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CERTIFICATION PROCESS OF STARLINK WIFI ON A320 AIRCRAFT

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Abstract: Driven by the growing demand for seamless in-flight internet access and efforts to enhance passenger comfort, airlines are increasingly adopting in-flight connectivity technologies such as the Starlink Wi-Fi system. Integrating these systems into aircraft requires obtaining Supplemental Type Certificate (STC) approval from aviation authorities to ensure compliance with airworthiness standards. This paper examines the certification process for installing Starlink Wi-Fi on A320 aircraft under EASA and DGCA regulations, with a focus on airworthiness aspects. The study uses a qualitative research method through a comparative regulatory analysis approach, supported by document reviews and practical experience within a Design Organization Approval (DOA) environment. The process involves defining the design description, classifying the modification, and identifying the certification basis and compliance requirements. Results indicate that the installation is classified as a non-significant major change under both regulatory frameworks, requiring adherence to specific certification basis, Means of Compliance, and Design Organization Approval (DOA) frameworks. DGCA mandates Class C and D DOA, while EASA employs a single DOA structure based on approved privileges, highlighting distinct regulatory approaches to certification.

Keywords: Certification, EASA, DGCA, Supplemental Type Certificate (STC), Starlink Wi-Fi

Introduction

Airplane Wi-Fi or in-flight Wi-Fi, allows passengers to connect their devices, such as smartphones or laptops, to the internet while flying. This enables them to watch movies, browse websites, work, and send messages during the flight. One of the emerging technologies in this domain is the Starlink satellite internet system developed by Space X. Starlink Hardware includes one Aero Terminal (the Antenna), one Power Supply Unit, up to three Wireless Access Points, and related harnessing (Spray, 2024). Generally, installing and activating Wi-Fi on an aircraft requires a modification certification process approved by aviation authorities. Design Organization Approval is typically responsible for developing modifications and issuing the necessary airworthiness documentation.

Several previous studies have been conducted in the context of design organizations, type certification, and design change certification. Tomi (2020) In his research on the EASA approval process for aircraft modifications, provides a general overview of how to obtain EASA approval for such modifications. Specifically, this study describes the certification process for modifying a Rotax-Cessna aircraft, which had previously received an STC approval for replacing the Cessna 150's original Continental engine with a Rotax 912S.

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Rocio (2019), in his research on the development of an aeronautical certification process focused on avionics equipment, provides a comprehensive explanation of how companies operate today, how they apply for product certification, which documents they must submit to various authorities, and how they handle unexpected issues. This research also addresses the development and analysis of the certification process for aeronautical products, with an emphasis on European regulations, and aims to guide companies in certifying new or modified products, particularly avionics equipment.

Nurfrida (2023), in her research on the comparative analysis of regulations in aircraft modification, explains the applicable processes under two major authorities, EASA and the FAA, and compares them with DGCA Indonesia. This study addresses a gap in the existing research by providing a comprehensive analysis of the certification processes for design organizations and aircraft modifications as regulated by the FAA, EASA, and Indonesia's DGCA.

In terms of research methodology, the previous studies adopted various qualitative approaches. Tomi (2020) employed a case study method by examining a specific aircraft modification project to explore the certification steps under EASA. Rocio (2019) utilized a descriptive qualitative approach, supported by document analysis and industry interviews, to map out the avionics certification process from a practical and regulatory standpoint. Meanwhile, Nurfrida (2023) applied a comparative analysis method by systematically reviewing and contrasting regulatory frameworks and procedures from multiple aviation authorities. These methodologies contributed to a broader understanding of how regulatory bodies manage and enforce certification in real-world design and modification contexts.

While several previous studies have addressed how to obtain approval for aircraft modifications, none have specifically focused on the installation of Wi-Fi systems on aircraft. This research aims to investigate and analyze the certification process for installing a Starlink antenna on A320 series aircraft under EASA legislation. It will also explore the implications of modifications performed by a Design Organization Approval (DOA) entity, as governed by regulations from Directorate General of Civil Aviation (DGCA) Indonesia.

This study offers new insights by focusing on the certification of Starlink Wi-Fi, a new player in aircraft connectivity. Unlike older systems, Starlink uses slim, modern antennas and provides fast internet through low Earth orbit satellites. This paper highlights how this new technology is certified under EASA and DGCA rules, something that hasn’t been widely discussed before, making it useful for both regulators and design organizations.

Method

This research adopts a qualitative research method using a comparative regulatory analysis approach to investigate the certification process for installing Starlink Wi-Fi systems on A320 aircraft. The study is supported by an in-depth document review of relevant regulations, guidance materials, and certification records from both EASA and DGCA. In addition, the analysis is enriched by practical experience within a Design Organization Approval (DOA) company, providing real-world insights into how such modifications are managed and certified.

