

**CAANZ 146 / CASA 21J /
EASA 21J**

**DESIGN ORGANISATION
DIFFERENCES**

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Air New Zealand Design Organisation**

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THIS PRESENTATION COVERS:



- **Overview of Air NZ's Design Organisation**
- **A look at some of the differences between CAANZ 146, CASA 21J, & EASA 21J Design Organisation requirements**
- **Air NZ's Experience in gaining CASA 21J**

Overview of Air NZ's Design Organisation

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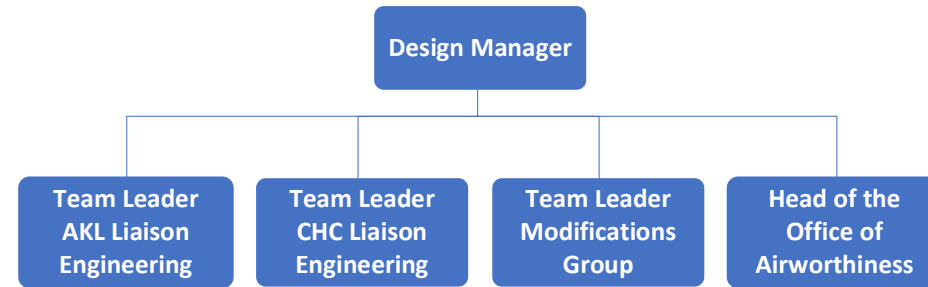


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AIR NZ's DESIGN ORGANISATION - OVERVIEW



Organisational Structure:



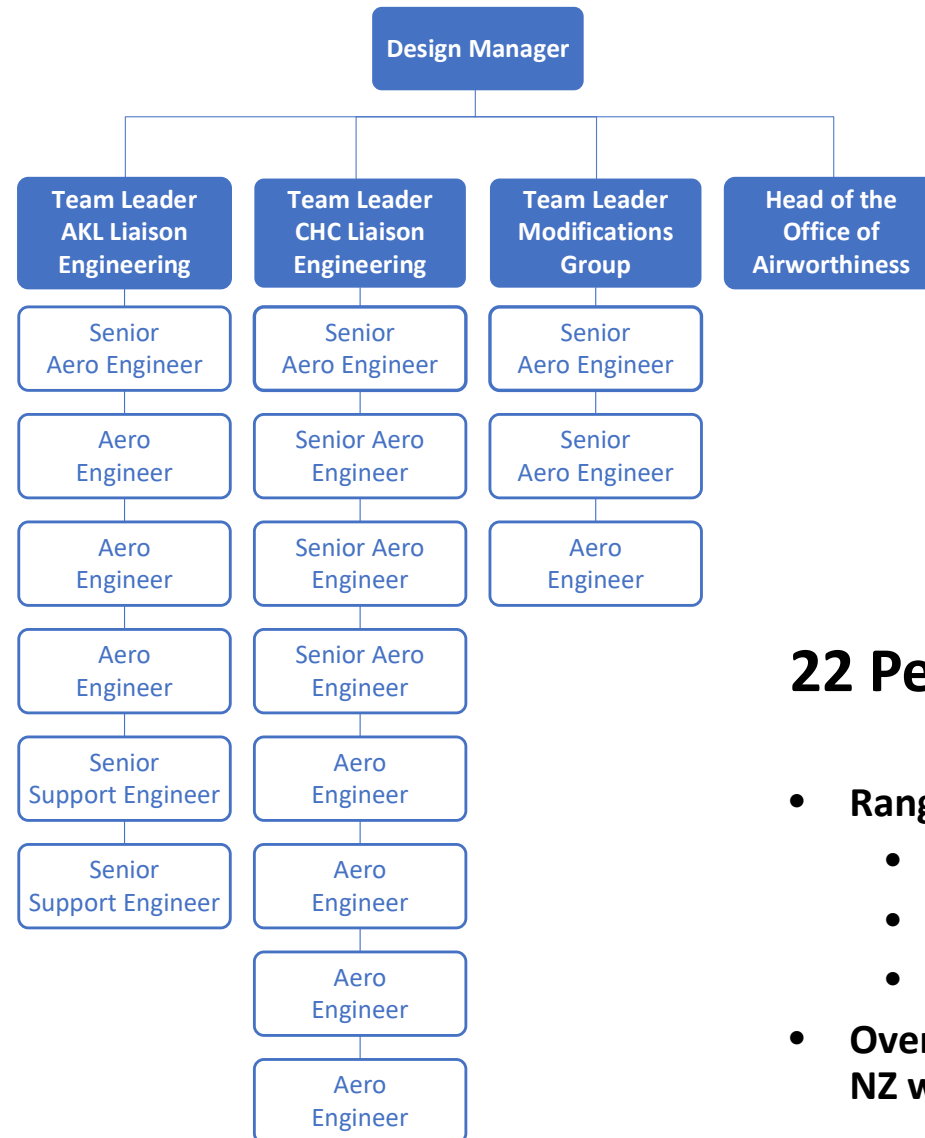
3 Teams, plus an Office of Airworthiness:

