MYANMAR CONSULTANCY COMPANY LIMITED

To

Office of the Commander-in-Chief (Air)
Myanmar Air Force
Republic of the Union of Myanmar

Date: 12th September 2019
Ref : 098 / AF - MCC/2019

Subject : Technical Proposal for CN 235 Military Transport Aircraft

Dear Sir,

Please accept the expression of complement and respect from Myanmar Consultancy Company Limited to the esteemed office of the Commander-in-Chief (Air), Myanmar Air Force, Republic of the Union of Myanmar.

Myanmar Consultancy Company Limited would like to submit the general description and technical proposal of CN 235 – 220M Military Transport Aircraft which have been used for VVIP/VIP, Military Transport, Maritime Surveillance and Maritime Patrol configuration for your kind consideration and evaluation purpose.

If there should be any queries on the program and the design, delivery, supporting facilities and training in more specific on the submission, we, Myanmar Consultancy Company Limited is always getting ready to have a details discussion at the earliest convenience time with the technical team of your esteemed office.

Looking forward to your kind attention and consideration.

Sincerely Yours,

Aung Myo Win
Chief Executive Officer
Myanmar Consultancy Company Limited

Enclosed.

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CN235-220M
MILITARY TRANSPORT AIRCRAFT

Myanmar Consultancy Company Limited

September 2019

GLOSSARY

AC	Alternating Current
ACP	Audio Control Panel
ACU	Audio Control Unit
ADC	Air Data Computer
ADF	Automatic Direction Finder
ADS	Air Data System
Ah	Ampere Hour
Al-Zn	Aluminum-Zinc
AM	Amplitude Modulation
AP	Auto Pilot
aux	Auxiliary
CG	Center of Gravity
CN	CASA Nusantara
dB	Decibels
DC	Direct Current
DF	Direction Finder
DGAC	Directorate General of Air Communication
e.g.	For Example
EADI	Electronic Attitude Direction Indicator
EFIS	Electronic Flight Instrument System
ELT	Emergency Locator Transmitter
FAR	Federal Aviation Regulation
FM	Frequency Modulation
fpm	Feet Per Minute
ft	Feet
ft^2	Square Feet
ft^3	Cubic Feet
GHz	Giga Hertz
GPS	Global Positioning System
GPU	Ground Power Unit
GS	Glide Slope
HF	High Frequency
Hr	Hour
IAe	Indonesian Aerospace
IAS	Indicated Air Speed
ILS	Instrument Landing System
INAA	Indonesian Military Airworthiness Authority
ISA	International Standard Atmosphere
kg	Kilograms
kHz	Kilo-Hertz
KIAS	Knots Indicated Air Speed
KTAS	Knots True Air Speed
kVA	Kilo Volt-Amps
lb.	Pounds
LH	Left Hand
LOC	Localizer
m	Meter
m^2	Square Meter
m^3	Cubic Meter
MAC	Mean Aerodynamic Chord
Max	Maximum
MB	Marker Beacon
MEW	Maximum Empty Weight
MFD	Multi Function Display
MHz	Mega Hertz
Min.	Minimum
MLW	Maximum Landing Weight
mm	millimeter
MTOW	Maximum Take-Off Weight
MTW	Maximum Taxi Weight
MZFW	Maximum Zero Fuel Weight
NM	Nautical Mile
OEW	Operating Empty Weight
Pax	Passenger
psi	Pounds per Square Inch
qty.	Quantity
RH	Right Hand
RPM	Rotation Per Minute
SAR	Search & Rescue
SHP	Shaft Horse Power
SI	Standard International
TBD	To Be Determined Later
TOW	Take Off Weight
TRU	Transformer Rectifier Unit
US	United States
UHF	Ultra High Frequency
UoM	Unit of Measurement
VA	Volt Ampere
VHF	Very High Frequency
VOR	Very High Frequency Omni Range
°	Degrees
°C	Centigrade

CN235-220M
MILITARY TRANSPORT AIRCRAFT
TECHNICAL PROPOSAL

INTRODUCTION

The CN235-220M is the military version of the CN235-220 which have been used for VVIP/VIP configuration, Military Transport configuration, Maritime Surveillance and Maritime Patrol configuration. CN235 -2 20Ms have been utilized by several Asian and African countries in various configurations.