The process begins by identifying the design modification description required for the installation of Starlink Wi-Fi. Depending on various factors, the process can range from being relatively straightforward to highly complex. Before installing new components or systems on an aircraft, it is essential to consider their implications for the aircraft's safety and airworthiness. In general, the certification process for aircraft design modifications can be divided into several steps as shown in **figure 1** below (EASA, 2013).

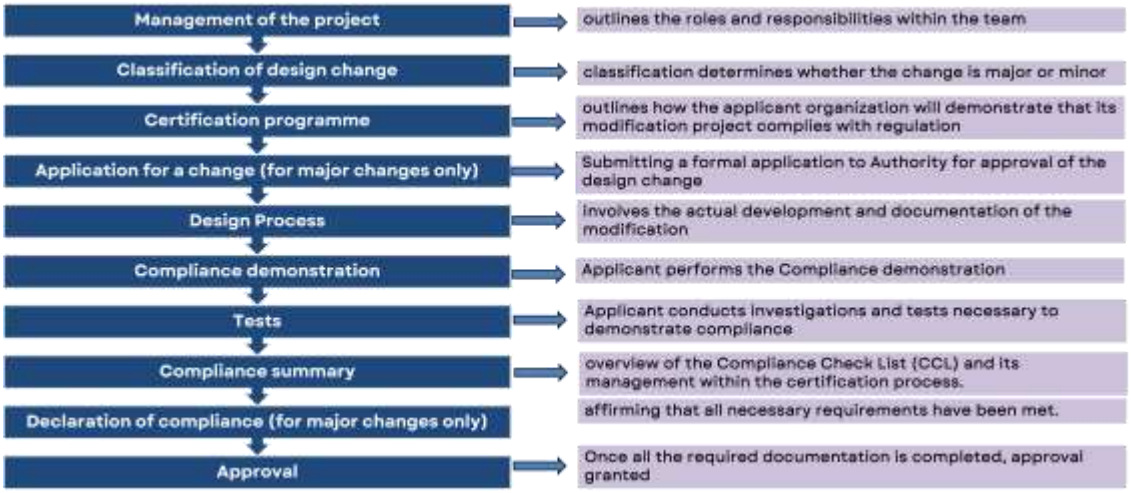

Figure 1: Aircraft Design change certification general process (Source: EASA DOA Template, 2013)

One of the key aspect of this process is the classification of design changes, governed by **EASA Part 21.A.91**. The decision-making process for classifying and certifying modifications is outlined in **Figure 2** (EASA, 2024), which provides a flowchart to analyse the design change classification.

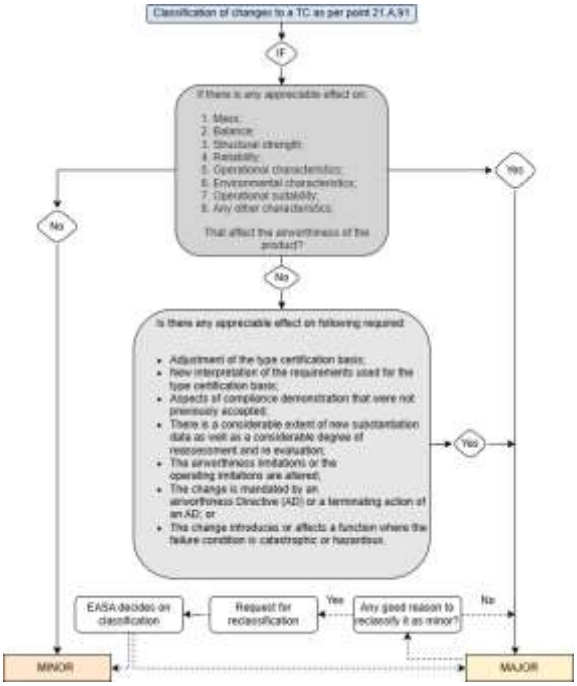

Figure 2: EASA Aircraft design change classification process (EASA Part 21, 2024)

Once the classification of the modification is determined, the next step involves defining the certification basis that the applicant must comply with. The process also involves the identification of the requirements and means of compliance, outlining how the applicant demonstrates compliance with each identified requirement related to the installation and certification of Starlink Wi-Fi on the A320 aircraft.

Currently, from the perspective of DGCA legislation, there is no DOA template issued by the Indonesian authority detailing how a design change such as Starlink WiFi installation should be implemented by Design Organization Approval (DOA). However, the general process can be assumed to follow the same structure as shown in **figure 1** above. A significant distinction under

DGCA regulations is in the classification of DOA entities in Indonesia, which are divided into four classes. As a result, not all DOA entities are authorized to manage the aircraft modification projects classify as major change.

