SAMPLE TCDS Comparison with Baseline ICAO Annex 8

The following Models are Considered:

- B737
- A320
- MBB-BK117 D

Baseline Comparison with FAA Type Certificate Data Sheet (TCDS) No. A16WE

This is the active legal document for the entire Boeing 737 family, including the "Classic," "Next Generation (NG)," and "MAX" series.

Overview of Differences

The most significant difference between a standard "clean sheet" TCDS (as outlined in the ICAO baseline) and the Boeing 737 MAX TCDS is the certification age, The 737 MAX operates under an Amended Type Certificate that traces its legal lineage back to 1967. This creates a complex "patchwork" certification basis rather than a single unified standard.

Detailed Comparison by Section

1. General Information

Baseline Expectation: A single model designation and a recent issue date. **Boeing 737 MAX Reality:**

- **Document Consolidation:** The MAX does not have its own separate TCDS. It is listed as a new "model" added to the existing TCDS (A16WE) which also lists the 737-100 from the 1960s.
- **Naming Convention:** The TCDS does not use the marketing term "MAX." Instead, it legally designates the aircraft as the **737-8**, **737-9**, or **737-8200** (the high-density variant).
- **Holder:** The Boeing Company.

2. Certification Basis (The Critical Difference)

Baseline Expectation: A clear reference to a modern airworthiness code, e.g., "14 CFR Part 25, Amendment 25-140." **Boeing 737 MAX Reality:**

- The "Changed Product Rule": This section is exceptionally complex due to 14 CFR 21.101. The TCDS lists a "tiered" certification basis.
- Grandfathered Rights: Significant portions of the aircraft are still certified to Civil Air Regulations (CAR) 4b, the standard effective in 1967. This allows the fuselage and flight control basics to remain legally compliant with 1960s standards.
- **Newer Standards:** Only *changed* areas (like the engines and winglets) are certified to newer 14 CFR Part 25 amendment levels.
- **Special Conditions:** The TCDS lists specific non-standard safety requirements unique to the MAX to address its novel features, such as:
    - *Lithium Ion Battery Installations:* addressing fire risks in modern electronics.
    - *Engine Mounting:* Addressing the structural implications of the larger LEAP engines.

3. Technical Characteristics

Baseline Expectation: Standard listing of engine, fuel, and dimensions. **Boeing 737 MAX Reality:**

- Engines: The TCDS specifies the CFM LEAP-1B series (e.g., LEAP-1B25, LEAP-1B28). It cross-references a separate Engine TCDS (No. E13NE).
- Thrust Ratings: It lists multiple thrust ratings for the same physical engine, which are selectable via software (e.g., 26,000 lbs vs 28,000 lbs thrust).
- Fuel System: Unlike the baseline which might list a simple capacity, the MAX TCDS has to account for different fuel densities and auxiliary tank configurations used in the Boeing Business Jet (BBJ) versions of the MAX.

4. Operating Limitations

Baseline Expectation: Static numbers for speed, weight, and center of gravity. **Boeing 737 MAX Reality:**

- **Flight Manual Dependence:** The TCDS heavily references the **Airplane Flight Manual (AFM)**. During the MAX grounding and return-to-service, the *content* of the TCDS didn't change as much as the *required revision number* of the AFM referenced within it.

- **Runway Slope:** Explicitly limits operation to runways with slopes between +2% and -2%.
- **Reliability (ETOPS):** The TCDS or associated approval letters contain specific limitations regarding Extended Operations (ETOPS) capability, which is distinct from the basic airworthiness.

5. Specific Features & Anomalies

- **737-8200 Exit Markings:** The high-density "Ryanair" version (737-8200) required an **Equivalent Safety Finding (ESF)** because its extra exit doors didn't meet the strict letter of the visibility regulation. The TCDS records that the design is "safe enough" despite this deviation.
- **MCAS and Software:** The Maneuvering Characteristics Augmentation System (MCAS) is **not** explicitly named in the public TCDS data lines. Instead, it is buried within the "Flight Control Computer" software nomenclature referenced in the AFM and Master Minimum Equipment List (MMEL). The TCDS mandates the presence of the system but does not describe its logic; that is found in the confidential design data.

Baseline Comparison with TCDS A.064 Airbus A320 Family TCDS

This comparison uses EASA Type Certificate Data Sheet No. A.064 (and its FAA counterpart A28NM) as the reference for the Airbus A320 Family, including the A318, A319, A320, A321, and their "New Engine Option" (NEO) variants.

