR) 51,800 kg (114,199 lb) (IGW) 54,500 kg (120,151 lb) (ECJ)
	Max. No. of Seats:	114 Passengers (STD, LR, and IGW). 98 Passengers (SR). 19 Passengers (ECJ)
	Noise Standard:	RBHA 36, equivalent to ICAO Annex 16 Volume 1 Chapter 3 Amendment 7 FAR Part 36

Engine: CF34-10E5, CF34-10E5A1, CF34-10E6, CF34-10E6A1, or CF34-10E7 (STD / LR / IGW)
CF34-10E7-B or CF34-10E6 (ECJ)
CF34-10E5A1 or CF34-10E7 (SR)

Type Certificate: E00070EN
Issued by: Federal Aviation Administration

(ii) Model: ERJ 190-200 STD / LR / GW

MCTOW: 48,790 kg (107,563 lb) (STD)
50,790 kg (111,972 lb) (LR)
52,290 kg (115,279 lb) (IGW)

Max. No. of Seats: 124 Passengers

Noise Standard: RBHA 36, equivalent to ICAO Annex 16 Volume 1 Chapter 3
RBAC 36, equivalent to 14 CFR Part 36 incorporating Amendments 36-1 through 36-28 specific to LR with CF34-10E5A1 LLCN.

Engine: CF34-10E5, CF34-10E5A1, CF34-10E6, CF34-10E6A1, or CF34-10E7 (STD / LR / IGW)

Type Certificate: E00070EN
Issued by: Federal Aviation Administration

(iii) Model: ERJ 190-300

MCTOW: 56,400 kg (124,340 lb)

Max. No. of Seats: 114 Passengers

Noise Standard: RBAC 36, equivalent to 14CFR Part 36 incorporating Amendments 36-1 through 36-28

Engine: PW1919G, PW1922G

Type Certificate: E00090EN
Issued by: Federal Aviation Administration

(iv) Model: ERJ 190-400

MCTOW: 61,500 kg (135,584 lb)

Max. No. of Seats: 146 Passengers

Noise Standard: RBAC 36, equivalent to 14CFR Part 36 incorporating Amendments 36-1 through 36-28

Engine: PW1921G, PW1923G, PW1923G-A

Type Certificate: E00090EN
Issued by: Federal Aviation Administration

Note: *Refer to Advisory Circular 21-1 Appendix 2 for the New Zealand type acceptance statusof engines listed above.*

3. Application Details and Background Information

The application for New Zealand type acceptance of the Embraer ERJ 190 series was from the manufacturer, dated 2 April 2019.

The ERJ 190 is a transport category airplane of conventional layout with an aluminium-alloy fuselage, wing, tailplane and fin; while ailerons, flaps, spoilers, elevator, rudder are of composite material. The landing gear is a retractable, tricycle type. The aircraft is powered by two high-bypass ratio turbofan engines installed under the wings (General Electric CF34-10E in the -100/-200 models and Pratt Whitney PW1919G in the -300/-400 models).

The maximum passenger capacity for the ERJ 190-100 is 114 for ANAC and EASA configurations whilst FAA limited passengers to 112. The maximum passenger capacity for the ERJ 190-200 is 124 passengers. An executive jet version is also available, designated the ERJ 190-100 ECJ. A short runway model was developed for British Airways operation at London airport

The ERJ 190-300 and -400 models are collectively known as the "E2" family. The ERJ 190-300 is a derivative version of the ERJ 190-100 IGW with the same fuselage length anda maximum passenger capacity of 114 passengers. A new wing, horizontal stabilizer, landing gear, APU, P&W engine and full fly-by-wire with digital closed loop control were the main differences. The ERJ 190-400 is a derivative version of the ERJ 190-300 aircraft model, with a lengthened fuselage, one additional pair of over-wing exits, wingtip extension and an increased passenger capacity of up to 146 passengers in a high-density single-class arrangement.

The aircraft comes in three basic versions, ANAC, FAA and EASA, depending on the regulatory jurisdiction chosen. Aircraft can be converted by serial number effectivity from one version to another by Service Bulletin.

As part of the type acceptance process, a CAA team from the Airworthiness Unit visited Embraer in San Jose dos Campos for a validation/familiarisation visit.

Type Acceptance Certificate No. 19/21B/25 was granted on 4 November 2019 to the Embraer ERJ 190 series based on validation of ANAC Type Certificate EA-2005T13 and FAA Type Certificate number A57NM. Specific applicability is limited to the coverage provided by the operating documentation supplied. There are no special requirements for import into New Zealand.

Revision 1 of this report was raised to change the Type Certificate holder from Embraer S.A. to Yaborã Indústria Aeronáutica S.A. as a result of the joint venture between Boeingand Embraer.

Revision 2 of this report was raised to change the Type Certificate holder from Yaborã Indústria Aeronáutica S.A. back to Embraer S.A. due to the cancellation of the strategic partnership between Embraer S.A. and the Boeing Company.

4. NZCAR §21.43 Data Requirements

The type data requirements of NZCAR Part 21B Para §21.43 have been satisfied by supply of the following documents, or were already held by the CAA:

(1) State-of-Design Type certificate:

ANAC Type Certificate Number 2005T13

ANAC Type Certificate Data Sheet number EA-2005T 13 at revision 28 dated 01 January 2022

– ERJ 190-100 STD, approved on 30 August 2005
– ERJ 190-100 LR, approved on 30 August 2005
– ERJ 190-100 IGW, approved on 30 August 2005
– ERJ 190-100 ECJ, approved on 30 October 2007
– ERJ 190-100 SR, approved on 21 January 2010
– ERJ 190-200 STD, approved on 30 June 2006
– ERJ 190-200 LR, approved on 30 June 2006
– ERJ 190-200 IGW, approved on 30 June 2006
– ERJ 190-300, approved on 28 February 2018
– ERJ 190-400, approved on 15 April 2019

(2) Airworthiness design requirements:

(i) Airworthiness Design Standards:

ANAC Certification Basis

The certification basis of the ERJ 190-100 models is RBHA 25, corresponding to 14 CFR Part 25, including amendments 25-1 through 25-101, plus additional amendments up to 25-120 as listed on the TCDS, plus nine Special Conditions, 16 Equivalent Levels of Safety (ELOS) and two Exemptions. The ERJ 190-100 ECJ model had an additional two Special Conditions, four ELOS and three exemptions.

The certification basis of the ERJ 190-200 models is RBHA 25, corresponding to 14 CFR Part 25, including amendments 25-1 through 25-101, plus additional amendments up to 25-117 as listed on the TCDS, plus eight Special Conditions, 15 Equivalent Levels of Safety (ELOS) and two Exemptions.

The certification basis of the ERJ 190-300 models is RBHA 25, corresponding to 14 CFR Part 25, including amendments 25-1 through 25-136, plus additional amendments up to 25-141 as listed on the TCDS, plus 20 Special Conditions, 35 Equivalent Levels of Safety (ELOS) and one Exemption.

The certification basis of the ERJ 190-400 is the same as the ERJ 190-300 with the addition of one ELOS.

FAA Certification Basis

The certification basis of the ERJ 190-100 models corresponds with the ANAC amendments and is based on 14 CFR Part 25, including amendments 25-1 through 25-101, plus additional amendments up to 25-120 as listed on the TCDS. The FAA issued four Special Conditions, 16 Equivalent Levels of Safety (ELOS) and two Exemptions. The ERJ 190-100 ECJ model had an additional two Special Conditions, one ELOS and three exemptions.

The certification basis of the ERJ 190-200 models was the same as the ERJ 190- 100 models, less one of the Special Conditions.

The certification basis of the ERJ 190-300 models was the same as the ERJ 190-100 IGW, with changed areas corresponding to 14 CFR Part 25, including amendments 25-1 through 25-139 and amendment 25-141, plus 16 Special Conditions, 26 Equivalent Levels of Safety (ELOS) and four Exemptions.

The certification basis of the ERJ 190-400 is the same as the ERJ 190-300 with the addition of one ELOS.NOTE: The FAA Special Conditions, ELSO and Exemptionsare not listed in this report but may be accessed at the FAA's Regulatory and Guidance Library website.

Common notes

The ERJ 190-100 STD, LR, SR, IGW, and ECJ models have been approved for extended operations (ETOPS) when operated and maintained in accordance with theapplicable ERJ 190 Configuration, Maintenance and Procedures (CMP) document. This does not constitute operational approval to conduct ETOPS operations.

For the ERJ 190-100 ECJ model, the compliance requirements of cabin safety are demonstrated on interior installation and certification of aircraft.

These are an acceptable certification basis in accordance with NZCAR Part 21B Para §21.41 and Advisory Circular 21-1A, as 14 CFR (FAR) Part 25 is the basic standard for Normal Category Airplanes called up under Part 21 Appendix C and Advisory Circular 21-1. There are no non-compliances and no additional special conditions have been prescribed by the Director under §21.23.

(ii) Special Conditions:

Special Conditions specific to ERJ 190-100 models:

FCAR HDE-27 – Steep Approach Mode Functionality (SAM) - RBHA/14 CFR Part21.26, 25.125, 25.143(g) and 25.143(b) – The ERJ 190 Steep Approach Mode (SAM) allows steep approaches with an enhanced glide slope control and flare. This special condition required first the retention of adequate stall margins during a SAM steep approach and landing by ensuring that the system (including any failures that are more than improbable) not increase stall speeds by more than the greater of 3 knots or 3 percent otherwise the landing reference speeds would need to be recalculated using the higher stall speeds. Second, the special condition required that SAM system not decrease the stall margin during a banked turn manoeuvre of at least 40 degrees. Lastly, FAR 25.143(b) is amended to considered adequate lateral and glide control during a SAM steep approach.

Special Conditions specific to ERJ 190-100 & 200 models:

FCAR HES-01 – Engine Torque Loads for Sudden Engine Stoppage (RBHA 21.16; RBHA/14 CFR Part 25.361) – This special condition requires additional engine failure ultimate load cases (including the APU) to be analysed for engine support and adjacent airframe structure with an additional load factor of 1.25 applied to adjacent supporting airframe structure for 1g flight loads combined with the loss of any fan, compressor, or turbine blade or any other engine structural failure that results in higher loads.

FCAR HES-06 – Interaction of Systems and Structures (RBHA 21.16; RBHA/14 CFR Part 25.671 and 25.1309) – This special condition lays out additional strength requirements for structure that is affected by aircraft systems, either directly or as a result of a system failure or malfunction. Factors of safety are a function of probability of a system failure.

FCAR HSI-01 – High Intensity Radiated Fields (HIRF) Protection (RBHA 21.16; RBHA/14 CFR Part 25.1309, 25.1333, 25.1431, and 25.1529) – This special condition requires that electrical and electronic systems that perform critical functions to be designed such that they are not adversely affected when the airplane is exposed to external high intensity radiated fields.

