
Type Acceptance Report

TAR 5/21B/17 – Revision 2

BOEING 777 Series

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Executive Summary

New Zealand Type Acceptance has been granted to the Boeing Model 777 Series based on validation of FAA Type Certificate number T00001SE. There are no special requirements for import.

Applicability is currently limited to the Models and/or serial numbers detailed in Appendix 1, 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.5/21B/17 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: The Boeing Company
Type Certificate: T00001SE
Issued by: Federal Aviation Administration
Production Approval: FAA PC700

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

- (i) **Model:** 777-200
- MCTOW: 545,000 lb. [247,200 kg.]
656,000 lb. [297,550 kg.] – (IGW version)
- Max. No. of Seats: 440
- Noise Standard: FAR Part 36 including Amendment 36-1 through 36-20
- Engine:** Rolls Royce RB211 Trent 800
Type Certificate: E.047
Issued by: European Aviation Safety Agency
(Validated under Type Acceptance Certificate 18/21B/36)
- (ii) **Model:** 777-300ER
- MCTOW: 775,000 lb. [351,534 kg.]
- Max. No. of Seats: 550
- Noise Standard: FAR Part 36 including Amendment 36-1 through 36-24
- Engine:** General Electric GE90-115B
Type Certificate: E00049EN
Issued by: Federal Aviation Administration
(Validated under Type Acceptance Certificate 11/21B/7)

3. Application Details and Background Information

The application for New Zealand type acceptance was from the operator Air New Zealand Limited, dated 17 November 2004. (An application letter was also received from the manufacturer, forwarded through the FAA Transport Airplane Directorate.) The airline has ordered an initial batch of eight Model 777-200ER aircraft, Tabulation Numbers WC486 through WC493, and has reserved the marks ZK-OKA through ZK-OKH. The first-of-type example will be MSN 29404, line number 534, registered ZK-OKA. The Boeing 777 is a low-wing long-range Transport Category passenger aircraft with twin high-bypass fanjets and a maximum operating speed of 0.87M (330 KCAS). The Air NZ configuration is 26 business class seats (Contour “dreamsuite” convertible beds), 18 Premium economy class (39” pitch) and 269 economy class seats (32” pitch), for a total of 313 passengers.

Type Acceptance Certificate No. 5/21B/17 was granted on 27 October 2005 to the Boeing Model 777-200ER based on validation of FAA Type Certificate T00001SE. Specific applicability is limited to the coverage provided by the operating documentation supplied. There are no special requirements for import into New Zealand.

The 777 was originally conceived as a stretched 767, but Boeing instead opted for an all-new design. It was the first Transport Category aircraft certificated to FAR 25 Amendment 25-82, which introduced dynamic seat testing under §25.562. It was also the first airliner to be completely developed digitally using three-dimensional computer graphics. Notable 777 design features include Boeing's first application of fly-by-wire, an advanced technology glass flightdeck with five liquid crystal displays and integrated ARINC 629 avionics, comparatively large-scale use of composites in the floor and empennage (10% by empty weight), and advanced high-thrust engines. The 777 was also offered with optional folding wing tips where the outer 6m/21ft of each would fold upwards for operations at space-restricted airports, but this option has never been selected by any customers for the aircraft.

The 777 as launched in October 1990 was offered in two versions, the basic 777-200 and the increased weight longer range 777-200(IGW) which is marketed as the 777-200ER. The latter is not a separate model on the type certificate, but is defined as any version with a MCTOW above 545,000 lb (up to a maximum of 656,000 lb). To achieve a range of up to 7725 nautical miles a new wing centre section fuel tank was added, which required strengthening of the structure and undercarriage, and 90,000 pound thrust engines were fitted. The 777-200 first flew on 12 June 1994, with FAA and JAA certification achieved on 19 April 1995. The FAA awarded 180 minutes ETOPS clearance for PW4074-powered 777-200s on May 30 that year, and the first customer delivery was to United Airlines. The first Model 777-200(IGW)/ER was delivered to British Airways in February 1997.

This report was raised to Revision 1 to include the 777-300ER version, after application by the manufacturer. Air New Zealand has ordered a fleet of five aircraft (variable numbers WE051-WE055), and the first-of-type example was MSN 38405, registered ZK-OKM. As part of the type acceptance process a team of certification specialists from the CAA Aircraft Certification Unit visited Boeing at Everett for a validation/familiarisation visit. (See Agenda and Meeting Minutes, attachments to Boeing Letter B-H360-10-01195.) Type Acceptance was granted on 20 December 2010.

The 777-300 is a stretched version with fuselage plugs fore and aft of the wing, but with minimal other changes. The 777-300ER is a more extensive development, with increased MCTOW and fuel capacity to extend range up to 7930 nautical miles. Major changes include strengthened structure for the higher operating weights; extended wing box and new raked wingtip extension; new nose and semi-levered main landing gear; tail-strike protection system; revised struts and nacelles; and increased 115k thrust engines (the GE90 is the only engine option). Optional features include: Overhead space utilisation through a new lattice system that allows for flight crew and attendant rests; and cross-aisle stowage.

The Air New Zealand 777-319ER cabin configuration features 44 Business Class Contour seats at 40" pitch; 50 Premium Economy seats at 36" pitch; and 244 Tourist Class Recaro seats 10-abreast at 33" pitch, for a total of 338 passengers.

Revision 2 of this report was issued to include the Model 777-212, which is the Boeing customer designation for Singapore Airlines. The first-of-type example was MSN 32336 registered ZK-OKI. This was originally delivered in a configuration with 26 Business Class seats at 51" pitch and 245 economy class seats at 33" pitch.

NOTES: Because Boeing provides CAA access to the myboeingfleet.com website for all serial numbers on the NZ Register, this revision has also been used to record that the CAA now accepts all variants of the Boeing 777-200/300 Series that have been approved against the certification basis stated on the TCDS and in this report, subject to provision of access to the applicable operating documentation.

Boeing only provides access on myboeingfleet.com to serial number aircraft that are on the New Zealand Civil Aircraft Register. Therefore advance copies of any applicable operating and maintenance documentation may need to be provided by Boeing or the aircraft operator until the aircraft is registered.

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) ICAO Type certificate:

FAA Type Certificate number T00001SE issued April 19, 1995

FAA TCDS number T00001SE at Revision 26 dated October 20, 2010

- Model 777-200 approved April 19, 1995
- Model 777-300ER approved March 16, 2004

(2) Airworthiness design requirements:

(i) *Airworthiness Design Standards:*

The certification basis of the Boeing model 777-200 is FAR Part 25 including Amendments 25-1 through 25-82, except for FAR 25.571(e)(1) which remains at amendment 25-71 level. Three Exemptions were granted and twenty equivalent safety findings were made. Originally just one Special Condition 25-ANM-78 was imposed, covering a range of issues, but others have since been added to address new production features which have been offered. These have all been reviewed and accepted by the CAA. The aircraft has been evaluated in accordance with FAA Special Condition 25-ANM-84 and been found suitable for 180-minute ETOPS operations. Boeing has also complied with optional FAR requirements for ditching and ice protection.

For the model 777-300 the certification basis was updated to FAR Part 25 including Amendment 25-86, with a few paragraphs remaining at the earlier Amendment date as noted on the TCDS. For the model 777-300ER the certification basis was further updated to FAR Part 25 at Amendment 25-98, with again some paragraphs still at the earlier Amendment 82 or 86. Most of the original Equivalent Safety Findings, Special Conditions and Exemptions were carried over to the later models.