Discussion

I. Challenges in Implementing Starlink Wi-Fi Onboard Aircraft

In addition to regulatory procedures, the implementation of Starlink Wi-Fi presents several key challenges. Technically, the installation requires careful attention to electromagnetic compatibility to ensure there is no interference with existing avionics systems. Furthermore, due to the external placement of the antenna on top of the fuselage, a flight test is necessary to verify that the antenna is well-designed and properly installed, particularly in terms of aerodynamic performance, structural integrity, and system functionality during various flight conditions. Regulatory differences between authorities such as EASA and DGCA may also lead to additional compliance efforts. Finally, the cost of system integration, aircraft downtime, and certification processes adds to the complexity of implementation for operators and design organizations.

II. Certification Process under EASA Regulations

The following section will provides an overview of the installation and certification process for Starlink Wi-Fi to obtain approval from the aviation authority, namely the European Union Aviation Safety Agency (EASA) with an emphasis on the airworthiness aspect. The process begins by identifying the design modification description required for the installation of Starlink Wi-Fi. Subsequently, an analysis of the modification classification was conducted. Once the classification of the modification is determined, the next step involves defining the certification basis that the applicant must comply with. The process also involves the identification of the requirements and means of compliance, outlining how the applicant demonstrates compliance with each identified requirement related to the installation and certification of Starlink Wi-Fi on the A320 aircraft.

II.1 Design Description

The Starlink hardware installed on aircraft consists of several critical components which are one Aero Terminal (the antenna), a Power Supply Unit (PSU), two or more Wireless Access Points (WAPs), and associated harnesses. Typically, the Starlink antenna is installed on top of the aircraft fuselage, while the PSU and WAPs are installed inside the cabin, usually above the ceiling panels. The installation process may vary depending on the specific design of each entity.

This position allows the antenna to maintain a strong connection to Starlink satellites during the flight. The antenna connects directly to the Power Supply Unit, which provides the electricity needed for the system. The Wireless Access Points, which enable passengers to connect to the onboard Wi-Fi, are also linked to the Power Supply Unit. These components are strategically installed within the aircraft cabin to ensure optimal signal coverage for all passengers. Power for the entire Starlink system is supplied directly from the aircraft's electrical system, allowing it to operate seamlessly during flight. In terms of installation, the placement and integration of the Starlink hardware are critical to ensure compliance with regulations. The design and of the antenna must take into account the aerodynamic effects caused by its installation. Additionally, the Wi-Fi system must be designed to avoid interference with the aircraft’s other systems, while still providing reliable internet connectivity throughout the flight. The **figure 3** below illustrates the schematic and overview of the Starlink Wi-Fi system on an aircraft.

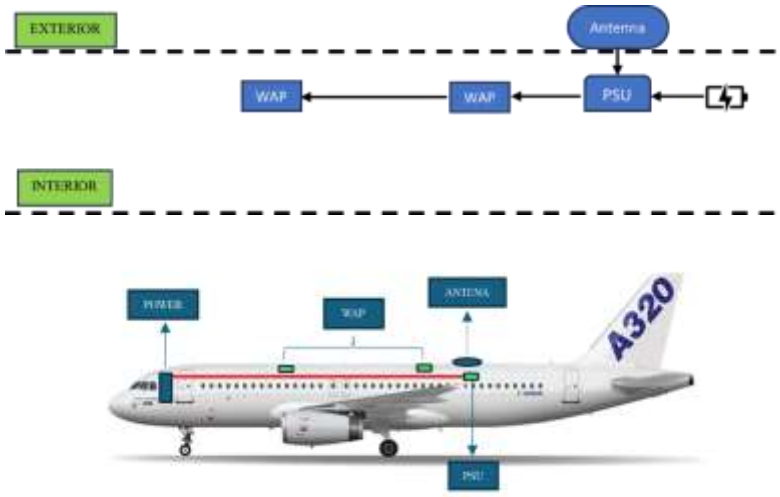

Figure 3: Starlink Wi-Fi design installation description

II.2 Design Change Classification

The initial stage in an aircraft modification certification program is the classification of design change. This classification process is governed by EASA Regulation Part 21, Section 21A.91, which defines changes to a type certificate as either minor or major. A "minor change" is defined as one that has no significant impact on the aircraft's mass, balance, structural strength, reliability, operational characteristics, operational suitability data, or any other characteristics affecting the airworthiness of the product, including its environmental characteristics. Any change that does affect these aspects is classified as a "major change." See **figure 4** below the design change classification analysis.