FCAR HSI-02 – Operation without Normal Electrical Power (RBHA 21.16; RBHA/14 CFR Part 25.1165(b), 25.1309, 25.1333(b), and 25.1351) – The ERJ 190 series is heavily reliant on electrical systems which require a continuous source of electrical power. This special condition required that following the loss of normal engine generator power (including loss of the APU) electrical power is able to be supplied to all systems required for immediate safety, for continued safe flight and landing, and for engine restart.

FCAR HDE-02 – Electronic Flight Control System: Control Surface Position Awareness (RBHA 21.16; RBHA/14 CFR Part 21.16, 25.143, 25.671, and 25.672) – The ERJ 190 series uses a fly-by-wire flight control system in which there is no direct mechanical coupling between the cockpit controllers to the airplane control surfaces. As such, there may not always be a direct correlation between pilot control position and control surface position. This special condition requires that when control surfaces are so near their limits that a specific crew action is required to return to the normal flight envelope and/or continue safe flight, a suitable annunciation be provided to the flight crew unless other existing indications are adequate to prompt those actions.

FCAR HDE-17 – Performance Credit for ATTCS during Go-around (RBHA 21.16; RBHA 25.117, 25.119(a), 25.121(d), 25.904, 25.1309, and Appendix I) – The ERJ 190 incorporates an Automatic Take-off Thrust Control System (ATTCS) which becomes automatically available during descent and approach to land. This special condition sets out the requirements for being able to claim credit for the system function in complying with the go-around requirements of FAR 25.121(d).

FCAR HES-44 – Seats with Non-Traditional, Large, and Non-Metallic Panels (RBHA/14 CFR Part 25.853) – The current regulations do not require seats to meet the more stringent flammability requirements of large cabin interior panels. To provide the same level of passenger protection non-traditional, large, non-metallic panels fitted to aircraft seats in lieu of a traditional metal frame covered by fabric must meet FAR 25, Appendix F, Parts IV and V, heat release and smoke emission requirements. (A large panel is defined as a panel with exposed-surface areas greater than 1.5 square feet installed per seat place.)

FCAR HSI-65 – CE/SC n° 25-058 (ERJ 170/190) – Installed Non-Rechargeable Lithium Batteries Special Conditions (RBAC/14 CFR 21.16, 25.683, 25.1301, 25.1309 and 25.1353) – This special condition required any lithium batteries used in the ERJ 190 be designed to preclude cell failure and prevent a thermal runaway event during normal operation. It also required that should a cell failure trigger a thermal runaway, that means exist to disconnect the battery from its circuit, prevent hazardous accumulation of corrosive fluids or gases, and prevent any hazardous affect to adjacent systems and structures.

Special Conditions specific to ERJ 190-100 ECJ model:

FCAR ES-06 – Interaction of Systems and Structures (RBHA 21.16; RBHA/14 CFRPart 25.671 and 25.1309) – The different fuel system of the ECJ model requires special conditions to prevent mismanagement of fuel outside CG limits. This special condition lays out additional strength requirements for structure that is affected by aircraft systems, either directly or as a result of a system failure or malfunction. Factors of safety are a function of probability of a system failure.

FCAR HDE-31 – Enhanced Flight Vision System (EFVS) (RBHA/14 CFR Part 25.773) – Special conditions for the head-up display EFVS were required to ensure adequate brightness, accessible controls, acceptable pilot workload, and minimise distracting, inaccurate or degraded visuals without interference with outside visual references.

Special Conditions specific to ERJ 190-300 & 400 models:

FCAR EI-13 – CE/SC 25-039 – Seats with Non-Traditional, Large, Non-Metallic Panels (RBAC/14 CFR 25.853) – The current regulations do not require seats to meet the more stringent flammability requirements of large cabin interior panels. To provide the same level of passenger protection non-traditional, large, non-metallic panels fitted to aircraft seats in lieu of a traditional metal frame covered by fabric must meet FAR 25, Appendix F, Parts IV and V, heat release and smoke emission requirements. (A large panel is defined as a panel with exposed-surface areas greater than 1.5 square feet installed per seat place.)

FCAR ES-02 – CE/SC 25-045 – Interaction of Systems and Structures (RBAC 21.16; RBAC/14 CFR 25.671 & 25.1309) – This special condition harmonises with EASA CS and adds strength requirements for structure that is affected by aircraft systems, either directly or as a result of a system failure or malfunction. Factors of safety are a function of probability of a system failure.

FCAR ES-04 – CE/SC 25-065 – Dive Speed Definition with Speed Protection System (RBAC/14 CFR 25.335 (b)(1)) – The ERJ 190-300/400 is equipped with a high-speed protection system. This special condition identified various symmetric and non-symmetric manoeuvres that need to be considered when establishing the design dive speed V_D/M_D. It also required that failure of the high-speed protection system must be improbable and must be announced to the pilots. It also established the condition for the airplane to be dispatched with an inoperative high speed protection system under an approved MEL with reduced operating speed V_{MO}/M_{MO}.

FCAR ES-05 – CE/SC 25-044 – Design Roll Maneuver Requirement for Electronic Flight Controls (RBAC 21.16; RBAC/14 CFR 25.349 (a)) – This special condition established specific aircraft roll manoeuvre requirements of the electronic flight controls to address potential effects on structure and any nonlinearities that exist in the response of the flight control system to control wheel deflection.

FCAR ES-07 – CE/SC 25-067 – Landing Pitchover Condition (RBAC/14 CFR 21.16, 25.305, 25.481, 25.571; ANAC FCAR ES-02; EASA CS 25.302) – The ERJ 190-300/400 incorporates an automatic braking system which could cause a high nose gear sink rate.This special condition defined the airplane configuration, speeds, and other parameters necessary to develop appropriate airframe and nose gear loads for that situation.

FCAR ES-17 – CE/SC 25-037 – Sudden Engine Stoppage (RBAC 21.16; RBAC/14 CFR 25.361 (b)) – This special condition required additional engine failure ultimate load cases (including the APU) to be analysed for engine support and adjacent airframe structure with an additional load factor of 1.25 applied to adjacent supporting airframe structure for 1g flight loads combined with the loss of any fan, compressor, or turbine blade or any other engine structural failurethat results in higher loads.

FCAR EV-03 – CE/SC 25-043 – Flight Envelope Protection: Pitch and Roll and High-Speed Limiting Functions (RBAC/14 CFR 25.143) – The ERJ has a complex full digital flight control system. This special condition established amendments to RBAC 25.143 to accommodate the unique features of the pitch angle, bank angle, and high-speed limiting functions of that system.

FCAR EV-07 – CE/SC 25-046 – Flight Envelope Protection: Normal Load Factor (g) Limiting (RBAC/14 CFR 25.143) – The ERJ 190-300/400 is equipped with a normal load factor limit function that limits the load factor the airplane can achieve during normal operation which cannot be overridden by the flight crew. This special condition established the minimum limit load factors for function design to provide acceptable aircraft manoeuvrability.

FCAR EV-09 –CE/SC 25-048 – Human Factors Requirements (14 CFR Part 25.1302) – This special condition replicated the requirements of 14 CFR Part 25.1302 as it was notpresent in ANAC RBAC Part 25 at the time of certification. FCAR EV-25 – CE/SC 25-057 – Flight Envelope Protection: High AoA Protection Function (RBAC/14 CFR 25.103, 25.201 & 25.203) – The ERJ 190-300/400 flight control system incorporates a high AoA protection function which limits the maximum angle of attack attainable by the airplane and cannot be overridden by the flight crew. This

special condition prescribed amended requirements for the establishment of stall speeds and required that the system prevent the airplane from encountering a stall during normal manoeuvres, sideslips, and expected levels of atmospheric disturbances. It also required that the system not impede recovery procedures in the case of windshear and the system must be verified in icing conditions. Loss of the system must be shown to be at least improbable, and any failure effect understood and accepted under 25.1309 & 25.671(c).

FCAR EV-37 – CE/SC 25-049 – Flight Envelope Protection: General Limiting Requirements (RBAC 25.143) – This special condition established requirements in addition to 25.143 that addressed the flight envelope protection aspects of the flight control system and required that any system failures are made known to the flight crew and do not result in the aircraft entering an uncontrollable condition or any other unsafe state.

FCAR PR-02 – CE/SC 25-035 – Performance Credit for ATTCS during Go-Around (RBAC/14 CFR Part 25.117, 25.121 (d), 25.904, RBAC/14 CFR Part 25-Appendix I) – The ERJ 190 incorporates an Automatic Take-off Thrust Control System (ATTCS) which becomes automatically available during descent and approach to land. This special condition set out the requirements for being able to claim credit for the system function in complying with the go- around requirements of FAR 25.121(d).

FCAR PR-06 – CE/SC 25-047 – Reverse Thrust Setting Below the Flight Regime (RBAC 21.16; RBAC 25.1155) – This special condition required that the ERJ 190-300/400 comply with EASA requirement CS 25.1155 for thrust reversers.

FCAR PR-33 – CE/SC 25-052 – Lightning Protection of Fuel Tank Structure(RBAC 21.16; 25.901 (c); 25.95425.981) – This special condition established requirements for lightning protection of fuel tank structure where compliance with 25.981(a)(3) was shown to be impractical. This included meeting the requirements of Appendix M of Part 25 at amendment 25- 125, prevention of catastrophic fuel vapour ignition due to lightning, and designing the fuel tank structure and systems lightning protection to be fault tolerant.

FCAR SE-04 – CE/SC 25-038 – Operation Without Normal Electrical Power (RBAC/14 CFR 21.16; 25.1165 (b); 25.1309, 25.1709 & 25.1351) – The ERJ 190 series is heavily reliant on electrical systems which require a continuous source of electrical power. This special condition required that following the loss of normal engine generator power (including loss of the APU) electrical power is able to be supplied to all systems required for immediate safety, for continued safe flight and landing, and for engine restart.

FCAR SE-05 – CE/SC 25-041 – Isolation of Aircraft Electronic System Security Protection from Unauthorized Internal Access (RBAC 21.16, 25.1301, 25.1309, 25.1431, 25.1529, Appendix H to Part 25) – The ERJ 190-300/400 digital systems architecture is composed of several connected networks, some of which are responsible for aircraft control and airline information functions. This special condition required the design either provided isolation from or electronic system security against unauthorized access sources internal to the aircraft. The design must also prevent inadvertent and malicious changes to, and all adverse impacts on aircraft systems, equipment, networks, or other assets require for safe flight and operations. Procedures must also have been established that ensure continued airworthiness is maintained, including all further modifications that may have an impact on the approved system security safeguards.

FCAR SE-06 - CE/SC 25-040 – Aircraft Electronic System Security Protection from Unauthorized External Access (RBAC 21.16, 25.1301, 25.1309, 25.1431,25.1529, Appendix H to Part 25) – The ERJ 190-300/400 digital systems architecture is composed of several connected networks, some of which are responsible for aircraft control and airline information functions. This special condition required the airplane electronic system be securely protected from unauthorized external access sources, including those possibly cause by maintenance activity. This must have been achieved by identification and assessment of security threats and protection strategies implemented to protect the airplane from all adverse impacts on safety, functionality, and continued airworthiness. Procedures must also have been established that ensure continued airworthiness is maintained, including all further modifications that may have an impact on the approved system security safeguards.