This is an acceptable certification basis in accordance with NZCAR Part 21B Paragraph §21.41, because FAR 25 is the basic standard for Transport Category Airplanes called up under Part 21 Appendix C. There are no non-compliances and no additional special conditions have been prescribed by the Director under §21.23.

(ii) *Special Conditions:*

(All Models unless otherwise noted.)

25-ANM-78: (Eight separate issues covered by the one Special Condition.)

Issue Paper A-2: Special Condition – Effect of Flight Control Systems on Structure
– This defines the criteria to be used in the assessment of the effects of the full time digital Electronic Flight Control System (EFCS), autopilot, stability augmentation and load alleviation systems directly or in a failure condition on the structural performance of the aircraft.

Issue Paper A-5: Special Condition – Design Maneuver Requirements – Specified pitch, roll and yaw manoeuvre loads to be designed for with an EFCS, which can limit pilot commands.

Issue Paper A-8: Special Condition – Limit Engine Torque Loads for Sudden Engine Stoppage – FAR §25.361(b)(1) – New engines with large fans can impose much higher loads if they become jammed, although this is a rare event. FAA imposed a special condition to consider the max. operating torque load as limit, and the load due to stoppage from structural failure as ultimate.

Issue Paper F-3.1: **Special Condition** – Electronic FCS: Guidance Material for Flight Characteristics Compliance via Handling Qualities Rating (HQR) Method – In lieu of compliance with FAR §25.672(c) a HQR system was used by the FAA for evaluation of EFCS configurations resulting from single or multiple failures not shown to be extremely improbable. Qualities were allowed to progressively degrade with failure state, turbulence and point on flight envelope.

Issue Paper F-3.4: **Special Condition** – Electronic FCS: Control Surface Awareness – With EFCS and no direct link to the flight controls a pilot may not be aware of excessive deflection and impending control surface limiting. Suitable position annunciation was required to be provided.

Issue Paper SE-1: **Special Condition** – Protection from HIRF – The usual requirement for all systems which perform critical functions must not be adversely affected when exposed to High Intensity Radiated Fields. (Defined as field strength of up to 100 volts/meter over a frequency range from 10 KHz to 18 GHz.) The Special Condition specified a six-stage compliance method.

Issue Paper SE-2: **Special Condition** – Lightning Protection Requirements – To ensure the protection of essential electrical and electronic systems the FAA clarified the threat definition of lightning based on AC 20-136 as specified current waveforms (components A, D and H) plus the voltage waveforms of AC 20-53A. The three considerations to evaluate induced effects were first return stroke; multiple stroke flash; and multiple bursts. Boeing also evaluated the indirect effects. Note: This Special Condition on lightning was subsequently removed from the type certificate due to Boeing's voluntary compliance with Amendment 25-80.

Issue Paper SE-4: **Special Condition** – Operation Without Normal Electrical Power – FAR §25.1351(d) – As the 777 fly-by-wire (FBW) system requires continuous electrical power it must be shown by test or analysis that the aircraft can continue safe flight and landing with inoperative normal engine and APU generator power (excluding the battery and any other standby sources.) .

Issue Paper SE-10.1: **Special Condition** – Command Signal Integrity – Special design measures and laboratory tests were required to demonstrate the integrity of the FBW system and its interfaces to a level of safety equivalent to that achieved with traditional hydro-mechanical designs.

25-ANM-84A:

Issue Paper EE-1: **ETOPS Special Condition** – To achieve the goal of ETOPS approval at the type certificate issue the FAA developed guidance based on a process, rather than the traditional product, i.e. achieved in-service reliability. The elements of this process included an ETOPS type design assessment; additional analysis and test requirements; a problem tracking and resolution plan; and a reliability assessment and demonstration. Acceptance criteria for the latter was that the number of failures that could cause diversion should be less than that expected of mature systems on a comparable existing certified airplane.

25-187A-SC:

A Special Condition was issued to address the new technology of inflatable lapbelts. This covered: performance requirements for a range of situations, including holding an infant, pregnancy and child occupation; buckle integrity and activation confirmation; system functioning with power loss or HIRF and lightning interference; and general protection from injury during normal or inadvertent deployment, including gas or particulate release. The flammability requirements were also changed because the specialised materials used could not meet the vertical burn test.

25-192-SC: *(777-200 only)* and 25-230-SC: *(777-300ER only)*

For the Overhead Crew Rest (OHCR) Compartments located above the main passenger cabin the FAA established special conditions covering seating, communication equipment, lighting, personal safety and evacuation, to ensure a level of safety equivalent to that on the main deck. Nineteen specific conditions were detailed, including seat loads and occupancy limitations; two evacuation routes with a separate access hatch; fire protection; and oxygen system and deployment. (These Special Conditions were initially developed for the 747, and later for STC applications. It was first imposed for 777 retrofit modifications, while the later one was used for production installations.)

25-260-SC:

This updated the Special Conditions of an OHCR for when it is occupiable during Taxi, Takeoff and Landing (TTL). This applies to the flightcrew rest in the forward part of the fuselage ceiling. Similar to the previous one this had twenty specific conditions, with additional requirements for: occupancy numbers and required training; access and security; and appropriate dynamic analysis of the seats.

25-295-SC (*As applicable*)

Issue Paper C-1: Equivalent Level of Safety – This Special Condition was imposed by the FAA covering requirements for sideways facing seats (defined as an angle greater than 18° from the centreline) equipped with inflatable lapbelts under the dynamic test regime of §25.562. This applies to the 777-219 because Air New Zealand has an interior arrangement where the Contour business-class seats are installed at an angle of 40°. Considerations for side-facing seats include occupant isolation (no impact with other persons); restraint system security; and torso loads. The latter involve test procedures and occupant injury criteria developed by the automotive industry for side-facing seats, and include limiting lateral pelvic acceleration, measuring a Thoracic Trauma Index with a Side Impact Dummy and neck injury criteria. This Issue paper was updated to Stage 4 to cover the new Premium Economy seats in the 777-319ER, because they were multiple occupancy with inflatable lapbelts. This included requirements for a qualitative (visual) evaluation of the ATD motions during dynamic tests for comparison with a typical forward facing seat; lock-out of armrests for TTL; and consideration of row-to-row egress due to deformation of the seat surround.

25-336-SC:

The FAA imposed a Special Condition on the Overhead Cross Aisle Stowage Compartment to ensure potential egress paths are not affected and require certain fire protection measures. This specified: Compartment Access and Placards; Power Lift Conditions; Provision for Manual Operation; Fire Extinguisher and Fire Containment; Smoke Penetration; and Specific Design Requirements including flammability and fire/smoke detection systems.

25-367-SC:

The FAA required seats with non-traditional, large, non-metallic panels to meet the more stringent requirements of similar type panels in the main cabin interior. The flammability properties of these panels have been shown to significantly affect the survivability of the cabin in the case of fire, but were not used on seats when the regulations were introduced. Panels of more than 1.5 square foot area per seat place must meet the heat release and smoke emission standards of Part 25 Appendix F.

(iii) Equivalent Level of Safety Findings:**All Models:**

FAA Memo PS05-0272-C-1 – Equivalent Level of Safety (ELOS) Finding for Doors Between Passenger Compartments on Boeing 777 Series Airplanes – FAR §25.813(e) – This ELOS was issued to provide for the installation of doors on mini-suites, based on a list of compensating features, including reduction of total numbers, and single occupancy.