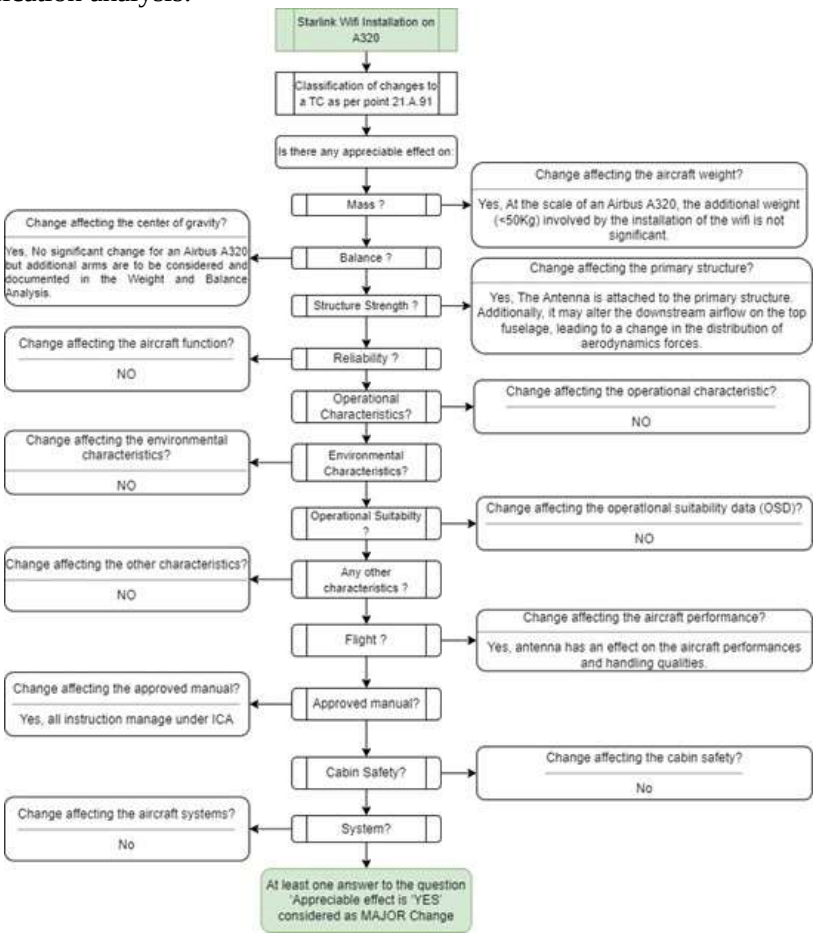

Figure 4: Analysis of design change classification

In accordance with Section 21A.19, if the modification involves substantial changes to the design, power, thrust, or mass, the regulatory agency may require a new type certificate. This is necessary when the change is so extensive that a full re-assessment of the aircraft's compliance with applicable certification standards is required. As a result, Section 21A.19 is crucial for determining when a design change goes beyond a typical major modification and requires a new certification process.

Focusing on the installation and connectivity of the Starlink wifi antenna, this modification is classified as a non-significant major change. Although it does not substantially/significantly alter the aircraft's core design, such as its structure or propulsion system, it impacts important aspects like aerodynamics, weight distribution, and potential electromagnetic interference with avionics systems. These factors require a more detailed evaluation to ensure compliance with safety and airworthiness regulations. As a result, the modification is classified as a major change, but because it does not require a new type certificate under EASA 21A.19, it falls under the category of a **non-significant major change**. This classification ensures that the appropriate certification procedures are followed while maintaining the aircraft's overall compliance with safety standards.

II.3 Certification Basis

As classified above, this modification is considered a *Major Non-Significant Design Change*. The certification basis is determined in accordance with the regulations outlined in EASA Part 21A.101, and the applicant may elect to comply with the applicable requirements. As per Part 21.A.101(f), 21.A.80(a)(1) or 21.A.82(a)(1) an applicant may elect to comply with a later amendment of the applicable certification specification than the amendment that was in force at the date of application (could be either the full set of CS or a selection of them). As per EASA TCDS EASA.A.064 issue 53 data, the certification basis are:

- CS 25 Amdt 11 for A320-251N/-253N/-271N
- CS 25 Amdt 15 for A319-151N/-153N/-171N
- CS 25 Amdt 18 for A320-200

Consequently, for changes to type design, the following certification basis have been elected to comply is CS 25 Amdt 18.

II.4 Certification Program

The certification program must be submitted and discussed with EASA. A formal application should be sent to EASA when the project has reached a sufficient level of maturity. Typically, the certification program includes updates on the modification, modification classification, and some technical data packages. However, the most critical part of the certification program is the compliance matrix, which refers to the certification basis determined according to the regulatory requirements outlined in EASA Part 21. The associated requirements will have their Means of Compliance (MOC) identified. Usually, the certification program proposed by the applicant, discussed with EASA specialists, and agreed upon. This process allows for the identification, discussion, and final agreement on specific interpretations, demonstration methods (whether existing or to be developed), and any need for equivalent safety demonstrations. The MOC defines the methods used to demonstrate that the proposed design meets the regulatory requirements (**Table 1** below shows list of requirements and the Means of Compliance codes).