FCAR SE-09 – CE/SC 25-058 – Lithium Batteries - Non-Rechargeable (RBAC/14 CFR 21.16, 25.863, 25.1301, 25.1309 & 25.1353) – This special condition required any lithium batteries used in the ERJ 190 be designed to preclude cell failure and prevent a thermal runaway event during normal operation. It also required that should a cell failure trigger a thermal runaway, that means exist to disconnect the battery from its circuit, prevent hazardous accumulation of corrosive fluids or gases, and prevent any hazardous affect to adjacent systems and structures.

FCAR SM- 01 – CE/SC 25-066 – Electronic Flight Control System: Control Surface Position Awareness, Multiple Modes of Operation, Flight Control in all attitudes (RBAC 21.16; RBAC 25.671) – The ERJ 190 series uses a fly-by-wire flight control system in which there is no direct mechanical coupling between the cockpit controllers to the airplane control surfaces. As such, there may not always be a direct correlation between pilot control position and control surface position. This special condition required that the system not hinder aircraft recovery from any attitude, and that the flight crew be made aware when the control limits are about to be reached and when the system is operating in any secondary or degraded modes.

FCAR SM-09 – CE/SC 25-042 – Electrical/Electronic Equipment Bay Fire Detection and Smoke Penetration (RBAC/14 CFR 25.831, 25.869, 25.1501 (a), HARM 25.1301, HARM 25.1309) – The ERJ 190-300/400 has three electrical/electronic equipment (EE) bays distributed in the pressurized compartment. This special condition required that a smoke/fire detection system be present for each EE bay and that means exist to prevent propagation of hazardous quantities of smoke or fire retardant in the passenger cabin.

(iii) Equivalent Level of Safety Findings:

ELOS specific to ERJ 190-100 model:

FCAR HSI-35 – RBHA/14 CFR Part 25.841(b)(6)) – Cabin Altitude Warning System – High Altitude Takeoff and Landing Operations – In order to operate at high airfields with elevations up to 14,000 feet maintaining the same level of safety as required by the section 25.841(b)(6), Embraer incorporated to the cabin pressure control system (CPCS) a function that automatically shifts the warning set point to avoid unnecessary warning messages and indications. Harmonised with FAA issue paper S-58 at HIS-35A.

ELOS specific to ERJ 190-100 & 200 models:

FCAR HES-13 – Checked Maneuver Loads (RBHA 21.21(b)(1); RBHA/14 CFR Part 25.331(c)(2)) – The RBHA/FAR requirement for the checked manoeuvre requirement RBHA/FAR 25.331(c)(2), differs from the corresponding EASA/JAR requirement for that manoeuvre. At the time of certification, the rule was being harmonized and Embraer elected to comply with the harmonized requirement.

FCAR HES-19 – Fuel Tank Crashworthiness (RBHA 21.21(b)(1); RBHA/14 CFR Part 25.721 and 25.963(d)) – Embraer elected to comply with the proposed harmonized requirement for fuel tank strength instead of RBHA/FAR 25 amdt. 25-69, applicable at the time. This ELOS deals only with fuel tank integrity regarding ultimate hydrostatic design conditions, which correspond specifically to RBHA/FAR 25.963(d). Interdependent with FCAR HES-20.

FCAR HES-20 – Minor Crash Criteria (RBHA 21.21(b)(1); RBHA/14 CFR Part 25.721 and 25.963(d)) – Instead of complying with RBHA/FAR 25.721 (amdt. 25-32), Embraer elected to comply with the new proposed requirement RBHA/FAR 25.721. The rule was being harmonized and was later adopted by the RBHA/FAR and EASA/JAR requirements at FAR 25 amdt 25-139. Interdependent with FCAR HES-19.

FCAR HES-36 (see Note 10 of TCDS) – Emergency Exit Locator Signs (RBHA 21.21(b)(1); RBHA/14 CFR Part 25.811(d)(3)) – The basic interior configuration of the ERJ 190-100 aircraft model includes emergency exit locator signs - above the aisle near each passenger emergency exit. There are no signs on the cabin bulkheads and/or dividers, as required by RBHA/FAR 25.811(d)(3). Instead of showing direct compliance to the rule, the cabin layout and aisle locator signs provide an equivalent level of safety.

FCAR HSI-15 – Equipment, Systems and Installations (RBHA 21.21(b)(1); RBHA/14 CFR Part 25.1309) – The guidance material for compliance with RBHA/FAR 25.1309 at the time of certification was not considered to be sufficiently effective and complete for assessing the safety aspects of complex and highly integrated systems that perform interrelated multi-functions such as those installed in the ERJ 190 aircraft. As a result of the FAA/JAA Harmonization Working Groups activities, both authorities reached agreement on a revised text and guidance material for the systems safety assessment requirements. Embraer elected to comply with the newly proposed amendments to these requirements as an ELOS.

FCAR HSI-27 – Equivalent Level of Safety Finding for Position Lights (RBHA 21.21(b)(1); RBHA/14 CFR Part 25.1389(b), 25.1391, 25.1393, and 25.1395) – The forward position lights of the Embraer ERJ 190-100 airplane exceed the allowable overlapping intensities specified by RBHA/FAR 25.1389(b)(3) and 25.1395. An ELOS was granted due to the position light intensities in the main coverage area exceeding the minimum intensity requirements which more than compensated for the slight exceedance in the overlap intensities.

FCAR HSI-38 – Cabin Ventilation – Humidity Requirement (RBHA 21.21(b)(1); RBHA/14 CFR Part 25.831(g)) – Embraer demonstrated that the environmental conditions in the cockpit and cabin after failure of all air conditioning provide for adequate cooling and ventilation to avoid an adverse impact on passenger health or the crew's ability to perform their duties. This was accomplished using an established environmental standard that considers temperature, humidity, air movement, and time exposure. This model more accurately reflects human susceptibility to the effects of a high temperature/humidity environment than the single point humidity limit in RBHA/FAR 25.831(g), amendment 25-89.

FCAR HDE-16 – Performance Credit for Use of Automatic Power Reserve (APR) during Reduced Thrust Takeoffs (RBHA 21.21(b)(1); RBHA/14 CFR Part 25.904, 25.149, and Appendix I) – The ERJ 190 aircraft design incorporates an automatic take-off thrust control system (ATTCS)/ automatic power reserve (APR) function in the engine full authority digital electronic control (FADEC) system architecture which automatically increases the thrust of the operating engine in the event of an engine failure during take-off or go-around operations. Embraer requested performance credit of the ATTCS system to be taken into account for reduced thrust take-offs when determining the take-off weight limits by showing there is no increase in pilot workload.

FCAR HPR-06 – Flight Critical Thrust Reverser (RBHA 21.21(b)(1); RBHA/14 CFR Part 25.933(a)(1)(ii), and 25.1309(b)(1)) – Instead of directly showing compliance with the requirements of FAR 25.933(a)(1)(ii) which requires to show that the aircraft is capable of continued safe flight and landing under any possible position of the thrust reverser, the ELOS was based on compensating design features which include various mechanical and electro-hydraulic mechanisms and system architecture independence, supported by rigorous safety analysis and appropriate continued airworthiness features to ensure that equivalency is achieved.

FCAR HPR-14 – Digital only Display of Turbine Engine High/Intermediate Pressure Rotor Speed (N2) (RBHA 21.21(b)(1); RBHA/14 CFR Part 25.901, 25.1305, 25.1309, 25.1321, and 25.1549) – The primary engine displays on turbine powered transport aircraft have traditionally displayed the engine rotor speed required by RBHA/FAR 25.1305(c)(3) in an analogue-only or an analogue and digital format. Embraer has demonstrated the use of digital-only primary displays for high pressure rotor speeds (N2), oil pressure and temperature and fuel flow indicators meets an equivalent level of safety as that required by the rule. The FADEC system has relieved the flight crew workload in having to monitor engine indications for secondary engine parameters and it was shown the visibility, relative location, criticality, and functionality of the digital only displays does not require any of the explicit or implicit benefits of a traditional analogue display.

FCAR HPR-17 – Adoption of APU Harmonized Requirements (RBHA 21.21(b)(1); RBHA/14 CFR Part 25 Subparts E, F, and G) – For the APU installation, with the purpose of having a common certification basis for all major certification authorities, Embraer adopted the proposed RBHA/FAR 25 Appendix K requirements, as presented in the Draft FAA NPRM, Rulemaking Team Draft, dated April 2001, rather than comply with the RBHA/FAR 25 applicable at the time of certification.

FCAR HPR-23 – Lack of On/Off Switch for ATTCS System (RBHA 21.21(b)(1); RBHA/14 CFR Part 25.117, 25.119(a), 25.121(d), 25.904, 25.1301, 25.1309, and Appendix I) – RBHA/FAR 25 Appendix I25.5(b)(4) requires that the manufacturer provides a means for the flight crew to deactivate the automatic function of the automatic take-off thrust control system (ATTCS) system. The Embraer ERJ 190 has incorporated the ATTCS system into the full authority digital electronic control (FADEC) system architecture, and does not have a means for the flight crew to deactivate the ATTCS during take-off or any phase of flight. Embraer has shown that the engine control system reliability is adequate for its failure mode criticality which provides for and equivalent level of safety.

FCAR HSI-55 – Lavatory Oxygen System Restoration (RBAC 21.21(b)(1); RBHA/14 CFR Part 25.1441(c) and 25.1443(c)) – In 2011, due to a safety concern, ANAC required COG (Chemical Oxygen Generator) systems installed inside the lavatories of transport category aircraft to be rendering inoperative or removed. Embraer subsequently incorporated a design change to restore the lavatory oxygen system by installing gaseous oxygen bottles in the lavatories as a means to provide supplemental oxygen in case of decompression. These bottles were sized such that the amount of oxygen supplied prevented strict compliance with RBAC 25.1443(c). Embraer were able to show (by measuring blood saturation levels directly on human subjects) that the capacity and flow rate provided at least an equivalent level of safety to that specified by RBAC 25.1443(c) which is based on tracheal oxygen partial pressures.

FCAR HES-43 – Photoluminescent Exit Sign (RBHA/14 CFR Part 25.812(b)(1)(ii) and 25.812(i)) – Embraer showed an equivalent level of safety in meeting the requirements of FAR 25.811 and 25.812 which relate to the illumination intensity, background and letter colouring of the emergency exit signs. The requirements are that the lettering needs to be red on a white background whereas utilising the photo-luminescent technology results in a light green background and dark lettering when the sign self illuminates.