Issue Paper A-3: Equivalent Safety Finding – Design Gust Criteria – Boeing proposed use of a tuned discrete gust methodology combined with a new definition of V_g in lieu of literal compliance. This is also consistent with the intent of the FAA/JAA Harmonisation effort. (In a search for efficiency modern Transport Category planes with more structural flexibility and improved aerodynamic design are more gust load critical.)

Issue Paper C-1: Equivalent Safety Finding – Exterior Exit Markings – FAR §25.811(f) – The coloured exit outline band must have a specified contrast. A lower reflectance difference was allowed for the door sill provided the width does not exceed 5” at the centreline, the remaining area exceeds minimums and evaluation is conducted for areas that extend above 4” high.

Issue Paper C-5: "No Smoking" Limitation in the Passenger Compartment – FAR §25.791, 25.853 – Hard-wired lighted signs are accepted as performing the same function as required placards. The FAA also accepted signs controlled by the ACESS database on the 777.

Issue Paper C-14: Equivalent Safety Finding – Door Sill Reflectance – FAR §25.811(f) – The difference between the painted exit band and the polished stainless steel metal door sill is less than the required 30%. A figure of 25% was accepted for a range of Boeing models as an equally effective contrast, provided the difference of the remaining areas exceeded 30%.

Issue Paper F-2: Equivalent Safety Finding – Use of 1-g Stall Speed Instead of Minimum Speed as a Basis of Determining Compliance – FAA imposed a requirement for a 3kt or 3% margin on V_{sw} , to show compliance with the intent of the existing FAR §25.143.

Issue Paper P-2: Equivalent Safety Finding – In-flight Thrust Reverser Deployment Demonstration – FAR §25.933(a)(1)(ii) – In lieu of strict compliance that the airplane be capable of continued safe flight and landing with any possible position of the engine thrust reverser, Boeing proposed to demonstrate a design that precludes deployment in flight. (By having three independent locking devices and deleting any "auto-restow" function.) Because of the critical nature of the system the FAA required a detailed equivalency substantiation considering all aspects of uncommanded thrust reverser actuation. This was subject to a Special Certification Review.

Issue Paper P-3: Equivalent Safety Finding – Fire Resistant Requirements for Hydraulic Components Located in the 777 Strut Aft Fairing – FAR §25.1182(a) – All areas of a nacelle behind a firewall must have fire detection and extinguishing provisions and have fire resistant flammable fluid lines and fireproof fluid tanks. Boeing proposed to use Kevlar braided hoses instead of stainless steel in the hydraulic system in the aft strut fairing cavity. Acceptance was based on the same level of fire resistance, plus previous in-service experience of models using the same design philosophy.

Issue Paper P-5: Equivalent Safety Finding – APU Instrumentation and Monitoring Requirements – The need for some of the engine instruments for an APU was obviated based on the automatic control and shutdown features of the installation, combined with warning messages.

Issue Paper SE-16: Equivalent Safety Finding – Flight Controls DC Power System – FAR §25.1351(b)(5) – The Flight Controls Permanent Magnet Generators (PMG) cannot be disconnected from the system. This was accepted as they are isolated from the structure, are dedicated to the flight controls only, have limited output capability, and there is power supply assembly voltage protection.

Issue Paper SE-17: Equivalent Safety – Flight Data Recorder Accelerometers – FAR §25.1459(a)(2) – The Boeing 777 uses an Air Data Inertial Reference Unit (ADIRU) in lieu of c.g. mounted FDR accelerometers. A correction algorithm will compensate for the distance from the c.g. location, and equivalent structural integrity is provided.

Issue Paper SE-21: Equivalent Safety Finding – Overspeed Warning Aural – FAR §25.1303(c)(1) – The Boeing 777 uses an integrated crew alerting system, whereby the aural warning indicates the level of urgency, rather than identifying the specific problem. The overspeed condition is also shown by lights.

Issue Paper SE-23: Equivalent Safety Finding – Finding Fiber Optic Cables – FAR §25.869(a)(4) – The fibre optic cables used on two non-essential local area networks do not meet the flammability requirements for electrical system components. However it was accepted because the sparse installation is evenly distributed and is not subject to normal electrical short heat sources.

Issue Paper SE-25: Equivalent Safety Finding – Red and Green Position Lights – FAR §25.1389(b)(3) – FAA allowed the Fwd position lights to exceed the maximum allowable intensities for overlap, which was caused by reflections and only occurs along the boundaries.

GE engines only:

Issue Paper P-10: Equivalent Level of Safety – Fire Resistance of Power Door Opening System Flex Hose Assembly – FAR §25.1183(a) – Flex lines which have not been tested to be fire resistant were accepted on the grounds they do not contain pressurized oil during flight; are shielded by surrounding structure from flame impingement; there is a limited supply of oil in the event of fire and the strut lower spar firewall would not be penetrated by flames.

777-200:

Issue Paper CI-6: Equivalent Safety – Lower Lobe Attendant Rest – For certification of a lower lobe compartment for in-flight and cabin attendant use only the FAA proposed a set of special conditions based on crew rest and occupant safety provisions, plus those developed for the B747-400 overhead compartment. These included two emergency evacuation routes; fire fighting procedures; and various requirements covering doors or hatches; communication; power supply and warning systems.

Issue Paper CI-8: Equivalent Safety Finding – Flexible Interior Items Fitting Factor of 1.33 – FAR §25.785 – The FAA required the attachment of moveable interior fittings to be designed to a safety factor of 1.33 instead of the fitting factor of §25.625, to allow for wear and deterioration in use due to removal and reinstallation.

Issue Paper CI-12: Equivalent Safety Finding – Inoperative FPLS During the Full Scale Evacuation Demonstration – AC 25.803-1 – FAA accepted the full-scale evacuation demonstration being conducted with the emergency escape path floor proximity lighting not being completely installed and inoperative, because this would be a more critical case.

Issue Paper CI-13: Equivalent Safety Finding – Alternate Method of Seat Track Misalignment for Dynamic Seat Testing – FAR §25.562(b)(2) – Testing of the front seat was done using misaligned outboard seat tracks which are not adjacent, because the 5-place economy row is attached to 4 seat tracks and using warpage of adjacent legs would produce excessive pre-load. It was considered acceptable to test it using five dummies and pitch and roll of the outboard (critical) legs.

Issue Paper F-5: Equivalent Safety Finding – Low V_{MCA} Determination/Application – Boeing proposed use of the FAA-JAA harmonised V_{MCL} determination/application rules of FAR §25.125(a)(2) and §25.149. This was accepted in anticipation of a rule change as being conservative.

Issue Paper P-8: Equivalent Safety Finding – Warning Means for Engine Oil Filter Contamination – FAR §25.1305(c) and §25.1019(a) – The 777/PW4084 uses a two-stage filter system with an automatic bypass. The second filter has no bypass or any impending blockage indication, other than low oil pressure that would require a shutdown, in order to minimise false alarms and possible engine damage from bypass of unfiltered debris. This was accepted because of the large capacity of the secondary filter stage and ability of the oil system to maintain acceptable flow with the secondary filter stage almost fully blocked.