Overview of Differences

The A320 Family (including the NEO) is certified to a **1988 standard (JAR-25)**. While still a "derivative" aircraft, the baseline it modifies is twenty years more modern than the 737's. The TCDS explicitly codifies the novel features of the aircraft (like Fly-by-Wire) rather than attempting to fit them into traditional mechanical definitions.

Detailed Comparison by Section

1. General Information

Airbus A320 Approach:

- **Clear Variant Grouping:** The TCDS lists all models (A318/A319/A320/A321) on a single sheet but uses distinct suffixes to denote the "NEO" status.
- **Nomenclature:**

    - **CEO (Current Engine Option):** Listed as A320-200 series (e.g., **A320-214**).
    - **NEO:** Listed with an "N" suffix (e.g., **A320-271N** for PW engines, **A320-251N** for CFM engines).
- **Holder:** Airbus S.A.S.

2. Certification Basis (The "Clean Sheet" Advantage)

Airbus A320 Family:

- **Modern Baseline:** The certification basis is **Joint Aviation Requirements (JAR) 25**, effective 1988 (specifically Change 11). This was the European predecessor to EASA CS-25.
- **Fly-by-Wire (FBW) Transparency:** Because the A320 was the first civil airliner with digital FBW, the regulations didn't exist yet. The TCDS contains extensive **Special Conditions (SC)** that explicitly define the safety requirements for "Flight Envelope Protection" (e.g., Alpha Floor protection).
    - *Comment:* This is a sharp contrast to the 737 MAX, where the MCAS system (effectively a limited envelope protection) was not explicitly detailed in the TCDS because it was treated as a sub-function of the speed trim system to maintain 1967 compliance.
- **NEO Updates:** The NEO variants are certified via the "Changed Product Rule" (like the MAX), bringing the engine and wing installation up to modern **CS-25** standards, but the fuselage remains on the JAR-25 basis.

3. Technical Characteristics

Airbus A320 Family:

- **Dual Engine Sources:** The TCDS lists two distinct engine manufacturers for the NEO, requiring separate data lines for each:
    - **CFM International:** LEAP-1A series (e.g., LEAP-1A26).
    - **Pratt & Whitney:** PW1100G "GTF" series (e.g., PW1127G).
- **Thrust Ratings:** Similar to the 737 MAX, the TCDS lists multiple thrust ratings for the same physical engine hardware, selectable via a "Plug."
- **Fuel System:** The A321-200NX (ACF) introduced complex "Rear Center Tank" (RCT) configurations. The TCDS must account for these flexible fuel limits, which are modular rather than fixed.

4. Operating Limitations

Airbus A320 Family:

- **Hard Protections:** The TCDS operating limitations section references the "Normal Law" flight envelope. The aircraft literally *cannot* be stalled or overstressed in Normal Law, and the TCDS references the software standards that guarantee this.
- **Crosswind Limits:** Often explicitly detailed in the TCDS or referenced documents due to the specific handling characteristics of the FBW system in strong winds.

5. Specific Features & Anomalies

- **Cabin Flex (A321NX):** The "Airbus Cabin Flex" (ACF) configuration removed the fixed Door 2 and replaced it with emergency exit hatches over the wing.
    - *TCDS Impact:* This created a variable "Maximum Seating Capacity" based on which exit doors are *activated*. An operator can physically deactivate a door to save maintenance, and the TCDS limits their passenger count accordingly (e.g., down-rating an A321 from 240 seats to 180).
- **Lithium Batteries:** Like the MAX, the A320 NEO TCDS includes Special Conditions for the installation of non-rechargeable lithium batteries, a modern fire-safety requirement that didn't exist for the original A320.

This assessment evaluates **EASA TCDS No. EASA.R.010** (for the MBB-BK117 family) against the ICAO-compliant checklist established in the previous step.

Assessment Summary

The TCDS is **Compliant** with ICAO Annex 8 requirements, though it employs a modern "Reference-Based" format rather than a "Data-Listing" format for several technical characteristics. This ensures the data remains current without constantly amending the TCDS, but it requires the operator to possess the specific manuals (RFM/AMM) to verify basic airworthiness parameters.

Baseline Comparison - MBB-BK117 D-3m TCDS - EASA.R.010

Detailed Checklist Verification

1. General Identification

- **[x] State of Design Identified:** Yes (EASA).