FCAR HSI-60 – New LED Position Lights System Overlap Exceedance (RBHA/14 CFR Part 25.1389(b)(3) and 25.1395) – In 2013, Embraer incorporated a design change to replace the position and anti-collision light system to LED Technology on ERJ l90-100 and ERJ 190- 200 aeroplanes equipped with winglets. The new LED position light system exceeded the maximum overlapping intensities allowed by the regulations. An equivalent level of safety was granted due to the position light intensities in the main coverage area exceeding the minimum intensity requirements which more than compensated for the slight exceedance in the overlapintensities. This assured enough signal clarity of the position lighting system allowing an observer in another aircraft to determine the orientation and direction of travel of the aeroplane.

FCAR HSI-69 – Position Lightning System with protective tape in the lens – Minimum Intensities RBHA/14 CFR Part 25.1389(b)(2),25.1391 and 25.1393- The position lighting system of the ERJ 190-100 and ERJ 190-200 equipped with winglet does not meet the minimum intensity of the RBHA 25.1389(b)(2). The general high main beam intensity of the position lights, in comparison with small non-compliance areas, assures enough signal clarity of the position lighting system allowing an observer in another aircraft to determine the orientation and direction of travel. While the position light installation does not literally comply with applicable requirements, the intensities supply a superior level of safety. In all cases, the lower intensity areas are only located at angles that are not considered critical viewing angles (e.g., high horizontal angles) or only cover a small area such that would only be visible to an observer in another aircraft for a very short time. Therefore, the position lights, as installed in the ERJ 190-100/-200, provide the necessary conspicuity to allow anyone encountering the airplane to easily discern its position and flight direction."

ELOS specific to ERJ 190-100 ECJ model:

FCAR EI-01 – Emergency Exit Locator Sign near Type III Door (RBHA 21.21(b)(1); RBHA/14 CFR Part 25.811(d)(1)) – The exit locator and exit marking signs required by RBHA 25.811(d)(1) and 25.811(d)(2)), are intended to be independent and serve different functions. This ELOS was granted to Embraer in order to utilise a single prism shaped emergency exit sign located above the Type III over-wing exit door, sign to comply with both requirements.

FCAR EI-02 – Emergency Exit Locator Sign near Type I Door (RBHA 21.21(b)(1); RBHA/14 CFR Part 25.811(d)(3)) – The exit locator marking signs required by RBHA 25.811(d)(1) and 25.811(d)(3)), are intended to be independent and serve different functions. This ELOS was granted to Embraer in order to utilise a single combined emergency exit locator sign installed on the aft face of the forward bulkhead, over the flight attendant seat to indicate the position of the forward Type I LH entry door to occupants approaching from the rear of the cabin.

FCAR EI-03 – Emergency Exit Sign Dimensions (RBHA 21.21(b)(1); RBHA/14 CFR Part 25.812(b)(1)) – The ERJ 190-100 ECJ is certified for a maximum passenger capacity of 19. RBHA 25.812(b)(1) specifies minimum lettering and background size requirements for the emergency exit locator signs required by RBHA 25.811(d). Due to the ERJ 190-100 ECJ interior configurations being divided into several smaller cabin zones, this ELOS was granted to utilise the reduced emergency lettering and sign sizes specified by RBHA 25.812(b)(2) applicable to smaller type aircraft with a passenger seating capacity of 9 seats or less.

FCAR EI-04 – In-flight Accessible Class C Baggage Compartment (RBHA 21.21(b)(1); RBHA/14 CFR Part 25.857(c)) – The ERJ 190-100 ECJ interior configurations has a door, in the partition panel between the upper floor class C baggage compartment and the passenger cabin to provide in-flight access. RBHA/FAR 25.857(c) requires that a class C baggage compartment be inaccessible in flight. Embraer has incorporated various compensating design features into the door design to provide sufficient isolation from fire and smoke in order to achieve an equivalent level of safety with the class C baggage compartment requirements.

ELOS specific to ERJ 190-300 & -400 models:

FCAR EI-02 – Exit Handle Marking (RBAC/14 CFR 25.811 (e)(4)) – Due to the design of the opening means of the forward type 1 exit doors on the ERJ 190-300 aeroplane type, literal compliance with the requirements of RBAC/14 CFR 25.811 (e)(4)) for exit handle marking was not possible due to the rotary motion of the handle not being in the same plane as the exit door. Embraer obtained an equivalent level of safety for their exit handle marking which followed the guidance of EASA AMC 25.811(e)(4) for linear opening handle types.

FCAR EI-16 – Protection of flight crew compartment – Reduced Energy (RBAC/14 CFR 25.795 (a)(1)) – Section RBAC/14 CFR Part 25.795(a)(l) establishes that the flight deck door as well as the boundaries that are separating the flight deck compartment from the area occupied by passengers shall be designed to withstand the impact of 300J. Embraer obtained an equivalent level of safety by utilising reduced energy intrusion protection requirements for specific areas based on the maximum load a passenger could apply within the confined geometric areas of the forward lavatory and galley areas.

FCAR EI-18 – Emergency Exit Locator Sign (RBAC/14 CFR 25.811 (d)(3)) – The interior configuration of the ERJ 190-300/400 aircraft model includes emergency exit locator signs - above the aisle near each passenger emergency exit. There are no signs on the cabin bulkheadsand/or dividers, as required by RBHA/FAR 25.811(d)(3). Instead of showing direct compliance to the rule, the cabin layout and aisle locator signs provide an equivalent level of safety.

FCAR EI-25 – Exit Signs with Graphical Symbol (RBAC/14 CFR 25.811) – Embraer obtained an equivalent level of safety in showing compliance with RBAC/14 CFR 25.811 by utilising graphical symbols (green running man on white background) as opposed to the standard Emergency Exit text on red lettering on a white background.

FCAR EI-26 – Emergency Assist Means Time (RBAC/14 CFR 25.810 (a)(1)(ii)) – RBAC/14 CFR 25.810 (a)(1)(ii)) requires the escape system to be automatically inflated and fully erected within 6 seconds after deployment is initiated. The Type l emergency exits of the ERJ 190- 300 are able to be fully opened and with the assisting means automatically erected within 10 secondsfrom the time the opening means of the exit is actuated. Therefore, even though the assisting means might require more than 6 seconds to be erected after deployment is begun, the total time until the emergency exit is ready for use will not be more than 10 seconds. Embraer has obtained an equivalent level of safety due to their exit and assist means, meeting the requirements of RBAC/14 CFR 25.809(b), which requires the emergency exit to be fully opened within 10 seconds after actuating the opening means.

FCAR EI-28 – Harmonized Requirements for Cargo, Stowage Compartments, Carry-on Articles and Equipment (RBAC/14 CFR 25.787 (a)) – Regulatory differencesbetween the requirements of 25.787 of the EASA CS 25 Amdt.13 and the FAA 14 CFR Part 25 wereeliminated in Amdt.139. As a result of this harmonization, Embraer requested to adopt the requirement 25.787(a) according to the harmonized FAA 14 CFR Part 25 Amdt.139 and EASA CS 25 Amdt.13 in lieu of RBAC 25.787 (a) Amdt.134, applicable at the time of certification.

FCAR EI-29 - Minor Obstruction to Type III Exit Provided (RBAC/14 CFR 25.813 (c)(2)(i)) – RBAC/14 CFR 25.813(c) (2) (i) requires that the projected opening of the exit provided must not be obstructed. The Type III over-wing exits have a seat cushion that protrudes into the exit opening. An equivalent level of safety was granted after Embraer showed that the obstruction was minor after taking into account compensating factors such as automatically opening/stowing emergency exit doors, easily compressible seat cushion and over wing exit size larger than the minimum requirements.

FCAR ES-19 – Checked Maneuver Loads (RBAC/14 CFR 25.331 (c)(2)) – The RBHA/FAR requirement for the checked manoeuvre requirement RBHA/FAR 25.331(c)(2), differs from the corresponding EASA/JAR requirement for that manoeuvre. At the time of certification, the rule was being harmonized and Embraer elected to comply with the harmonized requirement.

FCAR ES-20 – Gust and Continuous Turbulence Design Loads (RBAC/14 CFR 25.341, 25.343, 25.345, 25.371, 25.373, 25.391 & 25.1517) – The Aviation Rulemaking Advisory Committee (ARAC) recommended new criteria for gust and turbulence design loads. The FAA issued AC 25.341-1 according to ARAC results, as well as updating the correspondent requirement on amendment 141 of 14 CFR Part 25. Embraer adopted the new proposed requirements 25.341 (Gust and turbulence loads), 25.343 (Design fuel and Oil Loads), 25.345 (High Lift Devices), 25.371 (Gyroscopic Loads), 25.373 (Speed Control Devices), 25.391 (Control surface Loads), and 25.1517 (Rough Air Speed) according to CS 25 Amdt.13 and 14 CFR Part 25 Amdt.141,instead of the requirements applicable at the time.

FCAR ES-23 – Ground Gust Conditions (RBAC 25.391, 25.395, 25.415) – Embraer adopted the harmonized requirements 25.391 (Control surface Loads), 25.395(b) (Control System) and 25.415 (Ground Gust Conditions) from CS-25 Amdt.13 and 14 CFR Part 25 Amdt.141 insteadof the corresponding requirements applicable at the time.

FCAR ES-30 – Failure Criteria considered under the Aeroelasticity Stability Requirement (RBAC/14 CFR 25.629, 25.671 (c)(2), 25.1309) – The aeroelastic stability requirements of RBAC/14 CFR 25.629(d) include consideration of the failure conditions defined in RBAC/14 CFR 25.671 and RBAC/14 CFR 25.1309. Embraer requested compliance with the criteria contained in the draft harmonized proposal from the ARAC Flight Controls Harmonization Working Group in lieu of the failures defined in RBAC/14 CFR 25.671(c)(2) for demonstrating compliance with RBAC/14 CFR 25.629(d)(9). Embraer also requested compliance with the criteria contained in the draft harmonized proposal from the ARAC Systems Design & Analysis Harmonization Working Group, including AC/AMJ 25.1309 Draft Arsenal, dated June 10, 2002, in lieu of the failures defined in RBAC/14 CFR 25.1309 for demonstrating compliance with RBAC/14 CFR 25.629(d)(9).

FCAR ES-31 – Fuel Tank Integrity in a Minor Crash Scenario (RBAC/14 CFR 25.721, 25.963 (d) & 25.994) – Embraer elected to comply with the harmonized requirements of 25.721, 25.963(d) and 25.994 from the 14 CFR Part 25 at Amendment 25-139, as an equivalent level of safety to the same requirements of RBAC 25 at Amendment 25-134 applicable to the fuel tank, fuel system components and surrounding airframe structural strength of the ERJ 190-300 model.

FCAR ES-33 – Casting Factors (RBAC/14 CFR 25.621) – Embraer adopted the requirement of 25.621 according to the harmonized FAA 14 CFR Part 25 Amdt.139 and EASA CS 25 Amdt.13 in lieu of RBAC 25 Amdt.134 applicable at the time. As a result of the harmonized rules, quality control, inspection and testing conditions for critical and non-critical castings were clarified.