Issue Paper SE-20: Equivalent Safety Finding – Deviation from Forward Light Requirements – FAR §25.1387(b) and (c) – Partial blockage of the forward position lights was accepted because the area was small, only occurred when the LE slats were extended, the anti-collision lights are never blocked and the arrangement is better than previously allowed for the 767.

777-300ER:

Issue Paper A-12: Equivalent Level of Safety – Freedom from Wide Spread Structural Fatigue Damage – FAR §25.571(b) – Boeing certified the 777-300 to the latest requirements under Amendment 25-96, but using the data obtained during the fatigue tests on the 777-200, in accordance with the guidance factors in AC25.571-1C.

Issue Paper A-13: Equivalent Level of Safety – Dive Speed Definition with Dive Speed Protection – FAR §25.335(b) – A reduced margin between V_C and V_D was permitted because of the use of a Hardened Overspeed Protection system, stabilizer trim runaway monitors and Bank Angle Protection incorporated into the Electronic FCS.

Issue Paper A-15: Equivalent Safety Finding – Material Design Review – FAR §25.613 – In lieu of design values based on strictly defined statistical test data Boeing developed a rationale based on S-basis design values under a specific set of criteria, in conjunction with a successful service history and component testing.

Issue Paper A-16: Equivalent Safety Finding – Landing Gear Shock Absorption Tests – FAR §25.723(a) – The 777-300ER uses a new landing gear, with a dual chamber strut at the nose and semi-levered configuration at the main legs. Boeing conducted a drop test at the maximum landing weight at 10 feet/sec, instead of the MTOW at 6 feet/sec, on the basis the energy levels for the former were higher. This method is as per draft AC 25-723-1.

Issue Paper C-2: Equivalent Safety Finding – Off-Wing Escape Slide/Bottle Loss During Landing Gear Collapse – FAR §25.810(d) – The overwing escape slide may not activate if the bottle is damaged due to the landing gear collapse. This was accepted as an alternative route then exists over the wing that is less than 6 feet above the ground.

Issue Paper CI-19: Equivalent Safety Finding – Escape Slide Inflation Times – FAR §25.809(b)(2) and §25.810(a)(1) – The allowable inflation times was reduced from 10 to 6 seconds by Amendment 25-72. Existing slides were accepted on the basis of showing the slide was egress ready within 10 seconds of actuating the exit opening means.

Issue Paper F-8: Equivalent Level of Safety – Stall Identification/Characteristics – FAR §25.201(d) and §25.203(d) – The FAA accepted that the 777 stall characteristics of a roll towards wings level at high angle of attack was beneficial to safety.

Issue Paper P-1: Equivalent Level of Safety – Fuel Tank Flammability Reduction Rule – FAR §25.981 – The FAA accepted the Boeing calculation of the fuel tank flammability exposure criteria of Appendix M using deviations from the Monte Carlo model in Appendix N on the basis that the changes to the model parameters are conservative overall.

Issue Paper P-17: Equivalent Safety Finding – Thrust Reverser Installation for Engine Endurance Testing – FAR §25.934 – Boeing proposed to use a slave duct in lieu of a production thrust reverser (TR) for the forward thrust portion of the engine endurance test, on the basis the TR is an add-on retrofit and differences between the substitute and the production TR can be accounted for analytically.

Issue Paper SE-26: Equivalent Safety Finding – Airplane Operation with Air Conditioning Packs Off During Takeoff – FAR §25.831(a) – Boeing was required to show the ventilation system continues to provide a (defined) acceptable environment in the cockpit and passenger cabin for the brief period when it is not operating normally.

*(iv) Exemptions:***All Models:**

Issue Paper SE-18: Exemption No.5758 – Hydraulic System Proof Pressure Test – FAR §25.1435(b)(1) – Granted to allow Boeing’s request for the hydraulic system pressure test to be carried out at the normal operating pressure of 3000 psi, instead of the required 1.5 times. FAA accepted a test at 3600 psi, just below the relief valves setting, on the basis of test effectiveness, improved design process (digital), component qualification, historical precedence and analysis. (Exemption 6504 granted to 777-300 and Exemption No.7478 granted to 777-300ER/-200LR.)

Exemption No.7955 – Regulatory Docket FAA-2003-14201 – FAR §25.901(c) – Granted to allow incremental improvements to be made to existing engine control installations without requiring full compliance to be shown with the requirement that no single failure could lead to an uncontrolled high thrust condition. This was subject to the proviso that all practicable actions have been taken to minimise adverse effects on safety, and Boeing must demonstrate that any risks are no greater for the Model 777 than that for comparable known and accepted existing types.

Exemption No.9791 – Regulatory Docket FAA-2008-1249 – FAR §25.853(a) – This allows dispensation from the full flame testing requirements of Appendix F for some specified adhesives, which have seen widespread use over many years in small quantities. The FAA also found while they do not literally comply their performance is comparable to compliant materials.

Exemption No.9949 – Regulatory Docket FAA-2009-0320 – A time-limited exemption was granted to allow repairs to two separate areas of thermal damage on the thrust reverser inner walls of 777 aircraft with Rolls Royce Trent 800 engines. This meant improvements could be introduced sooner pending full analysis to show compliance with all the applicable requirements, provided structural loads were not increased and there was no comparable adverse effect on safety.

Exemption No.10156 – Regulatory Docket FAA-2010-0597 – FAR §25.853(d) – This permits a dispensation against the smoke emission and heat release testing requirements called up by 25-367-SC for Ensolite foam material used for padding, on the basis of the overall benefit provided by its energy-absorbing properties in preventing injury, the comparatively small area involved, and the long history of safe use of the material.

777-300ER:

Issue Paper CI-2: Exemption No. 5436 and No. 5436A– Floor Warpage for Flight Deck Seats – FAR §25.562(b)(2) – Granted to the flight deck seats to not require 10 degrees misalignment of the seat track rails during testing. This was on the grounds that flightdeck seat separations have not been a problem for airplanes with a minimum of 40 inches of frangible structure under the cockpit.

(v) Airworthiness Limitations:

See MPD Document Section 9 – Airworthiness Limitations (AWLs) and Certificate Maintenance Requirements (CMRs)

(3) Aircraft Noise and Engine Emission Standards:*(i) Environmental Standard:*

The Model 777 has been certificated for compliance with the smoke emission standards of FAR Part 34, including at Amendment 34-1 through 34-3, and the noise standards of FAR Part 36, including Amendment 36-1 through 36-28.

(ii) Compliance Listing:

Noise Certification Data Sheet – ZK-OKA s/n 29404 dated October 11, 2005
(See also the AFM Section 4 Page 35 – Noise Characteristics)

Noise Results from AC36-1H:

Boeing 777-200 at MCTOW 656,000 lb. with RR Trent 895:

Takeoff: 93.4 EPNdB Lateral: 98.3 EPNdB Approach: 99.5 EPNdB

Boeing 777-300ER at MCTOW 775,000 lb. with GE90-115B:

Takeoff: 92.8 EPNdB Lateral: 98.7 EPNdB Approach: 100.5 EPNdB

The 777-300ER with GE90-115B engines meets CAEP/6 (2008) requirements

(4) Certification Compliance Listing:

FAA Compliance Checklist Model 777-200A PW – Document D045W001 Rev.E

FAA Compliance Checklist Model 777-200(IGW) Trent 895 – D045W001 Rev.M

Issue Paper A-7: Discrete Source Damage for Uncontained Engine Failure – FAR §25.571(e) – Boeing used part of JAR advisory material risk analysis for determining the “likely” extent of damage after uncontained engine failure, in conjunction with FAA compliance criteria.

