Circular No. 1-302

Policy for Establishing Certification Basis

September 30, 2005, first issue (KOKU-KU-KI-5029)
June 30, 2011, partially amended (KOKU-KU-KI-282)

Director, Airworthiness Division, Civil Aviation Bureau,
Aviation Safety and Security Department
Ministry of Land, Infrastructure, Transport and Tourism

(translated on May. 19, 2014)

[Intentionally Blank]

1. Applicable scope

When the Civil Aviation Bureau implements type certifications for Japanese made aircraft, the latest Airworthiness Inspection Manual (hereinafter referred to as the Inspection Manual) is principally applied as a method to show compliance with the application standards. contrarily, if minor changes in designs or production methods are made, the Inspection Manual already applied may continue to be applied and the latest Inspection Manual may not be applied. In these cases, this Circular presents a guideline to implement the certifications without applying the latest Inspection Manual.

2. Purpose

When the type certification covers a very long period (assumed to exceed 5 to 6 years) to implement, or a design already certified is changed (hereinafter referred to as the Design Changes, the Inspection Manual at the time not covering a very long period (less than 5 years) or the latest Inspection Manual at the time of application is principally applied. However, the scale of Design Changes, contents of changes in production methods and magnitude of impact on safety are taken into consideration, the Inspection Manual already applied may be adjudicated better to continue to apply.

The purpose of this Circular is to establish a guideline and procedures to adjudicate such cases.

3. Application of the Inspection Manual

When the implementation of type Design Changes is intended, usually the latest Inspection Manual is applied to enhance safety and airworthiness.

However, there may be some cases of Design Changes to which the Inspection Manual already applied has levels of safety and airworthiness equivalent to those of the latest Inspection Manual.

In these cases, when the Civil Aviation Bureau deems them to meet the necessary standards, the Inspection Manual already applied may continue to apply.

3-1 Conditions for the continuous application

(1) The Design Changes do not fall into the following category and the Civil Aviation Bureau deems them minor changes:
   1) Changes in general form of aircraft
   2) Changes in important production methods
   3) Changes in conditions of the type certifications

(2) The Design Changes must have no impact on the systems, equipment, components and tools within a scope decided by the Civil Aviation Bureau.

(3) The Design Changes impact on the systems, equipment, components and tools within a scope decided by the Civil Aviation Bureau, but do not cause safety or airworthiness to decline.

3-2 Exceptional application

For aircraft with maximum takeoff weight of less than 2,722kg (6,000lbs) (excluding rotor aircraft) or rotor aircraft with maximum takeoff weight of less than 1,361kg (3,000lbs) and without a

turbine engine, the Inspection Manual already applied may remain applicable.

Even in this case, if the Civil Aviation Bureau deems that the Design Changes are significant within the stated scope, the latest Inspection Manual may be applied. However, even in this case, some may impose a requirement that when the Inspection Manual already applied remains applicable, safety and airworthiness equivalent to those of the latest Inspection Manual must be ensured.

3-3 Establishment of special requirements

When the existing Inspection Manual including the latest one are not deemed applicable due to unprecedented or unusual Design Changes, special requirements must be established and compliance certified.

3-4 Effectiveness of the Inspection Manual

If the Inspection Manual for type certifications includes very long application periods and Inspection Manual categorically dealing airworthiness is being revised, the latest Inspection Manual must be applied.

In this case, the application of the Inspection Manual shall be reexamined by a type certification examination meeting on a timely basis.

4. Procedures to determine the application

For the Design Changes to which this Circular is applied, the individual contents must be assessed and the required safety level ensured and maintained.

The following is to show matters to be examined following procedures to assess the applicability of this Circular:

Procedure 1: Identification of contents of Design Changes for the type certification

(1) Identifying the scope of impact (including physical, limitation and capability, and taking the multiple impact into consideration) on the form of aircraft with type certifications imposed by the contents of Design Change

(2) At this stage, it is important to assess the impact of Design Change on other systems, components, equipment or tools. As well as physical impacts, the impact on past compliance certification must also be taken into consideration.

Procedure 2: Identification of the scale of contents of Design Changes

(1) If the scale of impact on the currently applicable Inspection Manual is evidently substantial due to changes in the design concept, power, thrust or weight due to the Design Changes, a new type certification must be applied.

(2) The “evidently substantial” means that most current compliance certificates are unsuitable for the aircraft for which the design has been changed.

(3) Typical examples to assess Procedure 2 are shown in Table 1.

Procedure 3: Assessment of updated contents from the Inspection Manual already applied.

(1) When the currently applicable application standards are clearly unchanged from the contents of the Inspection Manual, the application of the Inspection Manual for these application standards are changed to the latest one. In this case, the contents of the portion, which is obviously irrelevant to the Design Changes, shall be included.

Procedure 4: Assessment of significant Design Changes (Section 3-1 (1) in this Circular)

(1) The significant Design Changes means, unlike the fundamentally essential changes in the aircraft, changes in the typical product level. Generally, it is a result of accumulated changes or product improvements. Therefore these matters are deemed sufficiently important to take into consideration when the Design Changes are assessed.

(2) Typical examples to assess Procedure 4 are shown in Attachment 1. .

(3) Examples of changes in the product level are shown below:

1) Changes in general form

As a result of impact on the capability or compatibility of the main components, it must be classed as a new type.

2) Changes in the general production method

The production method is totally changed or materials or their production method, which impact on the strength of products, are changed. Sometimes, large-scale reinvestigation may be required.

3) Changes in the type certification premises

The premises established for compliance certifications on performance, capability or operational envelope of products, are changed.

- A change from a non-pressurized fuselage to a pressurized fuselage
- An operational change in aircraft from land- to sea-based
- Enlargement of operational scope exceeding the current capability and design data

Note: Enlargement of operational scope of aircraft within the scope already certified current design is not deemed an important change.

4) When the application of the currently applicable Inspection Manual is intended to continue, it is assessed by Procedure 5, even if the Design Changes are deemed important.

Procedure 5: Assessment of scope of impact due to the Design Changes

(1) Impact due to the Design Changes on the scope, systems, components, equipment or tools other than those changed by this Design Changes is important. If no impact is made on other

scope where no changes made by the Design Changes emerge, the Inspection Manual applied to this scope is not updated.

(2) When the scope of impact is assessed, if there is a secondary impact on the physical or capability characteristics, the impact on entire aircraft (product) is inevitable. In this case, application of the latest Inspection Manual is taken into consideration.

(3) The following examples take the application of the latest Inspection Manual into consideration:

1) Physical condition

The physical condition means the conditions of structures, systems, components, equipment and tools (including hard- and software). When these conditions are assessed, the impact due to the Design Changes and its secondary impact must be distinguished.