FCAR ES-34 – Proof of structure (RBAC/14 CFR 25.307) – Embraer adopted the requirements of 25.307 according to the harmonized FAA 14 CFR Part 25 Amdt.139 and EASA CS-25 Amdt.13 in lieu of RBAC 25 Amdt.134 applicable at the time. As a result of this harmonization, the structural test requirements necessary, when analysis has not been found reliable, were revised.

FCAR EV-17 – Performance Credit for Use of ATTCS during Reduced Takeoff Thrust (RBAC/14 CFR 25.904, 25.149, Appendix 125.4 (a)) – The ERJ 190 aircraft design incorporates an automatic take-off thrust control system (ATTCS)/ automatic power reserve(APR) function in the engine full authority digital electronic control (FADEC) system architecture which automatically increases the thrust of the operating engine in the event of an engine failure during take-off or go-around operations. Embraer requested performance credit of the ATTCS system to be taken into account for reduced thrust take-offs when determining the take-off weight limits by showing there is no increase in pilot workload.

FCAR EV-35 – Electronic Flight Control System: Mis-trim Maneuvering (RBAC/14 CFR 25.255) – The ERJ 190-300 has new control architecture in the form of a full digital flight control system. Among other functions, this system incorporates a load factor and speed (Nz-u) command control law which provides conventional positive static stability in the normal flight envelope. Also the flight control system design includes a pitch trim control, however this control does not directly command the horizontal stabilizer but changes the speed trim reference. This design prevents Embraer to demonstrate literal compliance with RBAC / 14 CFR Part 25.255. An ELOS was issued due to the control system design providing a wide range of compensating features which exceeded level of safety provided by direct compliance to RBAC 25.255.

FCAR PR-03 – Flight Critical Thrust Reverser (RBAC 21.21 (b)(1); RBAC 25.933 (a)(1)(ii) & Harmonized RBAC 25.1309) – Instead of directly showing compliance with the requirements of FAR 25.933(a)(1)(ii) which requires to show that the aeroplane is capable of continued safe flight and landing under any possible position of the thrust reverser, the ELOS was based on compensating design features which include various mechanical and electro-hydraulic mechanisms and system architecture independence, supported by rigorous safety analysis and appropriate continued airworthiness features to ensure that equivalency is achieved.

FCAR PR-14 – Digital only Display of turbine engine high/ pressure sensor (N2),oil pressure, oil temperature and fuel flow (RBAC 21.21 (b)(1); 25.901, 25.903 (d)(2); 25.1305; 25.1309; 25.1321; 25.1322 & 25.1549) – The primary engine displays on turbine powered transport aircraft have traditionally displayed the engine rotor speed required by RBHA/FAR 25.1305(c)(3) in an analogue-only or an analogue and digital format. Embraer has demonstrated that the use of digital-only primary displays for high pressure rotor speeds (N2), oil pressure and temperature and fuel flow indicators meets an equivalent level of safety as that requiredby the rule. The FADEC system has relieved the flight crew workload in having to monitor engine indications for secondary engine parameters and it was shown that the visibility, relative location, criticality, and functionality of the digital only displays does not require any of the explicit or implicit benefits of a traditional analogue display.

FCAR PR-16 – APU Type Certification Requirements (RBAC 21.21 (b)(1); RBAC/14 CFR Part 25 Subparts E, F and G) – Embraer adopted the proposed 14 CFR part 25 Appendix K requirements for the auxiliary power unit (APU) installation rather than comply with the Part 25 subpart E, F, and G airworthiness regulations applicable at the time. The Embraer Model ERJ 190-300 and ERJ 190-400 airplanes do not present a direct indication when there is a failure in the APU shutoff valve and when it does not reach the commanded position. The APU is controlled by the full authority digital engine control (FADEC). The accomplishment of the APU shutdown command can, however, be verified by APU Speed and exhaust gas temperature (EGT) indications decreasing and an ELOS in this regard was issued.

FCAR PR-17 – Resistance to Fire of Nacelle Cowlings (RBAC 21.21 (b)(1); RBAC 25.1193 (e)(3)) – RBAC 25.1193(e)(3) requires the engine cowlings/nacelle skins to be fireproof.The Model PW1900G engine installation has only one designated fire zone, the engine core, that is completely enclosed by fireproof barriers. The other portions of the engine nacelle do not literally comply with the prescriptive requirements of RBAC 25.1193(e)(3). The ARAC Powerplant Installation Harmonization Working Group (PPIHWG) updated EASA Certification Specifications CS 25.1193(e) at Amdt 13 to provide some relief to the fireproof requirements under certainoperating conditions (fire resistant as opposed to fireproof). Embraer showed that fire

resistant skins provide adequate fire protection for those areas under certain operating conditions in that sufficient time is provided to stop the aeroplane and evacuate it and that this provided an equivalent level of safety to RBAC 25.1193(e)(3).

FCAR PR-18 – Lack of On/Off Switch for ATTCS System (RBAC/14 CFR Part 25 Appendix I 25.5 (b)(4)) – RBHA/FAR 25 Appendix I25.5(b)(4) requires that the manufacturer provides a means for the flight crew to deactivate the automatic function of the automatic take-off thrust control system (ATTCS) system. The Embraer ERJ 190-300 has incorporated the ATTCS system into the full authority digital electronic control (FADEC) system architecture and does not have a means for the flight crew to deactivate the ATTCS during takeoff or any phase of flight. Embraer has shown that the engine control system reliability is adequate for its failure mode criticality which provides for and equivalent level of safety.

FCAR PR-26 – Engine shutoff valve indication (RBAC 25.1141 (f)(2)) – RBAC 25.1141 (f)(2) requires that powerplant valve controls located in the flight deck indicate to the flightcrew when the valve has not responded as intended to the selected position or function. The ERJ 190-300 and ERJ 190-400 airplanes do not provide a direct indication when there is a failure in the engine shutoff valve. The engine shutdown is a function of the engine full-authority digital electronic control (FADEC), and its command is provided by the start/stop switch in the cockpit. With an engine stop command, the engine electronic control unit (ECU) commands the fuel shutoff valve to close. One second after the fuel shutoff valve command, the ECU commands the fuel metering valve to close. The accomplishment of the engine shutdown command can be verified by engine spool down and ITT decreasing. Failure of the fuel shutoff valve to shut the engine down can be detected by the FADEC and will be annunciated to the flightcrew.

FCAR PR-35 – ERJ 190-300 Fire Safety Requirements for Designated Fire zones and Areas adjacent to Designated Fire Zones (RBAC 21.21 (b)(1); 25.1181 (a)(6) and (b); 25.1182; 25.1191; 25.1193 (e); and; 25.1195 through 25.1203) – The engine fan case and the 2.5 bleed compartments of the ERJ 190-300 aeroplane do not literally comply with the fire zone requirements of RBAC 25.1181(a)(6) and (b), specifically the firewall RBAC 25.1191, fireproof skin RBAC 25.1193(e)), and fire detection and fire extinguishing requirements RBAC 25.1195 through 25.1203. These zones, however, have been shown to still meet the intent of RBAC 25.11 81(a)(6) and RBAC 25.1182 as its architecture and operating environment inherently protects against the start and continued propagation of a fire. This inherent protection provides an equivalent level of safety to those areas classified as designated fire zones and containing fire detection and extinguishing systems.

FCAR SE-13 – Position Lighting Systems Maximum Overlapping Intensity Deviations (RBAC/14 CFR 25.1389 (b)(3) & 25.1395) – The position light installation of the ERJ 190-300 does not meet the maximum overlap intensity levels of RBAC 25.1395 but the intensity levels provided by the position lights in the main beams are much greater than the minimums required by RBAC 25.1391. An equivalent level of safety was granted due to the position light intensities in the main coverage area exceeding the minimum intensity requirements which more than compensated for the slight exceedance in the overlap intensities.

FCAR SI-01 – Equipment, Systems and Installations Requirements: Use of ARAC Recommendations (RBAC/CS/14 CFR 25.1301 & 25.1309) – Embraer adopted the Aviation Rulemaking Advisory Committee (ARAC) recommended changes to 14 CFR 25.1301 & 25.1309 as submitted to the FAA in August 2002. Also, Embraer adopted the associated draft Advisory Circular 25.1309 Arsenal, dated June 10th, 2002, as an acceptable means of compliance with the applicable regulations.

FCAR SM-05 – Cabin Ventilation – Humidity Requirement (RBAC/14 CFR 25.831 (g)) – Embraer requested an equivalent level of safety for RBAC/14 CFR 25.83 l(g) and proposed, as a compensating factor, the adoption of ARAC Recommended Rulemaking from the Mechanical Systems Harmonization Working Group (MSHWG) final report on RBAC/14 CFR 25.83l(g), dated July 24th, 2003. Embraer demonstrated the environmental conditions in the cockpit and cabin after failure of all air conditioning provide for adequate cooling and ventilation to avoid an adverse impact on passenger health or crew ability to perform duties. This was accomplished using an established environmental standard that considers temperature, humidity, air movement, and time exposure.

FCAR SM-10 – "Determination of Minimum Oxygen Flow for the Lavatory (RBAC 25.1441; 25.1443 (c) / AD 2011-02-02)" – In 2011, due to a safety concern, ANAC required COG (Chemical Oxygen Generator) systems installed inside the lavatories of transport category aeroplanes to be rendering inoperative or removed. Embraer subsequently incorporated a design change to restore the lavatory oxygen system by installing gaseous oxygen bottles in the lavatories as a means to provide supplemental oxygen in case of decompression. These bottles were sized such that the amount of oxygen supplied prevented strict compliance with RBAC 25.1443(c). Embraer were able to show (by measuring blood saturation levels directly on human subjects) that the capacity and flow rate provided at least an equivalent level of safety to that specified by RBAC 25.1443(c) which is based on tracheal oxygen partial pressures.

FCAR SM-11 – "Crew Determination of Quantity of Oxygen in Lavatory Oxygen System Distributed Bottles – 25.1441(c) (RBAC/14 CFR 25.1441 (c) / AD 2011- 02-02)" – The design for the occupant's supplementary oxygen system installed on ERJ 190-300 aircraft provides the use of a gaseous oxygen system in the lavatories, that does not have means to inform the crew during flight of the quantity of oxygen available in each cylinder, and therefore will not comply with the requirements of RBAC 25.1441(c). The same design features that granted ELOS to RBAC 25.144 l(c) for previous Embraer models were incorporated in the new model ERJ 190-300.