- **AKL Liaison (Repairs)**
- **CHC Liaison (Repairs)**
- **Modifications Group (Modifications)**
- **Office of Airworthiness (Issues of Airworthiness and Design Certification)**

AIR NZ's DESIGN ORGANISATION - OVERVIEW



Organisational Structure:



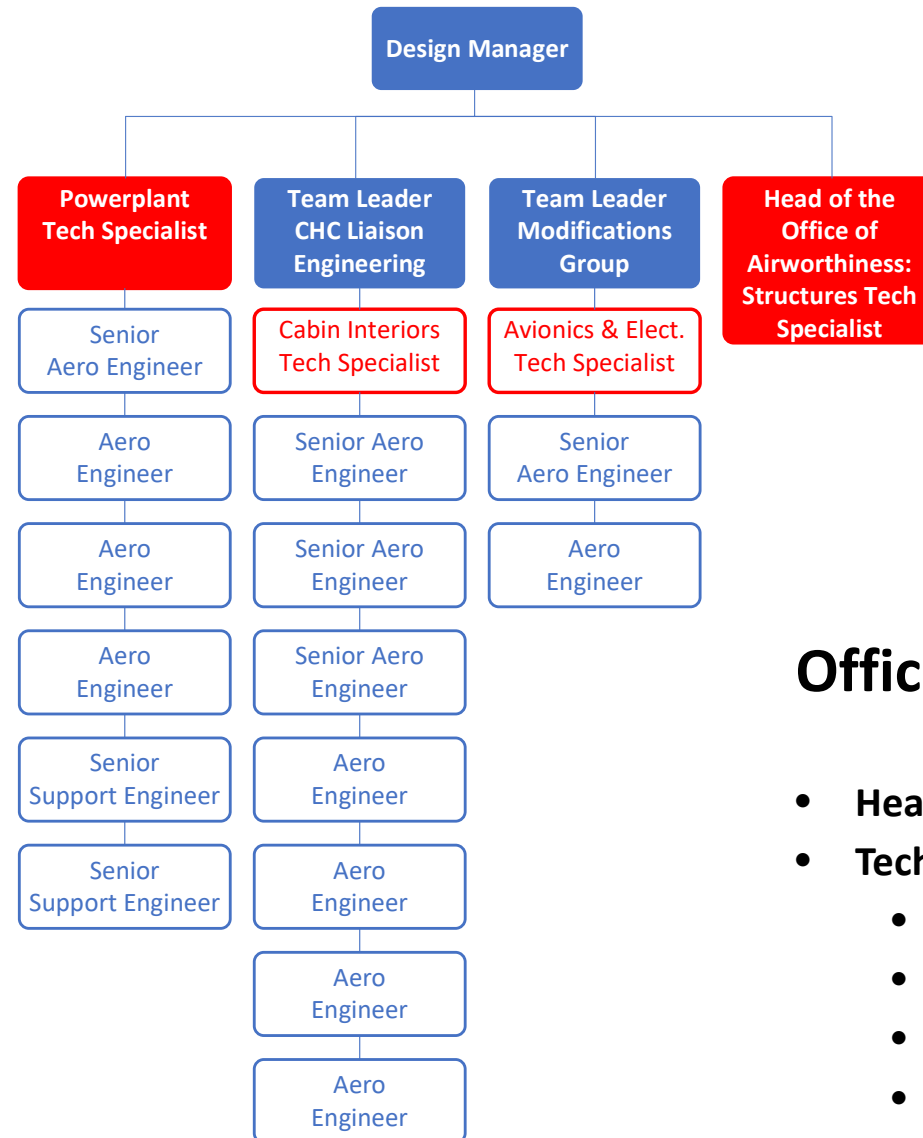
22 Persons in Total:

- Range of Skills:
 - DDH's
 - Licenced Engineers
 - Graduate Engineers
- Over 400 years Experience at Air NZ within the Team

AIR NZ's DESIGN ORGANISATION - OVERVIEW



Organisational Structure:



Office of Airworthiness:

- Head of Office of Airworthiness
- Tech Specialists in:
 - Powerplant
 - Cabin Interiors
 - Avionics & Electrical
 - Structures

AIR NZ's DESIGN ORGANISATION - OVERVIEW



11 DDH's in 3 Disciplines:

7 Structures, Mechanical Systems and Cabin Interiors

2 Avionics & Electrical

2 Powerplant



AIR NZ's DESIGN ORGANISATION - OVERVIEW



5 AP's (Similar to DDH) in 3 Disciplines:

3 Systems & Equipment (Mechanical), and Structures

1 Systems and Equipment (Electrical, Instrument & Radio)

1 Powerplant



Australian Government

Civil Aviation Safety Authority

AIR NZ's DESIGN ORGANISATION - OVERVIEW



In the 2018 Calendar Year:

- CAANZ 146 **823** Approvals
- CASA 21J **54** Approvals
- EASA 21J Application Lodged in Jan 2019 – Currently Writing Exposition

PLUS: Processing approximately 1900 other OEM-approved and technical advice-only jobs.



Australian Government
Civil Aviation Safety Authority



AIR NZ's DESIGN ORGANISATION - OVERVIEW



Variety of
Customers:



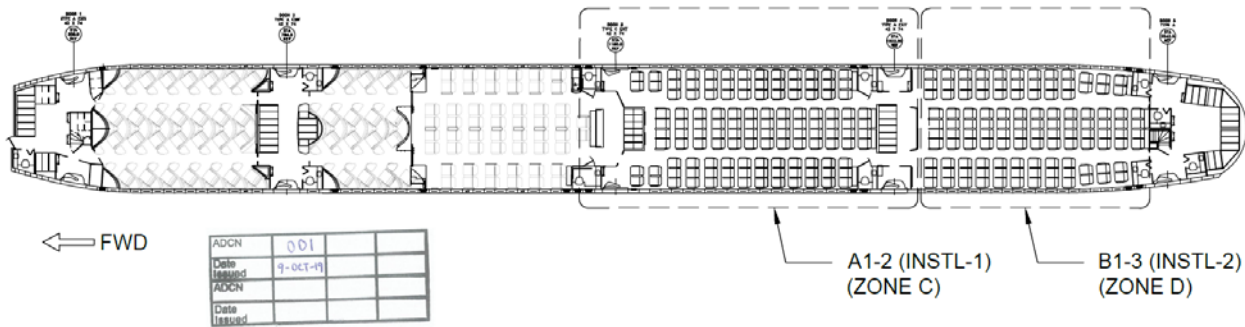
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AIR NZ's DESIGN ORGANISATION - OVERVIEW