The total aircraft program will be a complete turnkey project from the design stage to the delivery CN235-220 aircraft with supporting ground facilities and training. The time required to deliver the aircraft is depending upon the final configuration selected, and the initiation time of contractual effort.

This Technical Proposal will present general description of the proposed CN235-220 Military Transport Aircraft. This technical proposal may be change prior contract is signed.

The information supporting this technical proposal is described by sections as follows:

A. **SECTION 1 - OPERATIONAL REQUIREMENT**
   Describes the general requirement.

B. **SECTION 2 - AIRCRAFT GENERAL CHARACTERISTIC**
   Describes the aircraft capability to perform the required configuration.

C. **SECTION 3 - AIRCRAFT SYSTEMS CONFIGURATION**
   Describes the basic systems and system support.

E. **SECTION 4 - MISSION CONFIGURATION**
   Describes the aircraft mission equipments required by the configuration.

SECTION 1
OPERATIONAL REQUIREMENTS

The CN235-220 is an advanced, subsonic, short and medium range aircraft. The CN235-220 aircraft is modified and equipped as specified to perform its primary Military Transport Aircraft.

Two turboprop engines fitted on its inner wings will power the CN235-220 aircraft. The CN235-220 has feature of high cantilever wing, pressurized cabin and retractable tricycle landing gears.

The CN235-220 may be operated into Military Version (CN235-220M) as presented in this document.

The CN235-220M has following interior configurations as basic version that are interchangeable. Based on the requirements, it is proposed the Troop/Paratroop Configuration.

The aircraft shall be able to transport up to 49 troopers. By removing the center row seats the aircraft may accommodate up to 34 full geared paratroopers.

SECTION 2
AIRCRAFT GENERAL CHARACTERISTICS

2.1 Aircraft Main Characteristics

The main characteristics of the aircraft are presented in this section. Three view drawings are shown in figures 2-1 for the CN235-220M Aircraft.