Table 1: Compliance Matrix

Section	Amdt.	Requirement Statement	Means of Compliance Code									
			0	1	2	3	4	5	6	7	8	9
25.23	18	Loads distribution limits			x							
25.251 (b)	18	Vibration and buffeting			x				x			

Section	Amdt.	Requirement Statement	Means of Compliance Code									
			0	1	2	3	4	5	6	7	8	9
25.301	18	Loads			x							
25.303	18	Factor of safety			x							
25.305	18	Strength and deformation			x							
25.307	18	Proof of structure			x							
25.321	18	Flight Loads – General			x							
25.333	18	Flight manoeuvring envelope	x									
25.337	18	Limit manoeuvring load factors			x							
25.365	18	Pressurized compartment load			x							
25.561	18	Emergency landing condition-General			x							
25.571	18	Damage tolerance and fatigue evaluation of structure			x							
25.581	18	Lightening Protection	x									x
25.603	18	Materials	x									
25.605	18	Fabrication methods	x									
25.607	18	Fastener	x									
25.609	18	Protection of structure	x									
25.611	18	Accessibility Provisions		x								
25.613	18	Material strength properties and design values	x		x							
25.629	18	Aeroelastic stability requirements			x							
25.631	18	Bird strike			x		x					
25.841	18	Pressurized cabin			x							
25.899	18	Electrical bonding and protection against static electricity	x									
25.1301	18	Function and installation	x	x				x				
25.1309	18	Equipment, systems and installation	x			x		x				
25.1316	18	Electrical and electronic system lighting protection	x	x								
25.1351	18	Electrical system and equipment-General			x							
25.1357	18	Circuit protective devices	x									
25.1419	18	Icing protection			x							
25.1431	18	Electronic equipment		x	x							
25.1519	18	Weight, centre of gravity and weight distribution			x							
25.1529	18	Instruction for Continued Airworthiness		x								
25.1541	18	Marking and placard – General		x								
Appendix H	18	Instruction for Continued Airworthiness		x								

The **EASA Means of Compliance (MOC)** are methods or standards used to demonstrate that a product, design, or operation meets the requirements set by the European Union Aviation Safety Agency (EASA). **Table 2** below shows the Means of Compliance codes and their descriptions.

Table 2: Means of Compliance code

Type of compliance	Means of compliance	Associated compliance documents
Engineering evaluation	MC0: a) Compliance statement b) Reference to design data c) Election of methods, factors, etc. d) Definitions	a) Design data b) Recorded statements
	MC1: design review	c) Descriptions d) Drawings
	MC2: calculation/analysis	e) Substantiation reports
	MC3: safety assessment	f) Safety analysis
Test	MC4: laboratory tests	g) Test programmes h) Test reports i) Test interpretations
	MC5: ground tests on related product(s)	
	MC6: flight tests	
	MC8: simulation	
Inspection	MC7: design inspection/audit	j) Inspection or audit reports
Equipment qualification	MC9: equipment qualification	Note: Equipment qualification is a process that may include all previous means of compliance at equipment level.

II.5 EASA Level of Involvement

In accordance with EASA 21.B.100 level of involvement - The Agency shall determine its involvement in the verification of the compliance demonstration activities and data related to the application for a type-certificate, restricted type-certificate, major change approval, supplemental type certificate, major repair design approval or ETSO authorization for APU. It shall do so on the basis of an assessment of meaningful groups of compliance demonstration activities and data of the certification program.

That assessment shall address (EASA, 2022):

- The likelihood of an unidentified non-compliance with the type-certification basis, operational suitability data certification basis or environmental protection requirements; and
- The potential impact of that non-compliance on product safety or environmental protection, and consider at least the following elements:

1. novel or unusual features of the certification project, including operational, organisational and knowledge management aspects
2. complexity of the design and/or demonstration of compliance
3. criticality of the design or technology and the related safety and environmental risks, including those identified on similar designs
4. performance and experience of the design organisation of the applicant in the domain concerned.

Principles and generic criteria for the LoI determination EASA determines its LoI based on the applicant's proposal in view of the risk (the combination of the likelihood of an unidentified non-compliance and its potential impact). This is performed after proper familiarization with the certification project in three steps:

- ✓ Step 1: identification of the likelihood of an unidentified non-compliance,
- ✓ Step 2: identification of the risk class, and
- ✓ Step 3: determination of EASA's LoI.

The EASA level of involvement is typically proposed by the applicant, and Compliance Demonstration Items (CDIs) are identified. However, the procedure for determining this level of involvement is outside the scope of this thesis.