FCAR SM-12 – Determination of Minimum Oxygen Flow for the Passenger Oxygen System (except for the lavatory oxygen system, addressed in the FCAR SM-10) (RBAC/14 CFR 25.1443 (c)) – Embraer requested to make use of the same lower oxygen flow rates that were granted in ELOS FCAR SM-10 for the lavatory when determining the supplemental oxygen requirements for passengers other than in the lavatory. This ELOS was grantedbased on the same blood saturation levels measured for ELOS SM-10 as opposed to complying with that specified by RBAC 25.1443(c) which is based on tracheal oxygen partial pressures. The passenger supplemental oxygen is, however, still generated by Chemical Oxygen Generators as opposed to gaseous oxygen as utilised in the lavatories.

FCAR SM-14 – Flight Control System Failure Criteria (RBAC 25.671 (c)(2) and (c)(3), 25.1309) – The flight control system of transport category aeroplanes must be shown to be capable of continued safe flight and landing, without requiring exceptional piloting skill or strength, for single failures and certain combinations of failures not shown to be extremely improbable. Embraer were granted an ELOS for RBAC 25.671(c)(2) and (c)(3) based on the proposal from the Aviation Rulemaking Advisory Committee (ARAC) Flight Controls Harmonization Working Group (FCHWG) and its harmonized draft AC/AMJ 25.671.

FCAR SM-18 – Combined Aircraft Pressurization Outflow and Positive Pressure Differential Relief Valves (RBAC/14 CFR 25.841 (b)(1)) – The RBAC 25.841(b)(1) requires two pressure relief valves to automatically limit the positive pressure differential to a predetermined value in the design of pressurized cabins. The ERJ 190-300 design is such that there is only one dedicated positive pressure differential relief valve and one outflow valve which combines cabin pressure regulation and relief functions. Since there is only one independent relief valve, literal compliance to RBAC 25.841(b)(1) is not possible, and Embraer demonstrated that the Cabin Pressure Control System (CPCS) had a higher reliability level than traditional cabin pressure control valves as an equivalent level of safety.

FCAR SM-21 – Pneumatic Systems – Harmonized 25.1438 (RBAC/14 CFR 25.1438) – Embraer adopted the harmonized ARAC MSHWG propose rule in lieu of RBAC 25.1438. The proposed rule requires demonstration of compliance using the worst possible combination of temperature and pressure as well as stress loads on pneumatic system components from pressure and temperature changes in combination with vibration and external loads. System failure conditions and requirements to address fatigue, material properties, and gas storage device requirements are also incorporated into the proposed new rule.

FCAR SM-25 – Cabin Pressurization - High Altitude Takeoff and Landing Operations (RBAC/14 CFR 25.841 (a) & 25.841 (b)(6)) –In order to operate at high altitude airfields maintaining the same level of safety as required by the section 25.841(b)(6), Embraer incorporated to the cabin pressure control system (CPCS) a function that automatically shifts the warning set point to avoid unnecessary warning messages and indications.

FCAR SM-29 – Operation Tests (RBAC/14 CFR Part 25.683) – Based on recommendations from the FAA-sponsored Aviation Rulemaking Advisory Committee (ARAC), regulatory differences between the requirement 25.683 of EASA CS-25 and FAA 14 CFR Part 25 were eliminated at Amdt.139. As a result of this harmonization, control system requirements that consider structural deflection and vibration loads were added. Embraer adopted the harmonized requirement at amdt. 139 in lieu of the requirement applicable at the time.

FCAR SM-30 – Security Considerations – Chemical Oxygen Generator (RBAC/14 CFR 25.785 (d) & 25.1450 (b)(3)) – Based on recommendations from the Lavatory Oxygen Aviation Rulemaking Committee (LOARC), security related requirements for chemical oxygen generators were introduced in amdt. 138 relating to tamper resistant, tamper evident and location of such installation of COG systems in the lavatories. Embraer adopted the requirements 25.795 and 25.1450 according to the FAA 14 CFR Part 25 Amdt.138 in lieu of the respective RBAC 25 Amdt.134 requirements as an equivalent level of safety.

ELOS specific to ERJ 190-400 model:

FCAR – SE-14, in substitution of FCAR SE-13 for the ERJ 190-300 – "Position Lighting Systems Maximum Overlapping Intensity Deviations, for the RBAC/14 CFR 25.1389 (b)(1), 25.1389 (b)(2), 25.1389 (b)(3), 25.1391, 25.1393 & 25.1395" – The intent of RBAC/14 CFR/CS 25.1389(b)(3) and 25.1395 is to minimize the potential for confusion by limiting the angle and intensity of overlapping signal, in order to ensure that an observer in another aeroplane can visually detect the correct orientation and direction of travel of the observed airplane. The results obtained from the certification photometric tests show that the position lighting system exceeds the maximum overlapping intensities while not meeting the minimum intensity required by the certification regulations. Embraer showed that in all cases, the exceeding intensities in the overlap areas or the lower intensity areas are only located at angles that are not considered critical viewing angles (e.g. high vertical angles) or only over a small area such that they would only be visible to an observer in another aircraft for a very short time. The ELOS was granted based on the position lights characteristics installed in the ERJ 190-400 providing the necessary conspicuity to allow anyone encountering the airplane to easily discern its position and direction of travel.

(iv) Exemptions

Exemptions specific to ERJ 190-100 & 200 models:

Uncontained Engine Rotor Burst Hitting Pressurized Cabin (RBHA/14 CFR Part 25.841(a)(2)(i) and (ii)) – granted through Ordinance DAC (ANAC) No.595/DGAC, dated 28 June 2005 – An exemption was granted to the requirement for decompression altitude not exceeding 40,000 ft, or 25,000 ft for 2 mins after any failure condition shown to be extremely improbable, since the maximum cruise altitude of the ERJ is 41,000 ft. Embraer supported this exemption with descent profiles, decompression analysis and oxygen equipment standards which adequately protect the crew. MMEL requirements may also limit maximum flight altitude.

Uncontrollable High Engine Thrust (RBHA/14 CFR Part 25.901(c)) – granted through Ordinance DAC (ANAC) No. 548/DGAC, dated 16 June 2005 – an exemption was granted for the specific scenario of engine UHT combined with high crosswinds and wet or contaminated runways during certain landing or RTO conditions, on the basis of the low aggravated environmental conditions probability.

Exemptions specific to ERJ 190-100 ECJ model:

FCAR EI-05 – Passenger Cabin Interior Doors (RBHA 11.25(b)(5); RBHA/14 CFR Part 25.813(e)) granted through Ordinance DAC (ANAC) No. 299/ANAC dated 18 August 2008 – an exemption from the requirement for no interior doors between passenger compartments of RBHA/14 CFR Part 25.813(e) was granted based on private use, door frangibility, and features to ensure the doors are latched open during taxi take-off and landing.

FCAR EI-06 – Firm Handhold (RBHA 21.21(b)(1); RBHA/14 CFR Part 25.785(j)) granted through Ordinance DAC (ANAC) No. 298/ANAC dated 18 August 2008

–It was found impractical to provide firm handrails along each aisle due to large spacious areas typical in VIP layouts. An exemption was granted against the requirement providing no injurious features in the cabin, steadying features at doors or within one step, and instructions to remain seatedduring turbulence.

FCAR EI-07 – Dynamic Test Requirements for Side-Facing Divans (Sofas) /GeneralOccupant Protection for Occupants of Multiple Place Side-facing Seats (Divans) Installation (RBHA 11.25(b)(5); RBHA/14 CFR Part 25.562, 25.785) granted through Ordinance DAC (ANAC) No. 300/ANAC dated 18 August 2008 – Thecurrent regulations do not provide adequate or appropriate safety standards for occupants of side-facing multiple occupant seats (divans). Therefore, the only certification method available for this type of seating, for aircraft that include Amendment 25-64 in their certification basis, is through an exemption from the general occupant protection requirement of RBHA/14 CFR Part 25.785(b). This exemption required the minimum acceptable testing and human injury criteria applied to side-facing divan certification.

Exemptions specific to ERJ 190-300 & 400 models:

FCAR EI-01 – RBAC 25.809(a) Overwing Outside View Means (RBAC/14 CFR 25.809(a)), granted through Decisão nr. 81 dated on 31st May 2017 – Literal compliance with the requirement to see the ground contact point from the over-wing and flight deck exit windows could not be achieved but is achieved when making the first step onto the wing, similarly flight deck window exit path is vertical to the ground so fuselage curvature affects viewing angle. The rule was not originally intended to limit these cases.

FCAR PR-36 – Engine Uncontrollable High Thrust (UHT) Event combined with high crosswinds and wet or contaminated runways (RBAC 25.107, 25.109, 25.125, 25.143, 25.145, 25.147, 25.149, 25.161, 25.251, 25.571, 25.901, 25.903, 25.1309, 25.1322 & 25.1523), granted through Decisão nr. 190 dated on 16th November2017 – A partial exemption was granted for the specific scenario of engine UHT combined with high crosswinds and wet or contaminated runways during certain landing or RTO conditions, on the basis of the low aggravated environmental conditions probability.

FCAR SM-04 – Uncontained engine rotor burst hitting pressurized cabin (RBAC/14CFR 25.841 (a)(2)), granted through Decisão nr. 114 dated on 26th July 2017 – An exemption was granted to the requirement for decompression altitude not exceeding 40,000 ft, or 25,000 ft for 2 mins after any failure condition shown to be extremely improbable, since the maximum cruise altitude of the ERJ is 41,000 ft. Embraer supported this exemption with descent profiles, decompression analysis and oxygen equipment standards which adequately protect the crew. MMEL requirements may also limit maximum flight altitude.

(v) Airworthiness Limitations:

For all ERJ 190-100 and ERJ 190-200 models, except for ERJ 190-100 ECJ, the Airworthiness Limitations Section (ALS) is found in Appendix A (Part 1, 2, 3 and 4) of the MRB Report P/N 1928.

For the ERJ 190-100 ECJ model, the ALS is found in Appendix A (Part 1, 2, 3 and 4) of the Maintenance Planning Guide (MPG) P/N 2928.

For the ERJ 190-300 and ERJ 190-400 models, the Airworthiness Limitations Section is found in Appendix A (Part 1, 2, 3, 4 and 5) of the MRB Report P/N 5881.

For ANAC or FAA approved revisions refer to the applicable TCDS Note 3.

(3) Aircraft Noise and Engine Emission Standards:

(i) Environmental Standard:

The ERJ 190 has been certificated under the fuel venting and emission requirements of RBHA 34 equivalent to 14 CFR Part 34 and including the Amendment effective on the date of certification by ANAC.

(ii) Compliance Listing:
Refer (4) Certification Compliance Listing.
Noise compliance data is contained within the applicable aircraft flight manual section 5.

(4) Certification Compliance Listing:

ERJ 190-100 Certification Plan report no. 190CCC001 revision – (initial)
ERJ 190-100 ECJ model to be supplied on case-by-case basis depending on interior configuration.

ERJ 190-200 Certification Plan report no. 190CCC002 revision CERJ 190-300 Certification Plan report no. 196CCC001 revision CERJ 190-00 Certification Plan report no. 196CCC002 revision D

(5) Flight Manual:

Aircraft flight manuals are customised by serial number. "Master" flight manualdocument numbers are appended by -001.