Issue Paper A-11: Engine Unbalance Due to Fan Blade Loss – On a large fan engine the loss of a blade can result in significant structural unbalanced loads and vibration. FAA required test and analysis to show there was no damage to primary structure or critical equipment and flight deck vibration was not a hazard. Boeing looked at five concerns; system survivability analysis validation; simulation for flightcrew effects; passenger physiological effects; APU safety; and crew procedures.

Issue Paper P-1: Inflight Engine Restart – High bypass ratios and EEC technology that affords improved fuel efficiency (at the expense of operating margins and acceleration schedules) have reduced the capability of modern engines to be windmill restarted. The FAA withdrew a proposed special condition after Boeing showed that the 777 engine had no novel or unique features and comparable restart capability.

Issue Paper SE-22: User Modifiable Software – FAR §25.1301/1309 – Documented the FAA’s view of the certification issues, with two options. Boeing elected to show that the user cannot interfere with the intended function of, or affect the safety of, any system; or violate any certification requirement; and that such protection must be inherently part of the overall system.

Issue Paper SE-24: Ground Proximity and Windshear Warning Detection Systems Criticality – FAR §25.1309 – FAA did not accept Boeing’s proposal to certify these systems as non-essential, although it was in the approved cert. plan. However after supply by Boeing and Allied Signal of statistical data on failure rates and false and undetected warnings, FAA accepted that at the LRU level the ground proximity and windshear warning functions in the GPWS meet the integrity level for essential or major hazard category, and a single-string system is the best available.

FAA Compliance Checklist: Model 777-300ER – Document D045W008-51

(5) Flight manual: FAA-Approved Boeing 777-200/-200LR/F Airplane Flight Manual
Document Number D631W001.219 – CAA Accepted as AIR 2931

FAA-Approved Boeing 777-300/-300ER Airplane Flight Manual
Document Number D631W002.319 – CAA Accepted as AIR 3174

FAA-Approved Boeing 777-200/-200LR/F Airplane Flight Manual
Document Number D631W001.212 – CAA Accepted as AIR 3844

(6) Operating Data for Aircraft and Engine:

(i) *Maintenance Manual:*

777 Aircraft Maintenance Manual (ANZ) – Boeing Document D633-W101-ANZ

777 Maintenance Planning Data (MPD) – Boeing Document D622W001

777 Maintenance Review Board Report – Document D622W001-MRBR

777-200 Structural Repair Manual – Document D634W201

777-300 Structural Repair Manual – Document D634W210 [includes 777-300ER]

(ii) *Current service Information:*

777 Service Bulletins, Service Letters, Fleet Team Digest, Maintenance Tips

(iii) *Illustrated Parts Catalogue:*

777-200/300 Aircraft IPC (ANZ) – Document D633W111-ANZ-0138

777-200/300 Aircraft IPC (ILF) – Document D633W111-ILF-0117

777-200/300 Wiring Diagram Manual (ANZ) – Document D280W535

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

CAA has access to www.myboeingfleet.com for all airframe publications

(8) Other information:

Air New Zealand (ANZ) Detail Specification Model 777-219ER – Document Number D019W005ANZ72P-1 – Revision: New – January 25, 2005

Detail Specification – Air New Zealand (ANZ) Model 777-319ER – Document Number D019W005ANZ73E-1 – Revision: A – November 15, 2010

Configuration Specification – Model 777-200, -200ER, -200LR, -300, -300ER Boeing Document No. D019W005 at Revision G

777-200/-200LR/-300/-300ER Flight Crew Operations Manual – Document Number D632W001-TBC – April 01, 1994 at Revision Number 36

FAA Master Minimum Equipment List – Boeing 777 – Revision 16
Boeing 777 Dispatch Deviation Guide (DDG) – Doc. No. D630W003 Rev.29

Dwg. LOPA 772-176 Rev.G – Delivery Interior Arrangement Diagram ILFC/ANZ

Airplane Letter of Definition for ILFC/ANZ 777-219 First of Model Airplane WC486, FAA Project AT9577SE-T

Original dated Sep 16, 2005 – Boeing Reference B-H360-05-3568

Revision A dated Oct 14, 2005 – Boeing Reference B-H360-05-4124

Revision B dated Oct 20, 2005 – Boeing Reference B-H360-05-4276

Electrical Load Analysis Boeing 777 Passenger Airplane (ANZ WC486-WC489)
Doc. D281W002-C486 – Revision: new dated Oct 13, 2005

777 RNP Navigational Capabilities, Generation 1 – Doc. D243W018-13 Rev.D

777 AIMS-2 Update Certification Summary – Doc. No. 243W018-14 Rev.F

Model 777 ETOPS Configuration, Maintenance and Procedures – Doc. D044W054

ILFC (ANZ) Weight & Balance Control and Loading Manual – Chapter 2 Aircraft Report Model 777-219 Passenger – Doc. Do43W520-ANZ1-29404 Aug 29/2005

Air New Zealand Weight & Balance Control and Loading Manual – Chapter 2 AR – Model 777-319ER Passenger – Doc. D043W530-ANZ1-38405 DEC 07/2010

Flight Planning and Performance Manual 777-200ER Trent 895 FAA Kg/°C/Ft – Doc. D632W005-WY058

Flight Planning and Performance Manual 777-300ER GE90-115B FAA Kg/°C/Ft – Doc. D632W003-WY071

Detail Specification – Singapore Airlines, Ltd Model 777-212ER (2-Class Interior Arrangement) – Document No. D019W005-SIA-3B – Revision F – Feb 25, 2004

5. New Zealand Operational Rule Compliance

Compliance with the retrospective airworthiness requirements of NZCAR Part 26 has been assessed, as it is 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	FAR Part 25 para §25.811(a)(e) & (f) at Amendment 25-82
B.2	Crew Protection Requirements – CAM 8 Appdx. B # .35	Not Applicable – Agricultural Aircraft only

Appendix C - Air Transport Aircraft - More than 9 Pax

PARA:	REQUIREMENT:	MEANS OF COMPLIANCE:
C.1	Doors and Exits	FAR Part 25 para §25.809(b) at Amendment 25-82
C.2.1	Additional Emergency Exits per FAR 23.807(b) @ 10.5.93	Meets FAR Part 25 Certification requirements dated 1994
C.2.2	Emergency Exit Evacuation Equipment – Descent means	FAR Part 25 para §25.810(a) at Amendment 25-82
C.2.3	Emergency Exit Interior Marking - Size/self-illuminating	FAR Part 25 para §25.811(e) and §25.812(b) (see ESF)
C.3.1	Landing Gear Aural Warning - Automatic Flap Linking	FAR Part 25 para §25.729(e) at Amendment 25-82