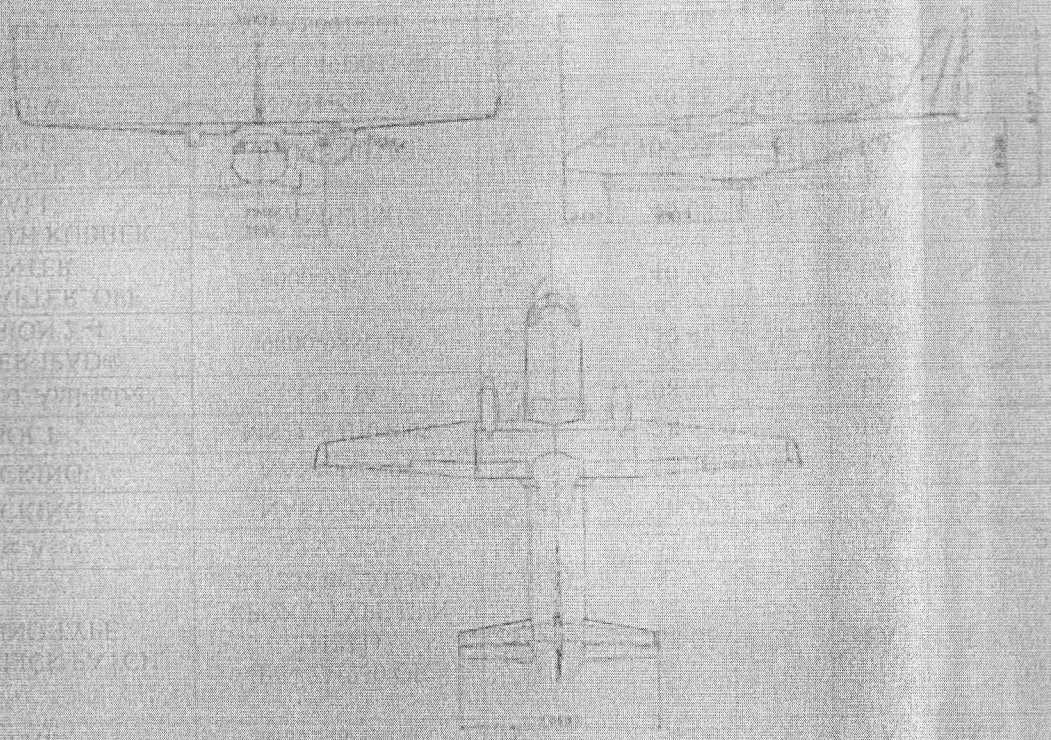

Figure 2-1 CN235-220M Three View Drawings

2.1.1 Dimension

- Overall span : 84.678 ft (25.81 m)
- Overall length : 68.480 ft (21.400 m)
- Overall height : 26.888 ft (8.177 m)
- Wing area : 657.452 ft^2 (61.000 m^2)
- Horizontal stabilizer span : 34.777ft (10.600 m)
- Wheel track : 12.795 ft (3.900 m)
- Wheel base : 22.700 ft (6.919 m)
- Cabin length (compartment) : 31.647 ft (9.646 m)
- Cabin height (interior) : 6.037 ft (1.840 m)
- Cabin volume : 1.478.847 ft^3 (41.877 m^3)

2.1.2 Power Plant

- Engines

  Two General Electric CT7-9C with the installed power available:
  - Automatic power reserve (APR) : 1,870 SHP
  - Max. Take off : 1,750 SHP
  - Max. Continuous : 1,750 SHP
- Propellers

  Two Hamilton Sundrand 14SF-21, four blade propeller:
  - Diameter : 132 inches (3.354 m)
  - Max. speed : 1,384 rpm

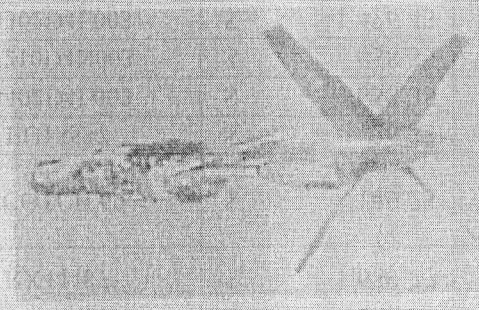

Figure 2-2 Power Plant

2.1.3 Weight

The following structural design weights represent limiting cases which will cover all possible loading situations within the operating requirement of the CN235-220M.

• Max. Taxi Weight	16,550 kg	36,486 lb.
• Max. Take-off Weight	16,500 kg	36,376 lb.
• Max. Landing Weight	16,500 kg	36,376 lb.
• Max. Payload	5,200 kg	11,464 lb.

2.1.4 Design Altitude

The design maximum operating altitude is 25,000 feet and the normal maximum operating altitude is 18, 000 feet.

2.1.5 Doors

There is one Type-1 Crew Door located on forward RH side of fuselage, outward open with integrated stairs. One-type III emergency door is located on forward LH side of the fuselage. The cockpit will have two sliding type windows, to be used as emergency exits for pilot/copilot. The CN235-220M will have two main doors, 0.900m wide x 1.747m high as passenger and/or paratroop doors. Those doors will be provided on both sides of the rear cabin. Those rear LH and RH door are completed with separate removable stair, and these doors will open inward.

2.1.6 Loading Door

The CN235-220M Aircraft shall have a ramp door and a ventral door, located in the aft part of the fuselage.

Useful volume : 5.3 m³ 87.17 ft³

The dimensions of the rear fuselage of the CN235-220M Aircraft are shown in figure 2-3.