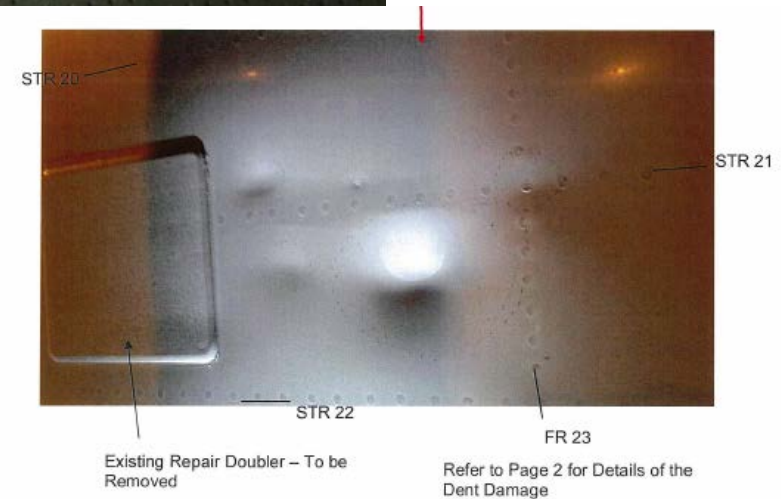
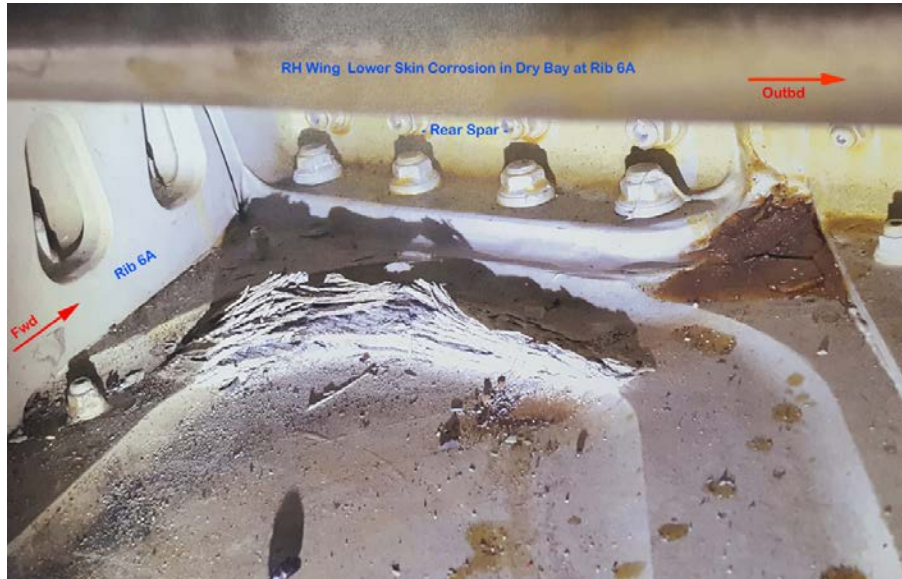
Typical Repairs/Mods:



AIR NZ's DESIGN ORGANISATION - OVERVIEW



Typical Repairs/Mods:



CAANZ 146, CASA 21J, & EASA 21J DO DIFFERENCES

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CAANZ 146, CASA 21J, & EASA 21J DO DIFFERENCES



- **Design Organisation Rules**
- **Mod / Repair Design Approval Rules**
- **STC rules**
- **Scope**
- **Senior Persons**
- **Approval Holders / AP's**
- **SOC / CVE / 21.009 Authorisation**
- **Check By / Independent checking**
- **Qualifications / Experience**
- **Minor / Major Classification**
- **Design Assurance System**
- **Permissible Unserviceability**
- **Design Advice**

DESIGN ORGANISATION RULES



CAANZ	CASA	EASA
<ul style="list-style-type: none">• CAANZ Part 146	<ul style="list-style-type: none">• CASR Part 21 Subpart J	<ul style="list-style-type: none">• EASA Part 21 Subpart J

- **Under CAANZ and EASA in order to be able to exercise design privileges (i.e. SOC, approvals) you must become an approved Design Organisation.**
- **Under CASA it is not mandatory to become a CASR 21J ADO. Many smaller organisations just hold CASR 21.M (mod/repair) design approval authority as “Authorised Persons”. Currently there are only six CASA 21J ADO’s*. There are 26 organisations that have 21.M AP’s who are not 21J ADO’s.**