III. Certification Process under DGCA Indonesia regulations

This section provides an overview of the installation process for Starlink Wi-Fi systems in compliance with Indonesian regulations. For this analysis, given the similarities between EASA

and DGCA DOA regulations, it is assumed that the design modifications and activities involved in the installation align with those previously outlined from the EASA perspective. This assumption is supported by the fact that Indonesian regulation fundamentally similar such as procedures for classification, determination of certification basis, and means of compliance. By maintaining consistent design assumptions, the analysis focuses on the specific regulatory requirements and challenges within the Indonesian context.

III.1 Design Organizational Approval

According to CASR 21.231, Design Organization means an organization responsible for the design of products, parts and articles or for changes or repairs thereto shall demonstrate its capability in accordance with applicable CASR. EASA only permits organizations with Design Organization Approval (DOA) under EASA Part 21 Subpart J to carry out aircraft certification tasks. Similarly, in Indonesia, only DOAs approved under CASR 21 Part J are allowed to perform aircraft certification tasks, including design and applying for new type certificates (TC), minor/major changes, and supplemental type certificates (STC). For organizations, the DGCA follows the EASA DOA Program. However, it has introduced a simpler classification system with four classes of DOA based on design and compliance scope, as shown in **figure 5 below.**

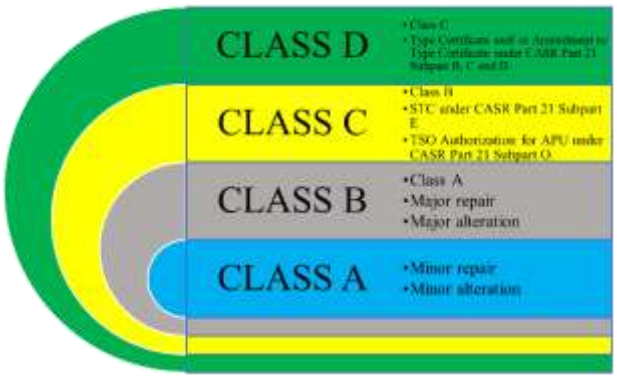

Figure 5: DGCA Approved DOA Class (DGCA CASR Part 21, 2015)

Based on the DOA classification defined above, in relation to the installation of the Starlink antenna on the A320 aircraft, it is essential to identify the appropriate DOA authorized to manage the certification process for the Supplemental Type Certificate (STC) concerning the Starlink Wi-Fi system. The design change certification process requires a DOA with the necessary scope and capability to ensure compliance with the relevant airworthiness standards and regulations.

The analysis of the design change classification is described in the following section: it has been determined that the DOA class capable of performing the design change certification for this specific modification is **DOA Class C and Class D.**

III.2 Design Change Classification

The design change classification between EASA and DGCA is broadly similar, as outlined in CASR Part 21.93. The process flow for determining the classification of an aircraft modification is also the same, as shown in Figure 4 of this thesis. Assuming that the design and procedures are considered equivalent between EASA and DGCA, the classification of the STC project for the Starlink Wi-Fi system on the A320 aircraft is categorized as a **major, non-significant change** in accordance with CASR Part 21.93, and based on the classification analysis shown in **Figure 4 above**.

III.3 Certification Basis

In the STC project for the installation of the Starlink WiFi antenna on the A320 series, we must adopt the certification basis referenced in the A320 series Type Certificate Data Sheet (TCDS) that has been validated by the DGCA Indonesia.

As per DGCA VTCDS No.: A061 Revision: 8 Date: 15 October 2019, the applicable technical conditions for models A320-211, A320–212, A320-231 and weight variants up to 006 (DGAC letter 53170 SFACT/TC) are defined as follows:

1. JAR 25 Change 11 (except paragraph 25.207 which remains at Change 10) as elected by the Manufacturer.
2. A320 Special Conditions, Experience Related Conditions and Harmonization Conditions.
   As per DGCA TCDS No.: A111 Revision: 2 Date: 15 October 2019, as it is defined in DGCA Issue Paper PM-01-SANEO "Certification Basis", the DGCA Certification Basis is developed using EASA Certification Basis for A320- 251N, A320-252N, A320-271N, A320-272N as stated in EASA TCDS No. EASA.A.064 Issue 37, dated 16 January 2019, CASR 34 Amendment 2, CASR 36 Amendment 3, and in pursuant to any other requirements the Directorate General may prescribe to provide a level of safety equivalent to CASR Part 25 Amendment 6.

The additional requirements to provide level of safety equivalent with CASR 25 Amendment 6 are:

1. CS-01-320NEO "CASR 21 Amdt. 2, Section 21.29(a)(3); Bilingual Placards".
2. AV-01-320NEO "CASR 25 Amdt.6 25.561(e); Electrical Systems Integrity under Emergency Landing Condition".