An example of the secondary impact is the rewiring/re-plumbing required for fuselage plugs to expand the fuselage.

2) Characteristics of capability/function

On an individual basis, these "scopes" include capability characteristics, operability, fire prevention, structural strength, aeroelasticity or fracture resistance and general characteristics of type certified aircraft (products). These characteristics impact on the entire characteristics of fuselage (products). For example, adding fuselage plugs has a significant impact on the capability and operability of the fuselage.

Procedure 6: Adequacy of the latest Inspection Manual application and degree of contribution to the level of safety/airworthiness

(1) When the latest Inspection Manual is inapplicable, it is necessary to prove that the level of safety and airworthiness is practically equivalent to the latest Inspection Manual or the Design Changes have no overall impact on the level of safety/airworthiness of the aircraft.

The followings are examples that have no impact on the level of safety/airworthiness:

1) Design

A case: Small fuselage plugs are added (installation of additional seats and overhead storage, and expansion of belly hold). These installations may be equivalent to the current installations.

As the safety/airworthiness level of all Design Changes do not always exceed those of the basic design, if the latest Inspection Manual is applied to the individual portion of Design Changes, the level is not always higher than before.

Likewise, even if the latest Inspection Manual is applied to both new and unchanged installations, the current Inspection Manual may be applied when the superiority of the safety/airworthiness cannot be confirmed.

However, generally, the fuselage plugs have a major impact on the certified basic structures, seats, storages, doors and belly hold. For these changes, new demonstration of compliance equivalent to the new type aircraft Inspection Manual is required. Under these circumstances,

the latest Inspection Manual is applicable.

2) Flight operation experience

i) Flight operation performance (operating time) may be used to prove the inability of the latest Inspection Manual application to enhance the safety/airworthiness level and assess the adequacy of the current Inspection Manual application

Applicable cases of the flight operation performance are shown in Attachment 3.

ii) Important and relevant individual data of flight operators on rotor aircraft and small airplanes may not be used due to their special operation and flight operation within limited areas. Under these circumstances, other details of flight operation history such as guarantees, repairs, parts, operational performance, accidents, incidents, technical information and airworthiness improvement notifications may be important data to continue the application of current Inspection Manual.

iii) Examples of flight operation experience require approval by the Civil Aviation Bureau to be utilized.

The Design Changes utilizing approved flight operation experience are deemed worthy to prove the adequacy of safety/airworthiness level.

3) Other experiences

For changes due to administrative reasons and slight changes due to typographic errors and omissions, the latest Inspection Manual need not be applied.

(2) Unrealistic

When the latest Inspection Manual is applied, if the applicant proves the application does not enhance safety compared with additional requirements, the application of the latest Inspection Manual is consequently deemed unfeasible.

The additional requirements include matters derived from the Design Changes, for which compliance is required, and matters to prove compliance, but more important matters to change the aircraft shall not be included.

The applicant must prove that the application of the latest Inspection Manual is unfeasible using demonstration data and analysis and obtain the consent of the Civil Aviation Bureau. The Civil Aviation Bureau may refer to other matters (for example, safety/airworthiness enhancement and burden in other comparable new designs) to assess the data proving the unfeasible nature and position of applicant.

Examples deemed unfeasible are shown in Attachment 2.

5. Miscellaneous Provisions

Notwithstanding the provisions of Sections 3 and 4, the application of the Inspection Manual for airworthiness may be dealt with using a different method if required by the director of the Aircraft Engineering and Certification Center.

Supplementary Provision

1. This Circular applies from October 1, 2005.

Supplementary Provision

1. This Circular applies from July 1, 2011.

Please contact the following address for questions and opinions on this Circular:

Aircraft Engineering and Certification Center,
Airworthiness Division, Aviation Safety and Security Department,
Civil Aviation Bureau,
Ministry of Land, Infrastructure, Transport and Tourism
C/O Nagoya Airport, Toyoba, Toyoyama-cho, Nishikasugai-gun, Aichi prefecture, 480-0202
Tel: 0568-29-1985
Fax: 0568-29-1990

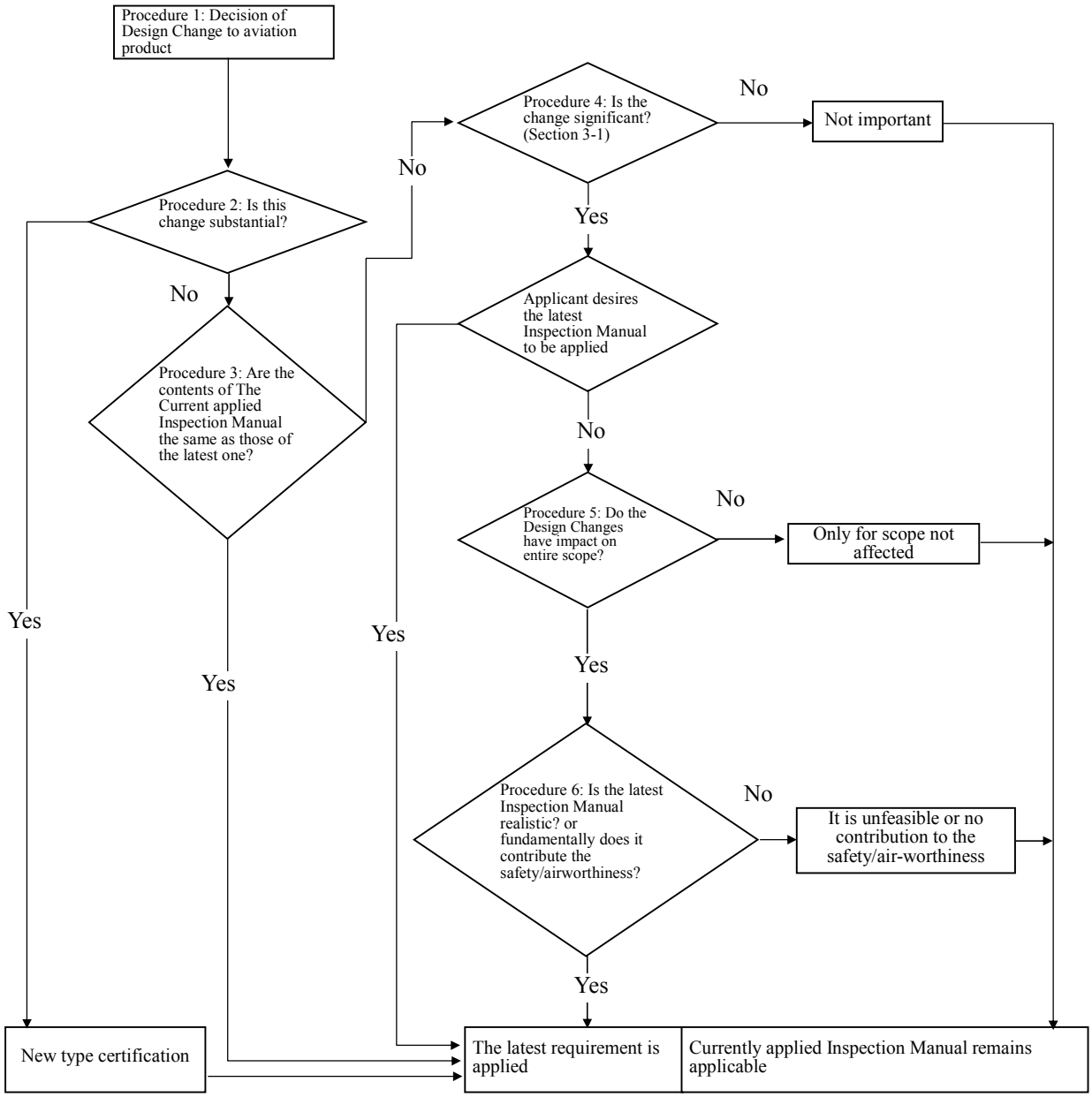
Procedure 1: Decision of Design Change to aviation product
Procedure 2: Is this change substantial?
Procedure 3: Are the contents of The Current applied Inspection Manual the same as those of the latest one?
Procedure 4: Is the change significant? (Section 3-1)
Not important
Applicant desires the latest Inspection Manual to be applied
Procedure 5: Do the Design Changes have impact on entire scope?
Only for scope not affected
Procedure 6: Is the latest Inspection Manual realistic? or fundamentally does it contribute the safety/airworthiness?
It is unfeasible or no contribution to the safety/air-worthiness
No
Yes
New type certification
The latest requirement is applied
Currently applied Inspection Manual remains applicable