All information is private and confidential
* **Air New Zealand Ltd, Aquila Engineering Ltd, Helimods Pty Ltd, Lufthansa Technik AG Pty Ltd, Northrop Grumman Integrated Defence Services Pty Ltd, QANTAS Airways Ltd**

MODIFICATION / REPAIR DESIGN APPROVAL RULES



CAANZ	CASA	EASA
<ul style="list-style-type: none">• Part 21 Subpart C – Design Changes• Part 21 Subpart M – Repairs• Part 21 Subpart N – Technical Data and Airworthiness Specifications	<ul style="list-style-type: none">• 21.M – Design of modification of, and repairs to, aircraft, aircraft engines, propellers and appliances	<ul style="list-style-type: none">• 21 Subpart D – Changes to Type-Certificates and Restricted Type Certificates<ul style="list-style-type: none">○ Applies to Changes only○ 21.A.95 – Minor Changes○ 21.A.97 – Major Changes• 21 Subpart M - Repairs

NOTE: EASA use the term Changes not Modifications

STC RULES



CAANZ	CASA	EASA
<ul style="list-style-type: none">• 21 Subpart E – Supplemental Type Certificates	<ul style="list-style-type: none">• 21.E – Supplemental Type Certificates	<ul style="list-style-type: none">• 21 Subpart E – Supplemental Type Certificates

DO SCOPE

- All regulators limit DO activity scope at both **Organisational Level** and at **Individual DAH**



Level. CAANZ	CASA	EASA
<ul style="list-style-type: none"> • Organisation: Design Ratings D1, D2, D3 <ul style="list-style-type: none"> • Further conditions/ limitations can be imposed under the ratings e.g. aircraft type, disciplines • Individual: Instrument of Delegation <ul style="list-style-type: none"> • Mod and repairs • Exclude EL0S • Must work under DO • Excludes major mods • Discipline inclusions or exclusions 	<ul style="list-style-type: none"> • Organisation: Design Activities, Limitations • Design Activities: <ul style="list-style-type: none"> • Advice Activity (1) • Approval Activity (12) <ul style="list-style-type: none"> 21.437 – Mod/Repair 21.009 – Technical Data 21.006A – Flight Manual 21.007 – Permissible Unserviceability • Certification Activity (9) <ul style="list-style-type: none"> 21.115 - STC • Experimental Certificate Activity • Limitations: <ul style="list-style-type: none"> • Engineering Specialties • Airworthiness Standards • Category of Airworthiness Products • Certain technologies • Other Limitations and Conditions • Individual: Internal process <ul style="list-style-type: none"> • Air NZ use an authorities table 	<ul style="list-style-type: none"> • Organisation: Categories, Limitations <ul style="list-style-type: none"> • 1A - TC highly complex or large product • 1B – TC complex or small/medium product, ETSO APU (large) • 1C – TC less complex or very small • Unrestricted <ul style="list-style-type: none"> • STC/Major Changes/repairs • Minor Changes/Repairs • Restricted Technical Fields • Restricted A/C size • Limitations • Individual: Internal process

SENIOR PERSONS



CAANZ	CASA	EASA
<ul style="list-style-type: none"> • Chief Executive • Design Control SP • Inspection and Testing SP • Safety Management SP • DDH's (per 146.51) <p>NOTE: SOC's not strictly senior persons by definition, but names required per 146.59(5))</p>	<ul style="list-style-type: none"> • Accountable Manager • Head of Design • Other Managerial Positions: <ul style="list-style-type: none"> • Compliance Assurance SP • Independent Monitoring SP • Persons who carry out a Design Activity (i.e. AP's) <p>(per CASR 21.263)</p>	<ul style="list-style-type: none"> • Chief Executive • Other Management Staff: <ul style="list-style-type: none"> • Head of Design Organisation • Chief of the Office of Airworthiness • Chief of Independent Monitoring of the Design Assurance System • Personnel making decisions affecting airworthiness, operational suitability, and environmental protection: <ul style="list-style-type: none"> • Compliance verification engineers • Personnel of the Office of Airworthiness making decisions affecting airworthiness, operational suitability and environmental protection, especially those linked with the 21.A.263 privileges (signing documents for release, approving classification of changes and repairs, and granting the approval of MINOR changes and MINOR repairs, granting the approval of SBs, and minor revisions to the aircraft flight manual) • For MAJOR changes and repairs a declaration of compliance is required <p>(per 21.243(d))</p>