The following special conditions have been developed post Type Certification is: F-GEN-01 "Installation of non-rechargeable lithium battery"

To conclude, for Indonesian Supplemental Type Certification (STC) purposes, the certification basis is the applicable airworthiness requirement of the JAA at the time of the original certification when the product was first certified. Therefore, the applicable certification basis, according to DGCA Indonesia regulations, is to comply with CASR Amendment 6. For the compliance matrix, it is assumed that each section in CS 25 (EASA regulations) is equivalent to CASR Amendment 6, as shown in Table 3 above. However, the requirements listed in **Table 3** below are exceptions, as they provide a level of safety equivalent to CASR 25 Amendment 6.

Table 3: Additional requirement from CASR certification basis

Section	Amdt.	Requirement Statement	Means of Compliance Code									
			0	1	2	3	4	5	6	7	8	9
21.29(a)(3)	2	Bilingual Placards	x									
25.561(e)	6	Electrical Systems Integrity under Emergency Landing Condition		x								

Tables 1 and 3 present a structured list of certification requirements that must be fulfilled for the installation of the Starlink Wi-Fi system on A320 aircraft. These tables serve as a summary of the applicable regulatory provisions and compliance items that form the basis for demonstrating airworthiness and obtaining approval from aviation authorities. The information included in the tables was obtained through a comprehensive analysis of EASA's Certification Specification CS-25 and other relevant guidance materials directly linked to the design aspects of aircraft modifications, particularly those involving connectivity systems such as antenna integration, structural impact, electromagnetic compatibility (EMC), and system safety.

III.4 DGCA Level of Involvement

For planning purposes, the DGCA's STC project team and the applicant's STC teams must identify the aspects of the project in which the DGCA intends to be involved and to what extent. Due to heavy workloads, DGCA personnel can only engage in a limited scope of certification activities. DGCA team members should review the applicant's design descriptions and project plans to determine where their involvement will be most beneficial and coordinate accordingly.

When a particular decision or event is critical to the safety of the product or to the determination of compliance, the DGCA must be directly involved. Project team members must build on their experience to identify critical issues. Some key issues that will always require direct DGCA involvement include rulemaking (such as for special conditions), ELOS determinations, development of issue papers, and compliance findings considered unusual or typically reserved for the DGCA. While these items establish the minimum direct DGCA involvement, additional critical safety findings must also be identified based on the safety impact or the complexity of the requirement or the method of compliance. Additional factors to consider in determining the areas of direct DGCA involvement include the DGCA's confidence in the applicant, the DOA's experience, the DOA's internal processes, and confidence in the DOA privileges.

Focusing DGCA resources on the most critical areas maximizes the use of the DOA privilege system while allowing for oversight and best use of the Sub directorate Engineering's limited resources. DGCA confidence in DOA privileges allows for full delegation for other than inherently governmental areas or new standards that are developing an experience base. Furthermore, confidence that the important safety areas are covered promotes greater delegation.

III.5 Considerations of other aspects

The key points above explain the process of obtaining DGCA Indonesia's Supplemental Type Certificate (STC) approval for installing Starlink Wi-Fi systems. In fact, only Design Organization Approval (DOA) can design, install, and certify these modifications. DOA holders must follow and demonstrate the requirements in CASR Part 21 Subpart J, which ensures their work meets safety and airworthiness standards.

However, it is important to consider whether Indonesian DOA holders can do when it comes to such modifications. Are all Indonesian DOAs qualified to handle the design and certification of Starlink Wi-Fi installations? What limitations or challenges do they face when working on these advanced systems? The following sections will explore these questions through different discussions.

III.5.1 DGCA Criteria for Issuance of STCs

The Directorate General of Civil Aviation (DGCA) will issue a Supplemental Type Certificate (STC) for a major change to the type design of a type-certificated product when the change does not warrant a new Type Certificate (TC), as specified in CASR section 21.113. While any person may apply for an STC, TC holders have the option to seek an amendment to their original TC.

In general, STCs are not issued for replacement parts, instead, Parts Manufacturer Approvals (PMAs) are provided. However, in unique circumstances where the installation of a replacement part constitutes a major change in type design, an STC may be issued. This STC then serves as the design approval basis for the subsequent approval of a PMA, allowing replacement parts for the STC design to be manufactured and supplied accordingly.

Additionally, the DGCA may issue an STC for the installation of an article approved under a Technical Standard Order (TSO) when the inclusion of the TSO-approved article represents a major change in the type design of the product. In such cases, individuals other than the TSO

authorization holder may obtain approval for design changes to the TSO article as part of the overall approval for the type design change under CASR Part 43 or other applicable airworthiness regulations. The STC must comprehensively address the installation requirements of the modified TSO article on the certificated product to ensure compliance with regulatory standards.