ERJ 190-100 and ERJ 190-200 models:

ANAC TC aircraft use ANAC approved AFM-1868 – CAA accepted as AIR 3942

FAA TC aircraft use ANAC approved AFM-1912 – CAA accepted as AIR 3943

ERJ 190-300 and ERJ 190-400 models:

ANAC TC aircraft use ANAC approved AFM-5691 – CAA accepted as AIR 3944

FAA TC aircraft use ANAC approved AFM-5692 – CAA accepted as AIR 3945

(6) Operating Data for Aircraft and Engine:

(i) Instructions for Continued Airworthiness:*
Aircraft Maintenance Manual (AMM) Part I (4194 and 5586) SDS - System Description Section
Aircraft Maintenance Manual (AMM) Part II (4194 and 5586) MPP - Maintenance Practices and Procedures
MPD (4198 and 5582) Maintenance Planning Document
MRB (1928 and 5881) MRB - Maintenance Review Board Report
NDT (4196 and 5587) Non-Destructive Testing Manual
SRM (1929, 6736 and 1929) Structural Repair Manual
SWPM (1590 and 6738) Standard Wiring Practices Manual
PPMM (5321705) Power Plant Maintenance Manual (190/195)

(ii) Current service Information:*
IB - Information Bulletin
SB - Service Bulletin
SNL - Service News Letters
Available on www.FlyEmbraer.com website

(iii) Illustrated Parts Catalogue:*
IPC (7371) Aircraft Illustrated Parts Catalog
PPIPD (5325616) Power Plant Parts Illustrated Data
PIL - Parts Information Letters

(iv) Other operating information:*

CMM EMBRAER CMM - Component Maintenance Manual - Embraer
CMM VENDORS CMM Vendor - EDE
CPC (1841 and 6735) Consumable Products Catalogue
ITEM (1586 and 6737) Illustrated Tools and Equipment Manual
PPITEM (5324178) Power Plant - Support Equipment and Tools Data
SRMI (1929 and 6736) Structural Identification
FIM (4931 and 5588) Fault Isolation Manual
QRRG (0001 and 6439) Quick Reference Reset Guide
SSM (6437) Schematic System Manual
WM (5589) Wiring Manual
APM (1901 and 5824) Airport Planning Manual
ARM (1923 and 6434) Airplane Recovery Manual
ASBM (1347 and 6816) Ata Specification Breakdown Manual
IGFER (1925 and 6431) Instructions for Ground Fire Extinguishing and Rescue
MFEP (1927 and 6433) Maintenance Facility and Equipment Planning
SM (1589 and 6436) Standard Manual
TPRG (2264) TPRG - Technical Publications Reference Guide

(7) Agreement from manufacturer to supply updates of data in (5), and (6):

CAA 2171 signed by Embraer Airworthiness Director dated 12 July 2019
*Access is provided to data via the www.FlyEmbraer.com website

(8) Other information:

Commercial designations:
Embraer ERJ 190-100 is commercially named as "EMBRAER 190"
Embraer ERJ 190-100 ECJ is commercially named as "Lineage 1000"
Embraer ERJ 190-200 is commercially named as "EMBRAER 195"
Embraer ERJ 190-300 is commercially named as "EMBRAER 190-E2" or “E190-E2”
Embraer ERJ 190-400 is commercially named as "EMBRAER 195-E2" or “E195-E2”

Note: Operating documentation is customised to the fleet operator and/or aircraft serial number. General applicability of Type Acceptance Certificate number 19/21B/25 is therefore conditional on continued access to the aircraft-specific technical publications through flyembraer.com.

5. New Zealand Operational Rule Compliance

Compliance with the retrospective airworthiness requirements of NZCAR Part 26 has been assessed as they are a prerequisite for the grant of an airworthiness certificate.

Civil Aviation Rules Part 26

Subpart B – Additional Airworthiness Requirements

Appendix B – All Aircraft

PARA:	REQUIREMENT:	MEANS OF COMPLIANCE:
B.1	Marking of Doors and Emergency Exits	14CFR Part 25 §25.811(a)(e) & (f) at Amendment 25-101or later, plus ELOS FCAR EI-25 (reviewed and accepted by CAA NZ)
B.2	Crew Protection Requirements – CAM 8 Appdx. B # .35	Not Applicable – Restricted Category Aircraft only

Appendix C – Air Transport Aeroplanes – More than 9 Pax

PARA:	REQUIREMENT:	MEANS OF COMPLIANCE:
C.1	Doors and Exits	14CFR Part 25 para §25.809(b) at Amendment 25-101 orlater
C.2.1	Additional Emergency Exits – per FAR 23.807(b) @ 10.5.93	14CFR Part 25 certification requirements dated after 10.5.1993 (first TC application 2001)
C.2.2	Emergency Exit Evacuation Equipment – Descent means	14CFR Part 25 para §25.810(a) at Amendment 25-101 or later
C.2.3	Emergency Exit Interior Marking – Size/self-illuminating	14CFR Part 25 para §25.811(e) and §25.812(b) plus ELOS FCAR EI-25, HES-43 (reviewed and accepted byCAA NZ)
C.3.1	Landing Gear Aural Warning – Automatic Flap Linking	14CFR Part 25 para §25.729(e) at Amendment 25-101 or later

Appendix D – Air Transport Aeroplanes – More than 19 Pax

PARA:	REQUIREMENT:	MEANS OF COMPLIANCE:
D.1.1	Exit Types – Shall be per FAR 25.807 @ 29.03.93	14CFR Part 25 certification requirements dated after29.03.1993 (first TC application 2001)
D.1.2	Floor Level Exits – Definition	14CFR Part 25 para §25.807(a) at Amendment 25-101 or later
D.2.1	Additional Emergency Exits – Must meet requirements	Not applicable: No non-required exits nor ventral/tailcone exits
D.2.2	Emergency Exit Access – All Required Exits must have: Passageway unobstructed 500m wide between areas and leading to a Type I or II Exit; Crew assist space; Access to Type III or IV Exit is unobstructed Internal doors must be able to be latched open – placarded	14CFR Part 25 para §25.813 at Amendment 25-101 or later, plus ELOS FCAR EI-29 (reviewed and accepted byCAA NZ) Not applicable – no internal doors (other than cockpit)
D.2.3	Emergency Exit Operating Handles – Markings/Lighting	14CFR Part 25 para §25.811(e) at Amendment 25-101 orlater, plus ELOS FCAR EI-02 (reviewed and accepted by CAA NZ)
D.2.4	Emergency Exit Evacuation Equipment – Descent means	14CFR Part 25 para §25.810(c) at Amendment 25-101 or later
D.2.5	Emergency Exit Escape Route – Must be slip resistant	14CFR Part 25 para §25.810(c) at Amendment 25-101 orlater
D.2.6	Emergency Lighting (a) Switch Provisions; Uninterrupted Power; Last 10 min. (b) Descent Illumination – Automatic and Independent	 14CFR Part 25 para §25.812(f) & (i) at Amendmt 25-101 or later 14CFR Part 25 para §25.812(h) at Amendment 25-101 or later
D.2.7	Emergency Interior Lighting – independent supply; min. Illumination; incl. Floor proximity escape path markings	14CFR Part 25 para §25.812(c) & (e) at Amendment 25-101 or later
D.2.8	Emergency Exterior Lighting – in effect 30.04.72 or later	First TC application 2001
D.2.9	Emergency Exit Interior Marking – Clear; instructionsLocation signs above routes, by exits, on bulkheads Meet provisions in effect 30 April 1972, or later Minimum brightness 250 microlamberts	14CFR Part 25 para §25.811(b) & (d) at Amendment 25-101 or later, plus ELOS FCAR HES-36, HES-43, EI-02, EI-18 (reviewed and accepted by CAA NZ)
D.2.10	Emergency Exit Exterior Markings – 2" contrasting band; opening instructions in red or bright chrome yellow;	14CFR Part 25 para §25.811(f) at Amendment 25-101 or later
D.3	Lavatory Fire Protection – Placards; Exterior ashtray; Waste Bin – Sealed door; built-in fire extinguisher; smoke detector system with external warning	14CFR Part 25 para §25.791(d) at Amendment 25-101 orlater 14CFR Part 25 para 25.853(d) & (e) at Amendment 25-101 or later
D.4	Materials for Compartment Interiors – T/C after 1.01.58: (b) Manufactured 20/8/88 – 20/8/90 – Meet heat release requirements of FAR 25 at 20.08.86 increased to 100/100 Manufactured after 20/8/90 – Meet heat release rate and smoke tests of FAR Part 25 in effect 26.09.88 (c) Seat cushions (except flightdeck) must be fireblocked	14CFR Part 25 para §25.853 at Amendment 25-101 orlater
D.5	Cargo and Baggage Compartments – T/C after 1.01.58: (a) Each C or D compartment greater than 200 cu ft shall have liners of GFRS or meet FAR 25 in effect 29.03.93 (c) Liners shall be separate from the aircraft structure	14CFR Part 25 para §25.855(b) at Amendment 25-101 orlater

Compliance with the following additional NZ operating requirements has been reviewed and were found to be covered by either the original certification requirements or the basic build standard of the aircraft, except as noted:

Civil Aviation Rules Part 91

Subpart F – Instrument and Equipment Requirements

PARA:	REQUIREMENT:		MEANS OF COMPLIANCE:	
91.505	Seating and Restraints – Safety belt/Shoulder Harness		14CFR Part 25 para §25.785 at Amendment 25-101 or later	
91.507	Pax Information Signs – Smoking, safety belts fastened		14CFR Part 25 para §25.791 at Amendment 25-101 or later	
91.509 Min. VFR	(1) ASI (2) Machmeter (3) Altimeter (4) Magnetic Compass (5) Fuel Contents (6) Engine RPM (7) Oil Pressure	14CFR §23.1303(b)(1) * 14CFR §23.1303(b)(1) ** 14CFR §23.1303(b)(2) * 14CFR §23.1303(a)(3) * 14CFR §23.1305(a)(2) * 14CFR §23.1305(c)(3) * 14CFR §23.1305(a)(4) *	(8) Coolant Temp (9) Oil Temperature (10) Manifold Pressure (11) Cylinder Head Temp. (12) Flap Position (13) U/c Position (14) Ammeter/Voltmeter	Not Applicable – Turbojet 14CFR §23.1305(a)(6) * Not Applicable – Turbojet Not Applicable – Turbojet 14CFR §23.699 * 14CFR §23.729(e) * 14CFR §23.1351 (b)(6) *
91.511 Night	(1) Turn and Slip (2) Position Lights	14CFR §25.1303(b)(4) * 14CFR §25.1389 *	(3) Anti-collision Lights (4) Instrument Lighting	14CFR §25.1401 * 14CFR §25.1381 *
91.513	VFR Communication Equipment		FAR Part 25 para §25.1307(d) at Amendment 25-101 orlater *	
91.517 IFR	(1) Gyroscopic AH (2) Gyroscopic DI (3) Gyro Power Supply (4) Sensitive Altimeter	14CFR 25.1303(b)(5) * 14CFR 25.1303(b)(6) * 14CFR 25.1331(a)(1) * 14CFR 25.1303(b)(2) *	(5) OAT (6) Time in hr/min/sec (7) ASI/Heated Pitot (8) Rate of Climb/Descent	14CFR §25.1303(a)(1) * 14CFR §25.1303(a)(2) * 14CFR §25.1323(h)(1) * 14CFR §25.1303(b)(3) *
91.519	IFR Communication and Navigation Equipment		14CFR Part 25 para §25.1307 at Amendment 25-101 or later	
	* The aeroplane in its baseline is equipped with two independent VHF. Each VHF system has an independent antenna. **The aeroplane may optionally be equipped with one HF or dual HF, under operator's request.** **The aeroplane may optionally be equipped with 3rd VHF radio, SELCAL, CMF (ACARS), FANS 2 communication system, SATCOM Iridium, or ANR headsets, under operator's request.** The aeroplane is equipped with two hand microphones, two headsets, and two speakers, which are part of the audio system. An additional headset is available at the observer seat. The basic navigation equipment installed in the -100/-200 aeroplane includes:			
	-100/-200 models		-300/-400 models	
	- One FMS - One GPS; - Two independent VORs; - Two independent DMEs; - One ADF; and - Two independent IRSs. **Additional independent FMS and/or GPS may be optionally equipped at operator's request.** To meet the MNPS requirement, it is necessary to have dual long range navigation sensors. Thus, it is required to have dual FMS installed and at minimum 2 IRS and single GPS that can be used as dual long range navigation sensors by the FMS.		- Dual FMS; - Dual GPS; - Two independent VORs; - Two independent DMEs; and - Two independent IRSs. **Single or dual ADF are installed as optional item.**	
	The ERJ 190 series is certified under applicable RVSM requirements. The operational manuals provided by Embraer contain the aircraft's approved PBN specifications. Note: The ERJ 190 series is approved for VFR, IFR, Icing conditions, Category I and II, RVSM.			
91.523	Emergency Equipment: (a) More Than 9 pax – First Aid Kits per Table 7 – Fire Extinguishers per Table 8 (b) More than 20 pax – Axe readily accessible to crew (c) More than 61 pax – Portable Megaphones per Table 9		***Operating Rule – Compliance to be shown by Operator*** 14CFR Part 25 para §25.851 at Amendment 25-101 or later Cockpit axe is standard fit. Megaphone: Optional item	
91.529	AELS & ELT – TSO C126 406 MHz after 22/11/2007		Fixed ELT 406 MHz (AF) located in rear compartment: Artex standard, or optional Elta for -100/-200; Kannad standard for -300/-400	
91.531	Oxygen Indicators – Volume/Pressure/Delivery		14CFR Part 25 paragraphs §25.1441(c) and (d) – (See ELOS FCAR HIS-55, SM-10, SM-11). NON-COMPLIANCE: Exemption 14/EXE/24 applies. §91.531(1)(ii) requires cabin altitude warning at 10,000 ft. The ERJ is certificated for high altitude airfield operations. In this mode cabin altitude warning is set to 500ft above the expected cabin altitude profile.	

91.535	Oxygen for Pressurised Aircraft: (1) Flight Crew Member On-Demand Mask; (2) Pax mask, Portable oxygen equipment (3) Crew Member – Pax Oxygen Mask and Portable (4) Minimal Supplemental Oxygen Quantity (5) Specified Supplemental/Therapeutic Oxygen Quantity **Above FL250** (1) Quick-Donning Crew On-Demand Mask (2) Supplemental O_2 Masks for all Pax/Crew and Toilets (3) 15 Minutes Therapeutic Supply **Above FL300** (1) Total Outlets Exceed Pax Seats by 10% (2) Extra Units Uniformly Distributed throughout Aircraft (3) Automatically Presented if Cabin Altitude ≥ 14000 ft. (4) Manual Means of Deploying Pax Masks Available	The ERJ 190 is equipped with an oxygen system that provides to the pilot and copilot as well as to the observer onthe flight deck a source of supplemental oxygen, free from effects of smoke or harmful gases. Two hours of oxygen is provided to permit descent from 41,000ft to 10,000ft following cabin decompression. Chemical oxygen masks are provided for flight attendants and all passengers for approximately 12min. The flight crew oxygen system comprises a quick-donning pressure demand oxygen mask that provides supplemental and protective oxygen. The crew mask is TSO C89, C78, C99 that can be placed on the face with one hand from the ready position within 5 seconds, supplying oxygen and properly secured and sealed.The number of extra dispensing unit masks exceeds the number of seats by at least 15 percent and is distributed uniformly throughout the cabin, and portable oxygen cylinders with mask is installed for use by each required cabin crew member. **The calculation of oxygen supply and the definition of number of portable oxygen cylinders are an operator'sresponsibility.** The ERJ 190 in its basic configuration is equipped with twofirst-aid portable oxygen cylinders. NON-COMPLIANCE: Exemption 14/EXE/24 applies. §91.535(d)(3) requires oxygen mask automatic deployment when cabin pressure is ≥ 14,000 ft. The ERJ is certificated for high altitude airfield operations. In this mode deploymentis set to 14,700 feet. A manual override switch is provided.
91.541	SSR Transponder and Altitude Reporting Equipment	ERJ 190 is equipped with dual Mode S transpondersystem. **Mode S enhanced available as option on -100/-200; fittedas standard on -300/-400** **ADS-B Out/In available as option at operator's request(TSO-C166b)**
91.543	Altitude Alerting Device – Turbojet or Turbofan	Fitted as Standard
91.545	Assigned Altitude Indicator	N/A – Altitude alerting device fitted
A.15	ELT(S) Installation Requirements	***To be determined on an individual aircraft basis*** Optional ELT(S) fitments available.

Civil Aviation Rules Part 121

Subpart F – Instrument and Equipment Requirements

PARA:	REQUIREMENT:		MEANS OF COMPLIANCE:
121.353	(a)(1)(ii) 3 ELT min 1 ELT(AF); or 2 ELT and autonomous position transmit capability every min in distress (a)(1)(iii) No. of Comm/Nav for route being flown		***To be determined on an individual aircraft basis*** One fixed ELT(AF) as standard, portable sELT available as options. ***To be determined on an individual aircraft basis*** Dual independent systems required; some options needed for MNPS for -100/-200. Refer to aircraft specific AFM for approvals.
121.355	Additional Instruments (Powerplant and propeller)		14 CFR Part 25 is a Part 21 Appendix C standard.Propeller indication N/A.
121.357	Additional Eqpt - Windscreen Wiper, Door, Key, Placard		Fitted as standard. Reinforced cockpit door optional on -100/-200, standard on -300/-400.
121.359	Night Flight - Landing Light, Light in each pax cabin		Fitted as standard
121.361	IFR Operations	Speed, Alt, spare bulbs/fuses	Fitted as standard. No spares required to be replaced in flight.
121.363	Flights over water	Liferafts	***Operating Rule – Compliance to be determined byOperator***
121.365	Emergency Equipment	Per §91.523 and EROPS kit	***Operating Rule – Compliance to be determined byOperator***
121.367	PBE	TSO C99 cockpit equipment TSO C115 cabin equipment	14CFR Part §25.1439 at Amendment 101 or later. ***Operating Rule – Compliance to be determined byOperator*** In addition to flight crew quick-donning masks, there is one portable PBE in the cockpit. **The ERJ 190 may optionally equipped with 3 portable PBEs (one for each hand fire extinguisher), under operator's request.**

121.369	Pax Address, Intercom	Meets FAR § 121.318 and 319	14CFR §25.1423 – A Flight Interphone System is part of the communications system, and permits contact between flight crew on the flight deck and the flight crew and ground crew.
121.371	Cockpit Voice Recorder Appendix B.5 requires TSO C84/C123		CVFDR Universal (alternate power source) – optional item
121.373	Flight Data Recorder Appendix B.6 requires TSO C124		CVFDR E1 – Universal – optional item L3 DVDR (combined CVR & FDR) with 90day under wateroperation (TSO-C121b)
121.375	Additional Attitude Indicator		Standby electronic AI fitted as standard.
121.377	Weather Radar Appendix B.8 requires TSO C63		P660 with optional P880 on -100/-200;P880 on -300/400. 3D radar option RDR-4000. TSO-C63c.
121.379	Ground Proximity Warning System Appendix B.9 requires TSO C92		EGPWS (equivalent to TAWS A) system part of HoneywellMAU (modular avionics unit). -100/-200 is TSOes-C92c & C151b; -300/-400 is TSOes-C92c & C151c.
121.381	Terrain Awareness and Warning System (TAWS) Appendix B.10 requires TSO C151a or b		EGPWS (equivalent to TAWS A)
121.383	Airborne Collision Avoidance System (ACAS II) Appendix B.11 requires TSO C119b		ACSS TCAS II 7.1 system is optional on -100/-200 models,standard on -300/-400. TCAS II 7.0 standard fit on -100/-200 models.Both are TSO-C119c.

NOTES: 1. A Design Rule reference in the Means of Compliance column indicates the Design Rule was directly equivalent to the CAR requirement, and compliance is achieved for the basic aircraft type design by certification against the original Design Rule.

2. The CAR Compliance Tables above were correct at the time of issue of the Type Acceptance Report. The Rules may have changed since that date and should be checked individually.

3. Some means of compliance above are specific to a particular model/configuration. Compliance with Part 91/119 operating requirements should be checked in each case, particularly oxygen system capacity and emergency equipment.

4. Acceptable Means of Compliance to Rule Part 39.51(a)(2)(i) only, in terms of State of Design, is considered to be Brazil (ANAC).

Attachments

The following documents form attachments to this report:

Three-view drawing Embraer ERJ 190 (Embraer letter ref GCF-0515/2019-1/13)
Copy of ANAC Type Certificate Data Sheet Number 2005T13 (issue 27)

Sign off

……..
Glen Somerville
Certification Engineer

…….....
Checked – Kavita Vanmari
Certification Engineer

Appendix 1

List of Type Accepted Variants:

Model:	*Applicant:*	*CAA Work Request:*	*Date Granted:*
ERJ 190-100 series*	Embraer	19/21B/25	4 November 2019
ERJ 190-200 series	Embraer	19/21B/25	4 November 2019
ERJ 190-300	Embraer	19/21B/25	4 November 2019
ERJ 190-400	Embraer	19/21B/25	4 November 2019

* ERJ 190-100 IGW serial numbers 19000214 and 19000277 referred to in marketing literature as EMBRAER 190 PR configured as delivered to the Brazilian Air Force are not eligible for import into New Zealand.