APPROVAL HOLDERS / AP'S



CAANZ	CASA	EASA
<ul style="list-style-type: none"> • Design Delegation Holder (DDH) • Delegation from the Ministry of Transport and CAANZ Director to approve design changes iaw 21.73. • CAA issues an instrument of delegation which includes scope and limitations. • Does not cover SOC 	<ul style="list-style-type: none"> • Authorised Person (AP) • Internal ADO authorisation to carry out a Design Activity (ie. Advice, Approve, Certification) • Activities are all separate. Air NZ currently have: <ul style="list-style-type: none"> • Approve Mods and Repairs (21.437) • Approve Technical data (21.009) (SOC under 146 but is considered an approval function under CASA) • Approve a change to a Flight Manual (21.006A) • Note: PU is a separate approval authority (21.007) 	<ul style="list-style-type: none"> • Office of Airworthiness, CVE. • Internal ADO authorisation • For MAJOR changes Head of DO or an authorised representative signs Declaration of Compliance • Personnel belonging to the Office of Airworthiness approve classification of changes and grant the approval of MINOR changes • Compliance Verification Engineers (CVE's) approve compliance documents (SOC under 146) and technical data. This is considered an approval activity under EASA

SOC / 21.009 / CVE



CAANZ	CASA	EASA
<ul style="list-style-type: none"> • Statement of Compliance authority • Internal DO authorisation • 21.505(6) requires an SOC for each design change. • 146.59(b)(5) requires the exposition to have procedures to issues SOC's and maintain a list of staff with authority to sign SOC's 	<ul style="list-style-type: none"> • 21.009 Authorised Person • Internal DO authorisation • 21.009 requires technical data to be approved if the design complies with the applicable airworthiness standards. • 21 Section M (mod/repair approval) requires 21.009 approval before 21.437 approval can be issued (21.420) • 21 Section J considers 21.009 to be a Design (Approval) Activity and person signing 21.009 are AP's 	<ul style="list-style-type: none"> • Compliance Verification Engineer (CVE) • Internal DO authorisation • 21J / 21.239 (Design Assurance System) requires the DO to demonstrate and verify compliance with applicable CS and environmental protection reqts. • 21J / 21.243 (Data) requires procedures, persons, and qualifications of those responsible for making decisions affecting airworthiness and environmental protection (incl CVE's)

CHECK BY / INDEPENDENT CHECKING



CAANZ	CASA	EASA
<ul style="list-style-type: none"> • 146 internal authorisation • 146.59 requires procedures to check drawings and reports showing compliance. • No rules defining independence of the checking function. • Air NZ's DM requires the checker to be independent to the preparer. The checker can be the DAH. • No rules covering qualifications or experience of checkers. 	<ul style="list-style-type: none"> • Internal authorisation • Independent checking requirement are well defined in the rules (21.269), AC, and MOS • The checker must not be the individual carrying out the design activity (i.e. the approval). • The person c/o the independent checking must have the same qualifications & experience as the AP. 	<ul style="list-style-type: none"> • 21.A.239 requires an independent checking function of the showings of compliance. • AMC 21.A.239(b) – “independent checking function of the demonstration of compliance should consist of the verification by a person not creating the compliance data.” • Independent checking is part of the CVE (SOC) function.

QUALIFICATIONS / EXPERIENCE



CAANZ	CASA	EASA
<ul style="list-style-type: none"> • CAANZ 146 rules specify qual/experience requirements for a DDH • No qual/experience requirements specified for SOC or Check By 	<ul style="list-style-type: none"> • CASA has very specific qual/experience/knowledge requirements for the various design activities in AC 21-J and Part 21 MOS. • Check By qual/experience reqts are basically the same as an AP and are more restrictive than CAANZ and EASA. 	<ul style="list-style-type: none"> • EASA rules do not specify qual/experience/knowledge requirements for design authorised people. • GM No 2 to 21.A.243(d) states: The persons responsible to: <ul style="list-style-type: none"> - Classify changes to type design or repairs - Verify compliance [21.A.239(b)] - Approve minor changes to type design and minor repairs [21.A.263(c)(2)] - Issue information or instructions [21.A.263(c)(3)] • should be selected by the organisation in accordance with a procedure and criteria agreed with the Agency.