Figure 1

Explanatory note: for large scale

O: appropriate, X: inappropriate, ---: inapplicable

Examples to be deemed significant (the airworthiness category: aircraft, N, normal; U, actual use; C; transport; A, acrobatics)

Details of Design Changes	Changes in General form Section 3-1(1)1)	Changes in Important production method; Section 3-1(1)2)	Change in Premises for the type certification	Remarks
Position of wings (tandem wing, inlet bucket, canard wing, high-wing/low-wing	---	---	---	Practical and perfect investigation is required into the application of the Inspection Manual for the Design Changes
Slanting of wing	---	---	---	Ditto
Alteration from single- to twin-engine	---	---	---	Ditto
Reinstallation from piston engine or turbo prop engine to turbojet or turbofan engine	---	---	---	Ditto
Change in form of engine (traction/propulsion type)	---	---	---	Ditto
Alteration of main structure from metallic to composite materials (fuselage, wing and tail unit)	---	---	---	
Changes from subsonic to supersonic	---	---	---	
Changes of tail from ordinary type to T- or Y-tail	○	×	○	Changes in general form. Reassessment of entire structure, flight quality and capability. Establishment of new flight rules describing the capability and flight characteristics.
The change of wing form; adding tail striker; change of dihedral; change of wing, flap, aileron width; change of tail touch-down angle; addition of winglet; setting angle of wing in front-back direction over 10%	○	×	○	Changes in general form. Major changes in wing structure. Establishment of new flight rules describing the capability and flight characteristics. Note: A minor change in wing tip is not an important change (see category table of unimportant factors)
The change of three wheel/tail wheel grounding	○	×	○	Change in general form. Impact on level of aircraft

equipment; addition of float				and premises for the type certification etc.
Change in the number of seats causing change in the air- worthiness category (from category N to C), However, there are no changes in form, important production methods and premises for the type certification	○	○	○	Change in general form Major change in the production method Extensive reinvestigation of production is required. The change of premises for the type certification are required. New flight rules and pilot rankings
Introduction of doors for cargo compartment; increase in floor load exceeding 20% or change of aircraft type for passenger/cargo aircraft from passenger aircraft to cargo aircraft	○	×	○	Change in general form affecting the flow of load, aerodynamic characteristics, and systems relevant to aircraft. The change of premises for the design
Expansion of fuselage invalidates current demonstration; Change in main structure, aerodynamic characteristics, operational envelope or change to invalidate premises for certification	○	×	○	Extensive changes in fuselage structure, aerodynamics, aircraft system capability, and operational envelope; new flight rules describing capability and flight characteristics are required.
The change of piston engines to same number of turboprop engines when the operational envelope is expanded.	×	×	○	Premises for the type certification invalidated; new flight rules describing capability and flight characteristics are required.
Addition of supercharger accompanying changes in power, operation range, or restriction items	×	×	○	Changes in operational envelope and limit invalidate the premises for certification. New flight rules describing capability and flight characteristics are required.
Replacement of important high power/thrust engine accompanying changes to make current certification result invalid or invalidate the premises for certification and changes in main structure, aerodynamic characteristics and operational envelope.	×	○	○	Premises for the type certification invalidated. new flight rules describing capability and flight characteristics are required. The main structure is changed and extensive reinvestigation of production is required.
Changes in material types of main structural members such as metallic to composite materials, or changes in fiber	×	○	○	Conventional production and design are changed. Premises for the

of composite materials such as glass fiber to carbon fiber				design/type certification are changed.
Changes accompanying large increase in design speed of Vd, Vmo or Va.	×	×	○	Premises for the type certification invalidated. New flight rules describing capability and flight characteristics are required.
STOL	×	×	○	Ditto
Changes in output power or thrust relevant to change in design speed, for which reassessment of the majority of the Inspection Manual is required.	×	×	○	Ditto
Fuel conditions: gas fuel or fuel cell; this may require absolute alternation due to fuel storage, handling and impact on the aircraft structure	×	×	○	The change of premises for the design/type certifications Extensive alteration for fuel storage and handling systems
The Design Changes changing the aircraft's flight characteristics or capability by an important type design involving kinematic and aerodynamic changes to the aircraft	×	×	○	Premises for the type certification invalidated. New flight rules describing capability and flight characteristics are required
Increase in weight to the transport C	×	×	○	Premises for the type certification invalidated. New flight rules
Change in concept of piloting system such as FBW and side-stick operating, or changes in mechanical operating equipment from independent hydraulic type to electric type	×	×	○	The change of premises for design and type certification. Extensive system constitution and integrated reinvestigation are required
Addition of pressurizing system to cabin	×	○	○	Extensive changes in fuselage impacting on flow of load, fatigue assessment, aeroelasticity, etc. Extensive reinvestigation of production is required
Increase in the type and number of emergency exits, or maximal number of seats, which have demonstrated for the type of aircraft	×	×	○	If the current scope of the demonstration is exceeded, the emergency exits must be demonstrated. Premises for the type certification invalidated
Change in the number of air crew necessary for increased piloting burden on pilot accompanying the relocation	×	×	○	Extensive changes in electronic equipment and aircraft system Premises for the type

or important changes in cockpit				certificate invalidated New flight rules
Obvious expansion of the operational envelope and operational capability such as flight at the highest operation altitude under freezing meteorological conditions and increase in the speed limitation	×	×	○	Premises for the type certification invalidated. New flight rules describing capability and flight characteristics are required
Upgrade of cockpit	×	×	○	Extensive changes in the design of electronic installations and electric systems Premises for the type certification invalidated. Extensive reinvestigation of system integration, burden on air crew and human factor assessment is required New flight rules
Introduction of automatic landing system	×	×	○	Premises for the original design invalidated