Appendix D - Air Transport Aircraft - More than 19 Pax

PARA:	REQUIREMENT:	MEANS OF COMPLIANCE:
D.1.1	Exit Types - Shall be per FAR 25.807 @ 29.03.93	FAR Part 25 para §25.807 at Amendment 25-82
D.1.2	Floor Level Exits – Definition	FAR Part 25 para §25.807(a) at Amendment 25-82
D.2.1	Additional Emergency Exits - Must meet requirements	(a) Complies (b) Not Applicable – no ventral/tailcone exits
D.2.2	Emergency Exit Access - Must have: Passageway 500m wide between areas and leading to a Type I / II Exit; Crew assist space; Access to Type III/IV unobstructed; Internal doors must be able to be latched open – placarded	FAR Part 25 para §25.813 at Amendment 25-82 See Boeing LOPA-772-176 Not Applicable – No internal doors
D.2.3	Emergency Exit Operating Handles - Markings/Lighting	FAR Part 25 para §25.811(e) at Amendment 25-82
D.2.4	Emergency Exit Evacuation Equipment – Descent means	FAR Part 25 para §25.810(c) at Amendment 25-82
D.2.5	Emergency Exit Escape Route - Must be slip resistant	FAR Part 25 para §25.810(c) at Amendment 25-82
D.2.6	Emergency Lighting (a) Switch Provisions; Uninterrupted Power; Last 10 min. (b) Descent Illumination - Automatic and Independent	FAR Part 25 para §25.812(f) and (i) at Amendment 25-82 FAR Part 25 para §25.812(h) at Amendment 25-82
D.2.7	Emergency Interior Lighting - independent supply; min. illumination; incl. floor proximity escape path markings	FAR Part 25 para §25.812(c) and (e) at Amendment 25-82 See <i>Boeing Detailed Spec. Section 33-51-00</i>
D.2.8	Emergency Exterior Lighting - in effect 30.04.72 or later	Meets FAR Part 25 certification requirements after 1-5-72
D.2.9	Emergency Exit Interior Marking - Clear; instructions Location signs above routes, by exits, on bulkheads Meet provisions in effect 30 April 1972, or later Minimum brightness 250 microlamberts	FAR Part 25 para §25.811(b) and (d) at Amendment 25-82 Meets FAR Part 25 certification requirements at Amendment 25-82 dated 21 June 1994.
D.2.10	Emergency Exit Exterior Markings - 2" contrasting band; opening instructions in red or bright chrome yellow;	FAR Part 25 para §25.811(f) (See Equivalent Safety Finding) Colour of markings to be determined on a individual basis
D.3	Lavatory Fire Protection - Placards; Exterior ashtray; Waste Bin - Sealed door; built-in fire extinguisher; smoke detector system with external warning	FAR Part 25 para §25.791(d) at Amendment 25-82 FAR Part 25 para 25.853(d) and (e) at Amendment 25-82 – See <i>Detailed Spec. §25-41-00 and §26-14-00</i>
D.4	Materials for Compartment Interiors – T/C after 1.01.58: (b) Manufactured 20/8/88 - 20/8/90 – N/A 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	FAR Part 25 para §25.853(c) at Amendment 25-82 FAR Part 25 para §25.853(b) at Amendment 25-82
D.5	Cargo and Baggage Compartments – For aircraft type certificated 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	FAR Part 25 para §25.855 (c) at Amendment 25-82 – All compartments are Class C – See <i>Detailed Spec. §25-50-00 Lower lobe cargo compartment fire extinguishing enhanced fire suppression fitted per Change Number 2623B29A18</i> Sloping portion of sidewalls are panels to BMS 8-223 FAR Part 25 para §25.855(b) at Amendment 25-82

NOTES: 777-219/319ER is equipped for RVSM operations – See *Detailed Specification §02-20-10*
777-219/319ER is approved to Cat. IIIB approach and landing per AC 120-28 – See *DS. §02-26-00*
777-219/319ER is equipped with a flightdeck entry door incorporating intrusion and ballistic characteristics compliant with FAR §25.795 – See *Detailed Specification §52-51-00*

Compliance with the following additional NZ operating requirements has been reviewed (originally for the Model 777-219 only, but the 777-319ER has virtually an identical basic equipment specification) 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	Shoulder Harness if Aerobatic; >10 pax; Flight Training	FAR Part 25 para §25.785 – See Detailed Spec. §25-11-10/5
91.507	Pax Information Signs - Smoking, safety belts fastened	FAR Part 25 para §25.791 – See Detailed Spec. §33-24-00/1
91.509 Min. VFR	(1) ASI FAR 25.1303(b)(1) ** (2) Machmeter FAR 25.1303(b)(1) ** (3) Altimeter FAR 25.1303(b)(2) ** (4) Magnetic Compass FAR 25.1303(a)(3) See Det. Spec. §34-23-10 (5) Fuel Contents FAR 25.1305(a)(2) See Det. Spec. §28-41-00 (6) Engine RPM FAR 25.1305(c)(3) * (7) Oil Pressure FAR 25.1305(a)(4) *	(8) Coolant Temp N/A – Turbojet (9) Oil Temperature FAR 25.1305(a)(6) * (10) Manifold Pressure N/A – Turbojet (11) Cylinder Head Temp. N/A – Turbojet (12) Flap Position FAR 25.699(a) See Det. Spec. §27-18-00 (13) U/C Position FAR 25.729(e) See Det. Spec. §32-61-00 (14) Ammeter/Voltmeter FAR 25.1351(6) *
91.511 Night	(1) Turn and Slip FAR 25.1303(b)(4) ** (2) Position Lights FAR 25.1389/§33-43-00	(3) Anti-collision Lights FAR 25.1401/§33-44-00 (4) Instrument Lighting FAR 25.1381/ §33-13-00
91.513	VFR Comm. Equipment	Dual HF to ARINC 719/753 fitted as standard – See Detailed Spec. §23-11-00 Triple 8.33 kHz channel spacing VHF to ARINC 750 fitted as standard – See DS. §23-12-00 5-channel SELCAL decoder to ARINC 714 fitted as standard – See Detailed Spec. §23-21-00 SATCOM system (ARINC 741) fitted as standard – See Detailed Spec. §23-15-00
91.517 IFR	(1) Gyroscopic AH ADIRS – See DS. §34-23-10 (2) Gyroscopic DI FAR 25.1303(b)(6) ** (3) Gyro Power Supply FAR 25.1331(a) ** (4) Sensitive Altimeter FAR 25.1303(b)(2) **	(5) OAT FAR 25.1303(a)(1)/§34-21-60 (6) Time in hr/min/sec FAR 25.1303(a)(2)/§31-25-00 (7) ASI/Heated Pitot See Detailed Spec. §30-31-00 (8) Rate of Climb/Descent FAR 25.1303(b)(3) **
	** Included in the indications displayed by the electronic flight instrument system (EFIS) – See Detailed Spec. §31-62-00 * Included in the indications displayed by the Engine Indicating and Crew Alerting System (EICAS) – See DS. §31-61-00	
91.519	IFR Communication and Navigation Equipment	Dual Collins VOR-900 with marker beacon to ARINC 711 fitted as std – See DS. §34-51-00 Dual frequency scanning DME-900 to ARINC 709 fitted as standard – See DS. §34-55-00 Dual Collins ADF-900 to ARINC 712 fitted as standard – See Detailed. Specification §34-57-00 Triple Collins GLU-925 Multi-Mode Receivers (MMR) to provide ILS and GPS functions generally meeting ARINC Characteristic 755 fitted as standard – See DS. Section 34-30-10
91.523	Emergency Equipment (a) More Than 10 pax - First Aid Kits per Table 7 - Fire Extinguishers per Table 8 (b) More than 20 pax - Axe readily acceptable to crew (c) More than 61 pax - Portable Megaphones per Table 9	Fitted as Standard – See Boeing Detailed Spec. §25-64-10 Fitted as Standard – See DS. §25-64-60 and §26-26-00 Fitted as Standard – See Boeing Detailed Spec. §25-60-10/2 Fitted as Standard - See Boeing Detailed Spec. §25-64-20
91.529	Emergency Locator Transmitter	Automatic fixed ELT fitted as standard – See Detailed Spec. §23-24-00 Honeywell Rescu 406S meeting TSO C91a and C126 P/N 1152682-1 fitted as BFE (777-219) ELTA ADT406AF fixed ELT and 3x ELTA ADT40S fitted as BFE to the 777-319ER
91.531	Oxygen Indicators - Volume/Pressure/Delivery	FAR Part 25 paragraphs §25.1441(c) and (d)
91.535	Oxygen for Pressurized Aircraft (1) Flight Crew Member On-Demand Mask; 15 min PBE (2) 1 Set of Portable 15 min PBE (3) Crew Member - Pax Oxygen Mask; Portable PBE 120l (4) Spare Oxygen Masks/PBE (5) Min Quantity Supplemental Oxygen (6) Required Supplemental/Therapeutic Oxygen Above FL250 - Quick-Donning Crew On-Demand Mask - Supplemental O ₂ Masks for all Pax/Crew - Supplemental Mask in Washroom/Toilet Above FL300 - Total Outlets Exceed Pax by 10% - Extra Units Uniformly Distributed - Automatically Presented Above FL140 - Manual Means of Deploying Pax Masks	Fixed and portable pbe are fitted on the flightdeck. The crew supply is sized to meet a 2 hour supply of supplemental oxygen. (10 min. emergency descent to FL100.) The 777-219 has 319 passenger masks, plus 32 (10% extra) plus 50% of 10 lavatories, plus 12 flight attendant masks. Boeing advise that system capacity is sized on basis of 100% use of oxygen for passengers for descent to FL140 plus level off for up to 3 hours, with standard 17 second delay. Using those assumptions and data Boeing calculated that all Air NZ routes could be flown with 7 bottles. (Boeing advise this is also sufficient for the extra 25 pax on the 777-319ER.) Both models have 8 x 115 cu.ft. composite oxygen cylinders and 20 x 11 cu.ft. portable bottles distributed in the cabin. Pax masks automatically deploy at 13,500 feet.
91.541	SSR Transponder and Altitude Reporting Equipment	Dual Mode S Transponders meeting ARINC 718A fitted as standard – See Boeing Detailed Spec. Section 34-53-00 ACSS XS-950 P/N 7517800-11006 fitted as BFE.
91.543	Altitude Alerting Device - Turbojet or Turbofan	Fitted as standard – See Detailed Spec. §22-10-10/§34-16-00
91.545	Assigned Altitude Indicator	Not Applicable – Altitude Alerting Device fitted
A.15	ELT Installation Requirements	The Boeing installation meets NZCAR Part 91 Appendix A.15 (b)(iii) and (iv) by inspection