- **[x] TC Holder Defined:** Yes (Airbus Helicopters Deutschland GmbH).
- **[x] Type Certificate Number:** Yes (EASA.R.010).
- **[x] Issue Date:** Yes (Issue 21, 24 November 2023).
- **[x] Model Designation:** Yes (Listed in Table of Contents, e.g., MBB-BK117 D-3m).
- **[x] Eligibility:** Yes (Serial numbers listed in "Notes" section for each model).

2. Certification Basis

- **[x] Primary Airworthiness Code:** Yes (e.g., *CS-29 Amdt 4* for D-3m; *FAR 29* for older models).
- **[x] Effective Date:** Yes (e.g., "2 March 2018").
- **[x] Special Conditions:** Yes (e.g., "Lithium Battery Installations", "Cybersecurity").
- **[x] Equivalent Safety Findings (ESF):** Yes (e.g., *CS 29.1587(a)(6)* for Cat A procedures).
- **[x] Noise & Emissions:** Yes (References *TCDSN EASA.R.010* and ICAO Annex 16).

3. Technical Configuration (The "Reference" Gap)

- **[x] Engines:** Yes (Manufacturer & Model listed, e.g., *Arriel 2E*).
- **[x] Dimensions:** Yes (Main Rotor Diameter 10.80 m, etc.).
- **[PARTIAL] Fuel & Oil:**
    - *Observation:* The TCDS does **not** list specific grades. It states: *"Refer to approved RFM, Section 2"*.
    - *Assessment:* Compliant with practice, but a gap against a strict "Data Sheet" expectation.
- **[PARTIAL] Control Surfaces:**
    - *Observation:* No degrees of travel are listed. It states: *"For rigging information refer to Maintenance Manual"*.
    - *Assessment:* This is a common modern deviation. It prevents TCDS errors if rigging tolerances change slightly, but hides the data from immediate view.

4. Operating Limitations

- **[x] Airspeed Limits:** Yes (V_{NE} 150 KIAS).

- **[x] Weight Limits:** Yes (Max Mass 3,800 kg for D-3).
- **[x] Center of Gravity:** Yes (Longitudinal limits listed in mm; Lateral limits listed).
- **[x] Datum:** Yes (Defined as 3950 mm forward of levelling point).
- **[x] Altitude:** Yes (20,000 ft PA).
- **[x] Crew/Passengers:** Yes (1 Pilot / 9 Passengers).

5. Required Documents

- **[x] Flight Manual:** Yes (Specific document versions referenced).
- **[x] Maintenance Manuals:** Yes (ALS, AMM, WDM referenced).
- **[x] MMEL:** Yes (Referenced via Section 13 OSD).

6. Auxiliary Power Unit (APU)

- **[x] APU Section:** Yes.
- **[x] Status:** Correctly identified as **"n/a"** (Not Applicable) for this single-engine rotorcraft family.

Gap Analysis Findings

The following table highlights areas where this TCDS diverges from the "Ideal" checklist or requires specific attention during an audit.

Area	Finding	Comments
Control Surfaces	**Referenced Only**	Unlike fixed-wing TCDSs which often list deflection angles (e.g., *Aileron Up 20°*), this TCDS hides rigging data in the Maintenance Manual. This makes the TCDS less useful for a quick "conformity check" without the full library.
Fuel Tank Safety	**Implicit CDCCL**	While newer models (D-2/D-3) mention "Fuel Venting" compliance, the legacy models (A/B/C) do not have a prominent "Fuel Tank Safety / SFAR 88" note in the TCDS text itself. Compliance is buried in the referenced *Airworthiness Limitations Section (ALS)*.

Area	Finding	Comments
OSD Separation	**New Structure**	Section 13 (Operational Suitability Data) is a newer EASA requirement. Older TCDS formats would not have this. It segregates MMEL and Flight Crew Data from the basic airworthiness data.

Conclusion

The provided document is a **high-quality, compliant TCDS**. It demonstrates the evolution of certification from 1970s standards (FAR 29) to 2020s standards (CS-29 + OSD). The primary "gap" is the reliance on external manuals (RFM/AMM) for data that was historically written directly on the sheet (fluids, rigging), a trend that reduces administrative errors but increases the documentation burden for the inspector.

Ep.7: Why the TCDS Matters: What Every Aviation Professional Should Know

This video is relevant because it walks through a real TCDS, explaining the significance of sections like the "Datum," "Certification Basis," and the link between the TCDS and approved manuals, which directly clarifies the findings in your BK117 assessment.