Examples deemed non significant (the airworthiness category: aircraft, N, normal; U, actual use; C; transport; A, acrobatics)

Details of Design Changes	Changes in General form Section 3-1(1)1)	Changes in Important production method; Section 3-1(1)2)	Change in Premises for the type certification Section 3-1-(1)3)	Remarks
Alteration of wing tip. (not plate of wing tip)	×	×	×	This is a major change in aircraft, but premises for the original general form, main production and type certification remain valid
Installation of ski or wheel ski	×	×	×	Ditto
Installation of camera for night vision or investigation	×	×	×	Additional flight and structure assessments are required, but this change does not require the basic type certification
Installation of bed (including litter) and equipment to fasten cargo)	×	×	×	This is unchanged in aircraft
Increase in tire size (including tundra tire)	×	×	×	Ditto
Change to another propeller type without an accompanying increase in the number of blades.	×	×	×	This is a major change in aircraft, but premises for the original general form, main production and type certification remain valid.
Addition of supercharger without accompanying changes in scopes or limit (accompanying capability enhancement for high-altitude and high temperature) of output power, and operation.	×	×	×	This is unchanged in aircraft.
Change from gasoline engine to diesel engine or to an engine with approximately equivalent power	×	×	×	This is a major change in aircraft, but premises for the original general form, main production and type certification remain valid
Using another adhesive method (change of adhesive material)	×	×	×	This is unchanged in aircraft
Another kind of metal is used	×	×	×	Ditto
Changes in production and joining methods without involving the main structure	×	×	×	Ditto
Change in aircraft cloth to	×	×	×	Ditto

another type of aircraft cloth				
Increase in speed of high lifting equipment or speed limit of landing equipment	×	×	×	This is a major change in aircraft, but premises for the original general form, main production and type certification remain valid.
Increase in strength of structure	×	×	×	Ditto
Upgrade accompanying the installation of equipment (when instrument flight method is inapplicable for the basic design)	×	×	×	This is unchanged in aircraft
Fuel system: when engine horsepower is increased, but it does not exceed the certified fuel flow rate	×	×	×	Ditto
Fuel tank: The change of fuel from gasoline to diesel oil and tank holding load is sufficiently small to apply existing analysis by external installation	×	×	×	Ditto
Limited change in pressurizing system (size of outflow valve, range of pressuring area. Only when the test of basic form is invalid and re-demonstration is required).	×	×	×	This is a major change in aircraft, but the original general form, and premises for the main production and type certifications remain valid.
Installation of a silent ventilation system	×	×	×	This is unchanged in aircraft
The change of cover or cooling system for engine	×	×	×	Ditto
Fuel type: change from aviation gasoline to diesel oil/JetA, from aviation gasoline to ethanol/methanol Change to composite fuel system including fuel type (excluding these for starting): Aviation gasoline/ethanol or JetA/automobile gasoline Unlimited mixing of different fuel types in a fuel system: aviation gasoline/diesel oil or JetA/ethanol	×	×	×	This is a major change in aircraft, but the original general form, and premises for the main production and type certifications remain valid
Same fuel type: changes from aviation gasoline to automobile gasoline, from aviation gasoline (80/87) to aviation gasoline (100LL), from ethanol to isoprobine, from JetA to JetB (this	×	×	×	This is a major change in aircraft, but the original general form, and premises for the main production and type certifications remain valid.

change is important because JetB has larger explosive potential than JetA)				
Fuel that changes the additives of conventional fuel without any change in fuel type. Fuel additives means MTBE, ETBE, ethanol, amine etc. this is not considered important for aviation gasoline.	×	×	×	Ditto
The change of maximum takeoff weight of less than 5% (premises for the type certification are unchanged)	×	×	×	Ditto
Addition of aileron tab (including other wings)	×	×	×	This is a major change in aircraft, but the original general form, and premises for the main production and type certifications remain valid
The change of line of control to one with larger diameter. When no design change is imposed on wiring and other systems.	×	×	×	This is unchanged in aircraft.
Installation of automatic pilot system (one used for instrument flight. When the basic design is inapplicable for the instrument flight).	×	×	×	This is a major change in aircraft, but the original general form, and premises for the main production and type certifications remain valid.
Increase in battery capacity or its relocation	×	×	×	This is unchanged in aircraft
Reinstallation from direct-current generator to alternating-current generator	×	×	×	Ditto
Addition of lights (position light, strobe light)	×	×	×	Ditto
Dimensional increase of brake	×	×	×	Ditto
Dimensional increase in fuel tank	×	×	×	Ditto
Addition of an oxygen system	×	×	×	Ditto
Relocation of galley	×	×	×	Ditto
Change from passenger aircraft to cargo aircraft without accompanying any change in the basic fuselage structure	×	×	×	This is a major change in aircraft, but the original general form, and premises for the main production and type certifications

				remain valid. Compliance with the cargo aircraft requirements is required
Installation of new seat belts or shoulder belts	×	×	×	This is unchanged in aircraft
Slight expansion of range of gravity center position	×	×	×	Original general form of aircraft and premises for the main production and type certifications remain unchanged
Installation of supplementary power unit not required for flight	×	×	×	This is a major change in aircraft, but the original general form, and premises for the main production and type certifications remain valid. Compliance with the requirements to install supplementary moving blade is required
Installation of alternative automatic pilot	×	×	×	This is unchanged in aircraft
Installation of TAWS	×	×	×	Ditto

Examples deemed significant (the airworthiness category: aircraft T, transport)