III.5.2 When DGCA-Registered Aircraft need to Instal Starlink Wi-Fi

In Indonesia, the use of in-flight Wi-Fi on airlines is still limited. Currently, only a few aircraft, such as some wide-body planes from Garuda Indonesia and A320 from Citilink Indonesia, are equipped with this service. However, installing Wi-Fi on more aircraft could be a great way to improve passenger comfort and service quality, making it an attractive option for airlines.

If Indonesian airlines want to install Starlink Wi-Fi on their aircraft, there are two suggested options. The first option is to work with foreign design organizations. If the aircraft was originally designed under EASA regulations, airlines can hire European Design Organizations. If the aircraft is under FAA regulations, they can hire American Design Organizations. Alternatively, Indonesian airlines may contract the modification of their aircraft to either EASA or FAA-approved DOAs, as both authorities have established bilateral agreements. In this case, EASA or FAA will act as the Certifying Authority, while DGCA Indonesia will validate the changes as the Validation Authority.

The second option is to have the modification designed by an Indonesian Design Organization Approval (DOA) holder. In this case, the Indonesian DOA must follow local regulations, such as CASR Part 21, CASR part 25 and others intended regulation, to ensure compliance. Collaboration with the aircraft's Type Certificate (TC) holder is also needed to get the technical data required for the modification.

III.5.3 When DOA Indonesia needs to Modify Foreign-Registered Aircraft

Indonesian Design Organization Approval (DOA) holders may develop a Supplemental Type Certificate (STC) for foreign-registered aircraft under certain conditions. The DGCA permits this if the modification complies with the airworthiness requirements of the aircraft's State of Registry. However, the DGCA encourages the use of Republic of Indonesia-registered aircraft for such modifications. Foreign-registered aircraft can only be inspected or tested if the State of Registry agrees and specifies its requirements for accepting the modification. If the applicant cannot provide evidence of an agreement from the State of Registry's Civil Aviation Authority (CAA), the DGCA will notify the CAA and request their written authorization before accepting the application or initiating the project.

The DGCA may also accept STC applications when the CAA of the State of Registry requests support for modifying Republic of Indonesia type-designed aircraft. For testing purposes, the foreign-registered aircraft must align with its DGCA-approved type design, serving as the baseline for the STC. Differences in CAA requirements must be reviewed to ensure they do not affect the modification.

The DGCA does not issue experimental airworthiness certificates for flight testing of foreign-registered aircraft but may issue a special flight authorization in coordination with the CAA and the aircraft owner/operator. If flight testing is conducted outside Republic of Indonesia airspace, the local CAA must authorize airspace use.

Conclusion

Key findings and conclusions are as Design Change classification the installation and certification of Starlink Wi-Fi on A320 aircraft is classified as a non-significant major change. For Type Certificate (TC) holders, it is processed as a major change under EASA Part 21 Subpart D or DGCA CASR Part 21 Subpart D. For non-TC holders, compliance must be demonstrated under EASA Part 21 Subpart E or DGCA CASR Part 21 Subpart E. The certification basis for EASA is derived from **TCDS EASA.A.064** (CS-25 Amendment 18), while DGCA uses **TCDS A061 Revision 8** (CASR Part 25 Amendment 6). Assuming that the section requirements under both EASA and DGCA regulations are identical, the distribution of requirements based on the Means of Compliance (MoC) is as follows: 12 sections must be fulfilled under MoC 0, 7 sections under MoC 1, 19 sections under MoC 2, and 1 section each under MoC 3, MoC 4, MoC 6, and MoC 9. Additionally, 2 sections are required under MoC 5. However, no requirements need to be addressed under MoC 7 or MoC 8 using this approach. Under DGCA regulations, For the installation and certification of Starlink Wi-Fi on the A320 series, a DOA Class C and D is required to undertake and complete this project. In contrast, EASA (European Union Aviation Safety Agency) does not categorize DOA into specific classes. Instead, all DOA capabilities under EASA are distinguished based on the specific privileges that have been approved by the agency. Obtaining DGCA Indonesia's STC for Starlink Wi-Fi installation must be carried out by DOA holders compliant with CASR Part 21 Subpart J. Indonesian airlines can collaborate with foreign or local DOA holders and TC holders to fulfill technical and regulatory requirements. For foreign-registered aircraft, modifications require coordination with the State of Registry, ensuring compliance with both local and international regulations and reflecting the complexity of the certification process.

Several recommendations derived from this study are as f rom the perspective of DGCA regulations, further study is needed to analyse the implementation of a single DOA (Design Organization Approval) class in Indonesia. This system could be streamlined into a single class, with distinctions based on the capabilities and privileges of each design organization. Considering that Wi-Fi technology onboard is not widely implemented in Indonesia, a thorough study is needed on how this technology can be developed and integrated into Indonesian airlines to improve passenger service and comfort.

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