Civil Aviation Rules Part 121

Subpart F - Instrument and Equipment Requirements

PARA:	REQUIREMENT:		MEANS OF COMPLIANCE:
121.355	Additional Instruments (Powerplant)		FAR Part 25 is a Part 21 Appendix C standard
121.357	Additional Equipment - (1) Windscreen Wiper (2) Door, Key (3) Door to emergency exit		Fitted as standard – See <i>Boeing Detailed Spec. §30-43-00</i> Fitted as standard – See <i>Boeing Detailed Spec. §25-18-00</i> Not Applicable – No doors between passenger compartments
121.359	Night Flight - Landing Light, Light in each pax cabin		Fitted as standard – See <i>Det. Spec. §33-42-10 and 33-20-00.</i>
121.361	IFR Operations	Speed, Alt, spare bulbs/fuses	Operational requirement – compliance as applicable
121.363	Flights over water	Liferafts	Aircruiser P/N 6277x-x2x Slide/Rafts fitted as standard (Capacities vary with P/N, which is different for each door.)
121.365	Emergency Equipment	Per §91.523 and EROPS kit	Operational requirement – compliance as applicable
121.367	PBE	TSO C99 required for cockpit equipment TSO C115 required for cabin equipment	Fitted as standard - See <i>Boeing Detailed Spec. §25-60-10/5</i> (EROS P/N MLD20-518 full-face mask fitted as BFE per Change Number 3511B72B34) Fitted as standard - See <i>Boeing Detailed Spec. §25-64-80</i> (Essex PB & R Corporation P/N MR-10046NY fitted as BFE.)
121.369	Pax Address, Intercom	Meets FAR § 121.318 and 319.	See <i>Detailed Spec. §23-31-00 (PA) and §23-42-00 (Cabin Interphone System includes provision for PA announcements)</i> Ground Crew Call and Flight Interphone Systems fitted – See <i>Detailed Spec. §23-43-00 and §23-51-00</i>
121.371	Cockpit Voice Recorder Appendix B.5 requires TSO C84/C123		2-Hour multiple channel CVR meeting ARINC 757 fitted as standard – See <i>Detailed Spec. §23-71-00</i> (Allied Signal P/N 980-6022-001 fitted as BFE.) Note: The 777-319ER will be fitted with an L3 CVR meeting the datalink requirements of FAR §25.1457 and §121.359
121.373	Flight Data Recorder Appendix B.6 requires TSO C124		25-hour DFDR meeting ARINC 747 fitted as standard – See <i>Detailed Spec. §31-31-00</i> – (Allied Signal P/N 980-4700-042 fitted as BFE.) Boeing confirmed all 777 manufactured after August 2002 are equipped at production for compliance with FAR 121.344(f) Appendix M [88 parameters] at Amendment 121-266 and JAR OPS 1 Subpart K 1.715 dated May 1995. 777-319ER fitted with Honeywell P/N 980-4750-009 DFDR
121.375	Additional Attitude Indicator		Included in Integrated Standby Flight Display (ISFD) – See <i>DS. §34-23-30</i>
121.377	Weather Radar Appendix B.8 requires TSO C63		Dual X-band Collins Wx meeting ARINC 708A with predictive windshear and turbulence mode fitted as standard – See <i>Detailed Spec. §34-43-00</i> (Rockwell Collins WRT-2100 P/N 822-1710-001 fitted as BFE.)
121.379	GPWS - Appendix B.9 requires TSO C92		Not Applicable – TAWS A fitted
121.381	Terrain Awareness and Warning System Appendix B.13 requires TSO C151a/b		Honeywell EGPWS Mk.V meeting TSO C117a and TSO C151b (Class A) fitted as standard – See <i>Detailed Spec. §34-46-00</i>
121.383	Airborne Collision Avoidance System Appendix B.14 requires TSO C119b		TCAS meeting ARINC 735 Change 7 compliant fitted – See <i>DS §34-45-00</i> ACSS RT-950 meeting TSO C119b fitted as standard.

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.

6. Certification Issues

FAR 25.785(h)(2) Direct View Requirements

Under this Rule the cabin attendant must be able to see 50% of the seats (at least one third of the seat must be visible) per airplane zone and 80% per airplane cabin as a whole. To achieve this the range of eye movement is limited to 16 inches either side of the attendant seat centreline while seated wearing a fixed harness. The FAA accepts a “see-through” partition as a means of compliance, and mirrors to a limited extent. The 777-219 has a drop-down viewing slot in the partition behind the premium economy seats. This must be in the open position for takeoff and landing. This is not placarded, but the limitation is contained in the cabin procedures manual.