Details of Design Changes	Changes in General form Section 3-1(1)1)	Changes in Important production method; Section 3-1(1)2)	Change in Premises for the type certification Section 3-1-(1)3)	Remarks
Number of location of engines (change of engines from 4 units to 2 installed at wings or relocation of 2 engine units at wings to 2 engine units installed on the fuselage	---	---	---	For the Design Change, the implementation of a conformity demonstration investigation for the required Inspection Manual is very extensive
Change from high-wing to low-wing	---	---	---	Ditto
Change from entire metallic aircraft to entire composite materials for main structure (fuselage, wing and tail)	---	---	---	Ditto
Derived type (increase in the number of passengers, updating of cargo aircraft or certified aircraft	○	○	○	A new model includes various changes. For the increase in installation weight or

				cargo aircraft, the general form and premises are changed. For the newest aircraft, the main production is changed.
Fewer air crew (when updating the cockpit)	○	×	×	Extensive changes in electronic installations and aircraft systems. Burden on air crew and degree of impact on human factor Ranking of pilots
Improvement of flight under freezing meteorological conditions by addition of freeze detection and ice removal equipment	○	×	○	New operational envelope, installation of new large-scale systems and aircraft assessment are required. The change of operational envelope
Change from passenger aircraft or passenger cargo aircraft to cargo flight Redesign of cargo compartment doors and floor structure including 9G net or hard barrier	○	×	○	Extensive changes in frame impacting on flow of load, aerodynamic elasticity characteristics and aircraft system for fire prevention. The change of premises for design change from passenger aircraft to cargo aircraft
Change in pressurized cabin, including installation of a pressurizing system	×	×	○	Re-demonstration of frame and system accompanying change of the operational envelope is required
Addition of leading edge slat	○	×	×	Extensive changes in wing structure and addition of aircraft system are required. New flight rules describing capability and flight characteristics are required
Changes in length of fuselage-expansion or shortening	○	×	×	Extensive changes in fuselage structure and relevant aircraft system are required. New flight rules describing capability and flight characteristics are required
Extensive alteration to	○	×	×	Ditto

structural frame such as installation of a large telescope accompanying a large opening in the fuselage				
Change in the number of axle or landing units due to change in aircraft weight	○	×	×	Extensive changes in fuselage structure and relevant aircraft system are required. New flight rules are required
Changes in materials of main structure from metallic to composite materials	×	○	×	Important changes in conventional design and production
Specifically, increase in design weight over 10%	×	×	○	Extensive re-demonstration on structure, capability, flight quality and systems of aircraft is required
Changes in wingspan, front-back direction setting angle and blade tip design or wing chord (note: including change from high- to low-wing or change to new wing)	○	×	X	Extensive changes in wing structure and addition of aircraft systems are required. New flight rules describing capability and flight characteristics are required.
Change in the type and number of emergency exits or increase in certified passenger number	×	×	○	Demonstration of new emergency exit is required if the change exceeds the previous scope of demonstration.
Comprehensive updating of cockpit	×	×	○	Integration of relevant electronic and electric systems, restructuring of concept and philosophy and reinvestigation of burden on air crew and other human factors, and premises for original design of the cockpit are required
Rebuilding the main navigating equipment with Fly-By-Wire (FBW) (Change in navigation equipment from partial FBW to entire FBW is not significant)	○	×	○	If the scope of change covers broad areas, integration of basic aircraft systems, structural concept and philosophy are affected. Overall reinvestigation of burden on air crew,

				operation quality and capability assessment, which differ from the premises of basic design, are required
Reinstallation from piston engine to turboprop engine	○	×	×	Extensive changes in frame structure, addition of aircraft systems and new flight rules describing capability and flight characteristics are required
Increase in thrust exceeding 10% specifically	×	×	○	Re-demonstration of engine installation is required. Aircraft capability and flight quality must be monitored
Initial installation of automatic landing gear	×	×	○	As the basis of aircraft is not designed for automatic landing operation, there are problems in the potential work burden on air crew and compatibility of systems
Installation of new fuel tank (installation of tail plane tank due to increase in maximum takeoff weight or auxiliary tank within fuselage except wing)	×	×	○	Change in frame, system and flight rules are required. As a result, capability is changed
Installation of door for the main cargo compartment	O	×	×	Reallocation of internal load, change in aerodynamic elasticity characteristics and change in system
Transform from cabin floor to cargo compartment floor and installation of cargo handling equipment	×	×	○	Total design and installation of new floor; reallocation of internal load; change in cabin safety requirements and change in system
Initial installation of auxiliary power unit required for aircraft operation	×	×	○	Change in emergency electric power requirement; changes in flight rules and operation characteristics

Examples deemed non significant (airworthiness category: airplane T transport)

Details of Design Changes	Changes in General form Section 3-1(1)1)	Changes in Important production method; Section 3-1(1)2)	Change in Premises for the type certification Section 3-1-(1)3	Remarks
Installation of engine at selectable same location or installation of hush kit	×	×	×	Increase in thrust not exceeding 10% specifically, or unimportant matter equivalent to change in important power unit
Change in length of fuselage- expansion or shortening	×	×	×	Slight change in length of aft fuselage for cruising capability or slight change in fuselage length relevant to re-covering of radome.
Re-covering for covering of wing tip (lighting, fuel drain pipe) and addition of separation panel to fix moving blade	×	×	×	Extensive changes in structure, flight rules and system are required.
Addition of output power for enhancement of capability under high altitude and high temperature	×	×	×	Usually, the basic operation envelope is unchanged. It can be estimated by the current certification data. When output is boosted by installing or adding a rocket motor, it is deemed important.
The change of general electronic devices	×	×	×	These changes comply with conventional specifications and premises for the type certificate are unchanged. It changes the structural concept and philosophy of the basic cockpit design. It does not significantly affect the burden on air crew.
Initial installation of automatic navigation equipment Integrated electronic device	×	×	×	It does unchanged premises for original type certificate complying with the conventional specifications. The basic actuation of systems is unchanged. It is unchanged from

				analog to digital.
Integrated electronic system	×	×	×	No change in basic system actuation It is unchanged from analog to digital.
Installation or relocation of interior decor of aircraft	×	×	×	Special requirement is required for cases of new or unprecedented installation.
Change from assembled main structure to integral or machined structure	×	×	×	The production method is sufficiently understood.
Repair of anti-icing and deicing system	×	×	×	Recertification is required. The applied requirement must be adequate.
Brake: change in design or material (from steel to carbon)	×	×	×	Ditto
Redesign of floor structure	×	×	×	The change of the floor itself is not significant. The change is important when part of the cargo compartment floor is changed to the cabin floor.
Assembly methods for equipment are new or unprecedented	×	×	×	The change of equipment is not at an aircraft level. Special requirement is required if there is no Inspection Manual suitable for the characteristics.
Initial installation of dispensable auxiliary power equipment	×	×	×	Installation of early independent auxiliary power equipment is designed for electric sources on ground and air-conditioning. In this case, the auxiliary power equipment is an additional installation independent of the airport power sources.