CAANZ will auth via the exposition

Qual/experience requirements are proposed by the ADO and must be agreed by EASA

MINOR / MAJOR



CAANZ	CASA	EASA
<ul style="list-style-type: none">• CAANZ have TWO Minor/Major classifications.• Mod/Repair classification by the Part 43/145 certifying engineer. 146 DO provides a recommendation on our TI's and EO's. If a mod/repair is major a Form 337 independent conformity is required.• Modification Design Change classification by the 146 DO. This requirement is stated in the DDH instrument of delegation. If major we need to go the CAANZ.• Note no requirement for Repair Design Changes to be classified.	<ul style="list-style-type: none">• Both Modification and Repair design changes need to be classified (also Permissible Unserviceability's need to be)• If major, we need to approach CASA with a Design Advice.	<ul style="list-style-type: none">• Similar to CASA• Both Changes (i.e. mods) and Repairs need to be classified.

DESIGN ASSURANCE SYSTEM



- **Both EASA and CASA emphasise the requirement for a “Design Assurance System”**
- **Design Assurance covers the key steps in the design process:**
 - **Compliance with applicable design standards, rules, etc**
 - **No unsafe features**
 - **Major/Minor Classification**
 - **Independent checking**
 - **Independent monitoring**
- **CASA suggests separate Exposition and DASM Manuals**
- **CAANZ 146 rule does not use the term Design Assurance System specifically but the requirements are there.**

PERMISSIBLE UNSERVICEABILITY



CAANZ	CASA	EASA
<ul style="list-style-type: none"> • No equivalent limitation • Unrepaired damage is treated the same as a repair. 	<ul style="list-style-type: none"> • Unique to CASA. Hangover from CAR 37. • Separate Design Approval Activity (21.009) • PU can sometimes be treated as a repair if some “repair” action is taken (i.e. NDT, reprotect, apply tape, etc.) • PU approvals can only ever be temporary. • CASA AC 21-28 provides guidance on how to treat a PU. It is 46 pages long!! 	<ul style="list-style-type: none"> • No equivalent limitation • 21.A.445 “unrepaired damage” sits under 21M repair approval • Allows DO’s to approve unrepaired damage provided it is classified as minor.

DESIGN ADVICE



CAANZ	CASA	EASA
<ul style="list-style-type: none">• Send email to: airworthiness@caa.govt.nz	<ul style="list-style-type: none">• Unique to CASA• Design Advice, is the primary means of obtaining advice or a determination from CASA in relation to design activities. A Design Advice may be submitted if an ADO or authorised person requires advice from CASA in relation to any matter associated with a modification/repair design• Part of Design Assurance System requirements.• CASA Form 655	<ul style="list-style-type: none">• Yet to establish how to formally communicate with EASA on certification determinations.

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AIR NZ's EXPERIENCE IN GAINING CASA 21J



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AIR NZ's EXPERIENCE IN GAINING CASA 21J



- **Through our partner company in Australia (TAEQ), at the time, we already were “21M Authorised Persons”, and were therefore known to CASA.**
- **CASA guidance available is very good and they were very helpful in assisting us:**
 - **Several AC's (21J ADO's, 21M Mods/Repair approvals, STC's, Major/Minor Classification**
 - **Sample manuals (ADO Exposition, ADO Design Assurance Manual)**
 - **Information booklet**
 - **They provided us with a face to face presentation on the process and reqts.**
 - **They provided us with a compliance spreadsheet, which is what they use internally to assess the manuals.**
- **We chose to have separate manuals from our CAANZ 146 manual. Same with forms.**
- **We chose to use their the sample manuals as our templates (not mandatory)**
- **Approximately 12 months from start to certificate issue**



Questions?