NZCAR 91.125 Stowage of Passenger Service Equipment

This rule provides that no person shall taxi, take-off, or land an aircraft equipped with any viewing screen that extends into the aisle unless that equipment is secured in a stowed position. ANZ applied for an exemption from this to permit the use of the IFE for the pre-flight passenger briefing. This required the front-row in-arm screens to be deployed. The CAA granted 6/EXE/17 based on deployment by the cabin attendants and procedures to ensure the screens were folded away prior to the “Cabin Ready” signal being given. The same exemption was granted under 10/EXE/70 for the 777-300ER.

NZCAR 91.519(c) RNP

WC486 will be delivered with 777 AIMS BP03 update, for which the demonstrated RNP capability with LNAV with Autopilot engaged and with GPS operational is 0.15 nm. The Flight Manual Section 3 Page 5A details the demonstrated RNP capabilities.

The 777-300ER aircraft are approved for the following navigation specifications: (Note, these aircraft approvals do not provide an operational approval to conduct operations)

- (a) RNAV 10 (RNP-10) per FAA Order 8400.12A.
- (b) Basic and Precision Area Navigation (BRNAV and PRNAV) per JAA TGL-2 and TGL-10 respectively. Refer to SIL 777-SL-02-005-C for full compliance details.
- (c) FAA AC 90-100 US Terminal and Enroute Area Navigation Operations.
- (d) Table X lists the RNP capabilities of the aircraft.
- (e) FAA AC 90-101 Approval Guidance for RNP Procedures with SAAAR.

Table 1: Demonstrated RNP Flight Operations Versus Mode of Flight.

Mode of Flight	FMC GPS Operational	FMC GPS Not Operational
LNAV with autopilot engaged	0.11 nm	0.28 nm
LNAV with Flight Director	0.14 nm	0.28 nm
Manual Flight with MAP on the Navigation Display	0.80 nm	1.00 nm

RNP operations are subject to assessment of GPS satellite availability and/or navigation aid coverage for the selected route. The FMCS has been shown to meet the requirements for primary means RNP navigation with the following equipment operational at departure: Two FMCFs, two CDUs, ADIRU, and two sensors capable of complying with the RNP.

NZCAR 91.519(e) RVSM

All 777 Series aircraft are RVSM eligible. (See TCDS note 7.) The AFM Section 3 Page 6A and Service Information Letter (SIL) 777-SL-02-002-D dated 12 Jun 2009 confirm the type design reliability and performance has been evaluated in accordance with FAA Memo 91-RVSM dated 14 March 1994 and is qualified for operation in RVSM airspace.

NZCAR 91.541 SSR Transponder and Altitude Reporting Equipment

CAR §91.541 does not identify all the surveillance systems requirements necessary for international operations. Depending on specific airspace requirements, aircraft operating internationally may require Mode S, Elementary Surveillance, Enhanced Surveillance and Extended Squitter (Automatic Dependent Surveillance – Broadcast) in addition to the basic Mode A and C capabilities. AFM D631W002 Section 3 Page 7A and SIL 777-SL-34-045-B define the surveillance system approvals for the 777 aircraft.

When installed, the Boeing 777-200 and 300 series aircraft are compliant with:

- (a) Mode A, C and S functions with respect to the Traffic Alert and Collision Avoidance System (TCAS).
- (b) Elementary Surveillance.
- (c) Enhanced Surveillance.
- (d) With Multi Mode Receivers (MMR) installed and interfaced to the ATC Transponders, Extended Squitter that complies with EASA AMC 20-24 with the exceptions noted in the AFM D631W002 Section 3 Page 7A.
- (e) The Rockwell Collins MMR GLU-925 P/N 822-1821-001 and ACSS Transponder XS-950 P/N 7517800-11009 (with software mod A) are included in CASA AC 21-45 (0) Appendix D Approved Equipment as being acceptable for use as a means of meeting the Australian ADS-B requirements defined in CAO 20.18.

FAR 25 ETOPS Certification

The 777 Series has been evaluated per FAA Special Conditions 25-ANM-84 and found suitable for 180-minute ETOPS operations, when in compliance with the Boeing CMP Document D044W054. This has been extended to 207-minute for the -200/-200LR/-300ER Models (See TCDS Note 5). Detail Specification §02-24-00 states the 777-319ER aircraft includes all components necessary for 330 minute ETOPS operations to meet FAA type design approval in accordance with EPL 20-1 and FAA-approved Boeing Doc D044W054.

777-319ER Interior Equipment

Because of the novel features involved the CAA imposed Special Conditions and required approvals for the following items of equipment which were installed post-delivery:

STC 11/21E/12 – Approval of “Bed” Mode for Business Class Seats – The Contour seats on the 777-219 were approved by the FAA under TSO C39b for the bed mode and TSO C39c for the seat mode, because the former did not call up SAE AS8049. Clause 3.2.6 of this document requires adjustable features of a seat to be able to be returned to the TTL position without release of the occupant restraints. The FAA subsequently changed their position on dual TSO approvals, and the 777-319ER aircraft was FAA certificated with the bed mode locked out. Air NZ applied for approval of Contour SB25-3738 UCS Bed Mode Activation, based on compliance with the ETSO. The CAA accepted the application but required Air NZ to show an equivalent level of safety to the FAA TSO. (See CRI G-3).

STC 11/21E/3 – Approval of “Skycouch” – Air NZ developed a novel concept whereby the seat rests in a row of three seats could be rotated 90° up to horizontal and the armrests fold completely out of the way to create a flat space where two people (or a family) could sleep. Restraint is provided by a supplemental seatbelt or loop-belts. The modified seat does not meet TSO C39c and could not be FAA-certified. For approval the CAA required Air NZ to demonstrate there would be no hazardous interaction between occupants when subject to manoeuvre loads or turbulence when using any of the defined configurations. (See CRI G-2) Substantiation was based largely on a computer modelling study carried out by the National Institute of Aviation Research at Wichita University on dynamic occupant response to turbulence, in conjunction with a detailed Occupant Safety Report.

STC 11/21E/10 – Installation of MGS Induction Oven – Air NZ have fitted this relatively new technology for use on board an aircraft. The ovens were approved after a test program in conjunction with the manufacturer, which included special consideration of EMI effects.

STC 11/21E/15 – Installation of Aerolux Toaster – The certification plan for this appliance approval included assessment of compliance with heat and smoke emission requirements, and demonstration that there was no undue risk to the aircraft from fire or EMI hazards.

Attachments

The following documents form attachments to this report:

- Photographs first-of-type example 777-219 serial no. 29404 ZK-OKA
- Photographs first-of-type example 777-319ER MSN 38405 ZK-OKM
- Three-view drawing Boeing Model 777-200(IGW)
- Three-view drawing Boeing Model 777-300ER
- Copy of FAA Type Certificate Data Sheet Number T00001SE

Sign off

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David Gill
Team Leader Airworthiness

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Checked – Greg Baum
Airworthiness Engineer

Appendix 1

List of Type Accepted Variants:

<i>Model:</i>	<i>Applicant:</i>	<i>CAA Work Request:</i>	<i>Date Granted:</i>
777-219	Air New Zealand Ltd	5/21B/17	27 October 2005
777-319ER	The Boeing Company	10/21B/23	20 December 2010
777-212	Air New Zealand Ltd	18/21B/34	6 June 2018