Examples deemed significant (airworthiness category: rotor aircraft N, normal; TA class, transport; TB class, transport)

Details of Design Changes	Changes in General form Section 3-1(1)1)	Changes in Important production method; Section 3-1(1)2)	Change in Premises for the type certification Section 3-1-(1)3	Remarks
Change in the number or form of rotor (from main rotor with tail rotor to two main rotors)	---	---	---	For the Design Change, a very extensive investigation of the demonstration of conformity with the applied Inspection Manual is required.
Change from all metallic rotor aircraft to all composite material rotor aircraft	---	---	---	Ditto
Comprehensive change of cockpit	×	×	○	Extensive degree of change in the integration of basic electronic and electric systems and changes of structural concept and philosophy Total reinvestigation of the burden on aircrew and other human factors and reassessment of premises for basic cockpit design are required.
Certificate for flight under freezing meteorological conditions	×	×	○	
Change in piloting system from mechanical type to FBW (fixed)	○	○	○	
Addition of engine (from single- to twin-engine) or decrease in the number of engines	○	×	○	Important change relevant to details of the project
Repair of fuselage accompanying change in main structure, aerodynamic and operational envelope, for which the premises invalidated.	○	×	○	
Application of certified main structure to different model (installation of main rotor of capability enhanced new model over existing model)	×	○	○	
Extensive change from	×	○	○	Major change of

metallic material to composite material for the main structure				premises for certification of product (aircraft) level and production The change of a few independent elements from metallic to composite materials is not specifically deemed important.
Emergency Medical Service (EMS) form accompanying a change in the main structure which invalidates premises for the type certificate	×	×	○	Most EMS forms are not classed as important. EMS alteration is usually for interiors and does not affect the general outer form. These are not automatically categorized as important.
Change in landing equipment from skid- to wheel-type or vice versa	○	×	○	Rotor aircraft with skid or wheel is determined in the basic certification design. This type of change is deemed unimportant
Change in the number of rotors	○	×	×	Increase/decrease of rotor is unimportant. Other basic power systems must remain unchanged.
Anti-torque equipment at tail section (tail rotor, ducted fan or other engineering)	○	○	×	

Examples deemed non significant (airworthiness category: rotor aircraft N, normal; TA class, transport; TB class, transport)

Details of Design Changes	Changes in General form Section 3-1(1)1)	Changes in Important production method; Section 3-1(1)2)	Change in Premises for the type certification Section 3-1-(1)3)	Remarks
Emergency float	×	×	×	This must conform to the special requirement for emergency floats. Form, all capability or operational ability of a rotor aircraft are unchanged by installing this equipment. Expansion of the operational envelope

				(for example: operation altitude and temperature) and operation profile (for example: change from passenger transport to hanging cargo outside the aircraft or hydroplane or flight under snowy conditions). These changes are not sufficiently important to invalidate the premises for original certification for the type certificate at airframe level.
Installation of FLIR (infrared camera) or camera for investigation	×	×	×	Additional Assessment on flight and structure is required, but basic type certificate remain valid.
Installation of Helicopter Terrain Avoidance System (HTAWS)	×	×	×	Change is certified in accordance with the guidance AC of HTAWS.
Health and Usage Monitoring System (HUMS)	×	×	×	Change is certified in accordance with the guidance AC of HUMS.
Minimum design change or expansion of limit without change in design (test or combining different limits (limit of gravity center, lubricant temperature, altitude, minimum/maximum weight, minimum/maximum external temperature and structural limit))	×	×	×	Expansion of the operational envelope (for example: operation altitude and temperature) and operation profile (for example: change from passenger transport to hanging cargo outside the aircraft or hydroplane or flight under snowy conditions). These changes do not sufficiently affect the premises for original type certification at airframe level.
Installation of a new engine type equivalent to the existing engine: no accompanying changes in equipment and limit of aircraft.	×	×	×	Refer to the guidance AC 27-1/29-2
Installation of windshield	×	×	×	The entire product

				form of rotor aircraft must remain unchanged.
Ski	×	×	×	It must conform to the special requirement relevant to this change. Expansion of the operational envelope (for example: operation altitude and temperature) and operation profile (for example: change from passenger transport to hanging cargo outside the aircraft or hydroplane or flight under snowy conditions). These changes do not sufficiently affect the premises for original type certification at airframe level.
External hoist for cargo	×	×	×	It must conform to the special requirement relevant to this change. Form, all capability or operational ability of rotor aircraft are unchanged only by installation of this equipment. Expansion of the operational envelope (for example: operation altitude and temperature) and operation profile (for example: change from passenger transport to hanging cargo outside the aircraft or hydroplane or flight under snowy conditions). These changes do not sufficiently affect the premises for original type certification at airframe level.
Updating of instrument flight due to installation of equipment (for cases where the instrument flight is inapplicable in the basic design)	×	×	×	This is unchanged in rotor aircraft.

Change in the number of pilots in the instrument flight (change from 2 to 1 person)	×	×	×	Especially, ranking of engine and driving system are adequately changed to TA class and the capability requirement. These changes do not invalidate premises for the type certification or change in general form of main production

Examples deemed significant (engine and propeller)

Details of Design Changes	Changes in General form Section 3-1(1)1)	Changes in Important production method; Section 3-1(1)2)	Change in Premises for the type certification Section 3-1-(1)3)	Remarks
Turbine engine				
Change from turbo fan engine to geared fan engine	○	×	○	Case of FOD is affected by this change. Note: This is almost equivalent to the new type approval.
Change from low bypass ratio engine to high bypass engine accompanying increased air intake range	○	×	○	The change of general form Similar to change of model name Premises for the type certificate are invalid when it is intake and freeze cannot be exchanged. Note: This is almost equivalent to the new type approval.
Change from turbo jet to turbo fan	○	×	○	The change of general form Similar to change of model name No compatibility Premises for the type certificate are invalid, when involving uplift, intake, freeze and damage to blade. Note: This is almost equivalent to the new type approval.
Change from turbo shaft to turboprop	○	×	○	Change in form such as addition of gear box The change of model

				name The change of operational profile Premises for the flight envelope and type certificate in ranking are invalid. Note: This is almost equivalent to the new type approval.
Change from existing ducted fan to fan without duct	○	○	○	The change of form The change of type No compatibility Premises for the type certificate are invalid. Note: This is almost equivalent to the new type approval.
Change from existing subsonic engine to supersonic afterburner engine	○	○	○	The change of form The change of type No compatibility Premises for the type certificate are invalid. The change of operational envelope Note: This is almost equivalent to the new type approval.
Increase/decrease in the number of steps of compressor/turbine accompanying the change in the certified limit (duration of life is not included)	×	×	○	Affecting engine specifications This change occurs alongside other changes affecting dynamic movement such as bends of structure, spike effect of torque, surge and stall characteristics.
New design of fan blade and hub or change of all-in-one-type blade and fan disk, which is inapplicable retroactively or change of fan diameter	○	×	○	The change of model name Impact on thrust/power of engine, and this change occurs alongside others affecting bend of structure, torque spike effect of case, movement at FOD, and dynamic movement or explosion prevention. Change in diameter affects the equipment
Hydraulic pressure –FADEC/EEC mechanical without backup from oil pressure	○	×	○	Change in operational form of engine The change of model name

				No compatibility No impact on premises for the type certificate (For example: HIRF, protection from thunder stroke, damage allowance, software certification and others relevant to FADE/EEC)
Replacement of gas generator accompanying change in certified limit (duration of life is not included) (including only one of core, turbine/compressor/burner)	×	×	○	Impact on thrust/power of engine and change accompanying other change affecting dynamic movement of engine Premises for the type certificate are invalid

Examples deemed significant (engine and propeller)

Details of Design Changes	Changes in General form Section 3-1(1)1)	Changes in Important production method; Section 3-1(1)2)	Change in Premises for the type certification Section 3-1-(1)3)	Remarks
Piston engine				
Transfer of operation systems from mechanical type to electric type	○	○	×	Change in form of engine The change of interface accompanying any change of engine The change of main production: digital controller and new production method and senor required environment test
Addition of turbocharger to enhance capability and for overall change of product	○	×	○	The change of general form: change of equipment and interface accompanying change of engine (ventilation system) Premises for the type certificate are invalid: change of the operational envelope and capability
Transfer from air cooling to	○	×	○	The change of general

liquid cooling				form: change of equipment and interface accompanying change of engine (cooling system) Premises for the type certificate are invalid: change of the operational envelope and temperature limit
Transfer from spark ignition to compression ignition	○	×	○	The change of general form: change of equipment and interface accompanying change of engine (removal of mixture lever) Premises for the type certificate are invalid: change of the operational envelope and capability

Example deemed significant (engine and propeller)

Details of Design Changes	Changes in General form Section 3-1(1)1)	Changes in Important production method; Section 3-1(1)2)	Change in Premises for the type certification Section 3-1-(1)3)	Remarks
Propeller				
Installation of blade holder with a totally different method	○	○	×	The change of propeller form The change of model name Operational characteristics of propeller and strength for which reassessment is required.

Examples deemed non significant (engine and propeller)

Details of Design Changes	Changes in General form Section 3-1(1)1)	Changes in Important production method; Section 3-1(1)2)	Change in Premises for the type certification Section 3-1-(1)3)	Remarks
Turbine engine				
The change of compressor drum to another metallic material	×	×	×	No change in capability No change in model name Premises for the type certificate remain valid
Increase/decrease in the number of steps of compressor/turbine without changing capability envelope as a result	×	×	×	No change in capability No change in model name Premises for the type certificate remain valid.
New installation inside FADEC/ECC without change in system actuation	×	×	×	No change in form Applicable retroactively Premises for the type certificate remain valid Change in main production is unimportant.
Change in software	×	×	×	
Design change in rib strip	×	×	×	Change relevant to equipment
New combustor without causing a change in approved limit (duration of life is not included) or aerodynamic impact	×	×	×	Ditto
The change of bearing	×	×	×	Ditto
New blade with similar material and applicable retroactively	×	×	×	Ditto
Redesign of fan blade, which is applicable retroactively	×	×	×	Ditto
Design change for lubricant tank	×	×	×	Ditto
Change to another type of hydraulic-mechanical operation	×	×	×	Ditto
Change in lifetime of equipment for which lifetime is limited	×	×	×	Ditto
Change in limit of temperature of exhaust gas	×	×	×	

Change in inspection items without change in form	×	×	×	
Improvement of airflow crash by changing flow in airframe (vibration of blade, change in allocation of cooling hole, change of coating for blade) within physical capacity of products	×	×	×	
Change in basic and physical characteristics and main structure or load transfer of heavy load equipment; for example: use of new metallic or composite materials for the heavy load equipment	×	×	×	Change relevant to equipment

Example deemed non significant (engine and propeller)

Details of Design Changes	Changes in General form Section 3-1(1)1)	Changes in Important production method; Section 3-1(1)2)	Change in Premises for the type certification Section 3-1-(1)3)	Remarks
Piston engine				
Change in basic and physical characteristics and main structure or load transfer of heavy load equipment; for example: use of new metallic or composite materials for the heavy load equipment	×	×	×	Change relevant to equipment
New or redesigned piston head, valve or piston	×	×	×	
The change of crankshaft	×	×	×	Change relevant to equipment
The change of crank case	×	×	×	Ditto
The change of carburetor	×	×	×	Ditto
The change of mechanical type fuel injection	×	×	×	
The change of mechanical type fuel injection pump	×	×	×	Change relevant to equipment
New engine model installed to new aircraft without changes in main subsystems; Important items such as output power, operational envelope or expansion of limit are not included.	×	×	×	
No change in basic operation or simple mechanical changes; for example: change	×	×	×	

from a double type magnet to two single type magnets in the same model				
Change in subsystem for products unchanged from the basic engine For example: change in turbocharger but no change in intake conditions of induction system, or limited change.	×	×	×	
The change of material for the secondary structure or equipment other than high load equipment; For example: a lubricant pool, which is not used for mount pad.	×	×	×	Change relevant to equipment
Change in physical characteristics and material of holder for load transfer structure	×	×	×	Ditto

Examples deemed non significant (engine and propeller)

Details of Design Changes	Changes in General form Section 3-1(1)1)	Changes in Important production method; Section 3-1(1)2)	Change in Premises for the type certification Section 3-1-(1)3)	Remarks
Propeller				
The change of material for blade bearing	×	×	×	Change relevant to equipment
The change of equipment for operation system	×	×	×	Ditto
The change of deicing boots	×	×	×	Ditto

Attachment 2

Guideline for assessment on unfeasibility relevant to the application of the latest Inspection Manual for the Design Changes

1. General

The latest Inspection Manual shall primarily apply to the important Design Changes relevant to enhance the safety/airworthiness of aviation products within the practical scope. However, there are some cases where safety/airworthiness enhancement is considered unlikely by applying the latest version of Inspection Manual, but the burden on the applicant becomes excessive. In such cases, the Civil Aviation Bureau must consider the burden on the applicant due to the application of the latest Inspection Manual as well as assess the application to prevent any decline in safety/airworthiness.

2. Procedures

Procedure 1: Specifying the changes in the Inspection Manual

(1) Special requirement (for example: load in pressurized room, 3-3-4, Chapter 3, Part III of the Airworthiness Inspection Manual

(2) Revision conditions of current application standards

(3) Latest revision of the Inspection Manual

Procedure 2: Special risks assumed by the Inspection Manual

(1) An individual requirement is stipulated by assuming risky situations. The effects of the revision of requirements are assessed under assumed risks.

Procedure 3: Investigation of the risk factors

(1) Identifying the risk factors and analyzing the causes of emergent risks. Various risks may be narrowed down to a single factor. Examples are shown below:

- Injured only
- Accident involving death of less than 10% of the passengers
- Accident involving death of over 10% of the passengers
- Accident of total loss

Procedure 4: Identification of historic and predictive occurrence frequency of individual risk factors.

(1) Another factor used to determine unfeasibility is past experiences. The occurrence frequency can be determined using this method, while certain risks which may occur in future are predicted by this frequency.

(2) As a risk factor can result in various other risks, the causes and occurrence frequency must be taken into consideration.

Procedure 5: Determination of effect derived from total compliance with the latest revision of the Inspection Manual

(1) Risk countermeasures are contained in the revision of the Inspection Manual. However,

sometimes these may not suffice in specific situations. When the application of the current Inspection Manual is compared with that of the latest Inspection Manual, it is assessed in terms of its effectiveness to risks.

(2) Determination of effectiveness must be objectively conducted. In any case, premises and data as a basis for assessment must be required.

(3) The guideline used to assess effectiveness is shown below:

- Sufficiently effective for all cases
  Compliance with requirements to eliminate risks and means of avoiding risks
- Possibility of methods to eliminate or avoid risks
  Compliance with methods to eliminate or avoid the predicted risks (however, all of the cases cannot be predicted).
- Appropriate response to risks
  Compliance with methods to eliminate or avoid risks in various situations (however, not all potential risks can be eliminated or avoided. Usually, a wide range of serious risks are mitigated).
- Response to partial risks
  This is a case complying with the requirement to only partially eliminate or avoid risks. Not all potential risks can be eliminated or avoided. Usually, only certain risks are mitigated.
- Partial risks causing negative impacts
  Compliance with requirements, whereby risks cannot be eliminated or avoided, or a negative impact ensues

Procedure 6: Bearing resources and avoidance

(1) Compliance with the Inspection Manual, intending to avoid damage to aircraft or accident must be shown, and it must be effective to reduce the manufacturer's burden imposed by the accident investigation.

(2) When intending to deem the latest Inspection Manual unfeasible, the increased burden due to the application of the current Inspection Manual or the possibility to enhance safety must be taken into consideration.

(3) When the increased burden is assessed, the case applying the latest Inspection Manual with that whereby these Design Changes are applied to a new aircraft must be compared.
In many cases, when the additional installation to a new aircraft is firstly publicized, data on the cost of this development are provided for assessment by the Civil Aviation Bureau.
When retroactive application or additional installation is imposed on the current design, the burden will increase more than at the time of manufacturing.
Examples of the burden are shown below:

1) Expense: The plan of the airframe size and method of use vary according to the basic and derivative designs.

i) Work: designer, manufacturer, inspector, flight operator and maintenance personnel

including training

ii) Investment: design, manufacturing, machine facilities, training and construction of plants for maintenance

iii) Materials: material cost, manufacturing facilities, stock, kit and supplementary goods

iv) Operational expense: fuel, lubricant, extra cost

v) Depreciation cost:

2) Avoiding costs

i) Accident investigation cost, cost of lawsuit, burden charge of accidents including insurance

ii) Overseas certification

Procedure 7: conclusion

(1) The conclusion must be comprehensively drawn from the information shown above. Examples are shown below:

1) When the latest Inspection Manual must be applied, the applicant proves compliance with this Basis.

2) When the application of the latest Certification is deemed unfeasible, the newest one must be selected, wherever possible, from the Certification Bases that have been revised during a period between the currently applicable Inspection Manual and the latest Inspection Manual and it should be applied to cope with risks. The selection is determined by the applicant's will.

3) When the application changes from the Inspection Manual currently applicable to the latest Inspection Manual, if the safety enhancement does not match the increase in the burden borne, the applicant may request continuation of the currently applicable Inspection Manual.

4) If analysis on this application cannot be concluded, the discussion must be continued.

Note: If the Design Changes are uneconomical, application of the Inspection Manual that ensures sufficient safety/airworthiness is prioritized.

Attachment 3

Utilization of Flight Operation Experiences in the Certification Procedures

1. General

When the safety level of the currently applicable Inspection Manual can be maintained at a level equivalent to that of the latest Inspection Manual by combining flight operation experiences with other methods, the flight operation experiences may be utilized to assess the application of the current Inspection Manual applied.

The applicant must demonstrate the adequacy of the application for assessment. If the adequacy and relevancy of data are confirmed and approved, a statistical approach is employed.

To be approved for the utilization of flight operation experiences, the data must be sufficient and adequate. Essential items for the procedures are shown below:

(1) Accurate understanding of the change of the Inspection Manual and purpose
(2) Detailed information on the characteristics of Design Changes
(3) High reliability and sufficient flight operation experiences
(4) Comprehensive verification of the flight operation experiences

2. Guidelines

The Civil Aviation Bureau determines the utilization of the flight operation experiences employing conformity views report procedures.

Data to be submitted by the applicant are shown below:

(1) Difference of effects between the currently applicable and revised Certification Bases
(2) Portions where the Design Changes do not conform to the latest Inspection Manual
(3) Evidence to show that the safety level of the Inspection Manual intended to apply to the Design Changes is sufficient to ensure conformity with adequate flight operation performance and the latest Inspection Manual
(4) Details of characteristics and functions of Design Changes
(5) Adequate product (airframe) data for the Inspection Manual
  1) Flight operation experiences from the following information:
    a) Report on accidents
    b) Report on incidents
    c) Technological notices
    d) Airworthiness enhancement notices
    e) Repair
    f) Alteration
    g) Flight hour/cycle of fleet leader and entire fleet
    h) Data on overall conditions of airline accidents worldwide

i) Flight operation difficulty report
j) Transport Safety commission report
k) Guarantee, repair and parts use data

2) Data to show that the submitted data entirely represents the flight operation experiences including, investigative results of the flight operator
3) Data to show that the flight experiences relate to the matters in question
4) Assessment and specifying each important scope relevant to the following items:
a) Reoccurrence or general failure mode
b) Causes
c) Event probability
d) Measures taken and their effects
5) Data of similar design and production of aircraft
6) Results of analysis and assessment on the failure mode; the analysis is conducted as follows:
a) Reassessment of results from previous tests
b) Addition of detailed tests
7) Conclusion reached by integration of data and logical basis
8) Other data required by the Civil Aviation Bureau