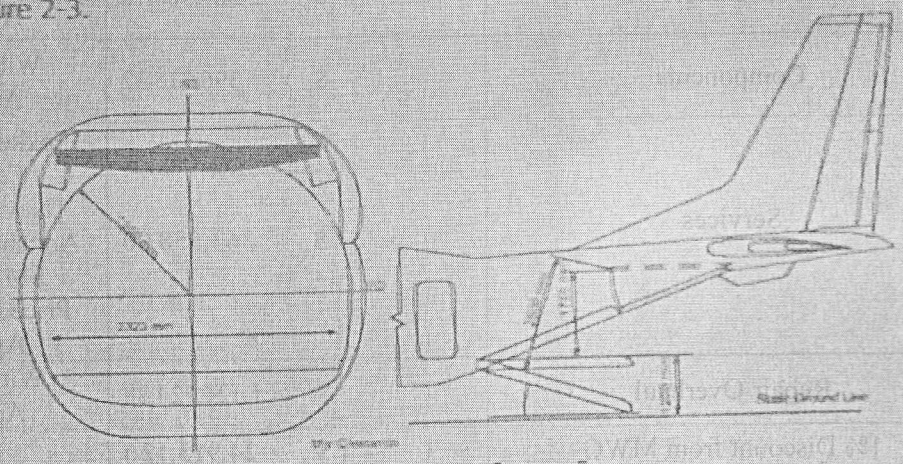

Figure 2-3 Rear Fuselage Dimension

The loading door is ease for unloading and loading, it can be used to change the configuration quickly; it also can be used as additional jumping point for Paratroop. The SAR kits (if available) will be deployed through in-flight openable Ramp Door.

2.2 Performance

2.2.1 Take-off Distance

The take-off distance at a takeoff weight of 16,500 kg (36,376lb.), temperature ISA +15°, sea level, dry hard surface, runway with no grooves, no slope, and no wind condition, using nose wheel steering and maximum take-off power, will have the following values:

- All Engine Operative Take-Off Distance : 982 m 3,220 ft
- Critical Field length (OEI) : 1,281 m 4,200 ft

2.2.2 Climb Performance

Maximum Climb Rate

The climb gradient at a gross weight of 16,500 kg (36,376 lb.), ISA +0°, sea level, take-off flaps up (0 degree) and landing gear up, maximum power will be:

- All Engine Operating 1,450 ft/min
- One Engine Inoperative 400 ft/min

Second Segment Climb Rate

The climb gradient at a gross weight of 16,500 kg (36,376 lb.), ISA +0°, sea level, take-off flaps up (10 degree) and landing gear up, maximum power will be:

- One Engine Inoperative 310 ft/min

Approach Segment Climb Rate

The climb gradient at a gross weight 16,500 kg (36,376 lb.), ISA +0°, sea level, take-off flaps (15 degree) and landing gear up, maximum power will be:

- One Engine Inoperative 255 ft/min

Service Ceiling

The single engine service ceiling gross weight of 16,500 kg (36,376 lb), ambient condition of ISA +0°, is:

- All Engine Operating 25,000 ft
- One Engine Inoperative 9,000 ft

2.2.3 **Cruise Speed**

The level flight speed at gross weight of 16,500 kg (36,376 lb), ISA +0° and pressure altitude of 18,000 ft, cruise speeds are:

- Maximum Cruise Speed 183 KIAS 237 KTAS
- Long Range Cruise Speed 163 KIAS 211 KTAS
- Maximum Endurance Speed 135 KIAS 174 KTAS

2.2.4 **Landing Performance**

Landing distance at a landing weight 16,500 kg (36,376lb), ISA +0°, sea level condition, hard surface with no grooves and no slope runway, normal breaking with reverse thrust:

- Landing distance 1,052 m 3,450 ft

2.3 **Flight Deck**

The flight compartment will have accommodation for two crew members. The seats will be recline-able and provide vertically and horizontally adjustable and lumbar support. They will have folding armrests for ease of access. Seats will have inertial safety belts. Pilot seats will be placed centrally in relation to the control columns, the pedals and the primary instruments.

A third crew member foldable seat between the pilot and co-pilot seats will be provided. The seat is complied with safety and airworthy requirement.

The CN235-220M advanced glass cockpit allows safe operation in all-weather condition both day and night and also NVG compatibility.

The center display which functioned as MFD is optional.

Figure 2-4 Typical Flight Compartment

2.4 Certification

Design Organization Approval (DOA) Certificate Number: DOA.21J.003 Class D Issued by DGCA (Directorate General of Civil Aviation) Indonesia, with the capability to conduct new design, modification (Required by Airworthiness Directives/ Operations/ Customer Req.), the maintenance, overhaul, repair and alteration. The Type Design Model of CN235-220 is approved by the Directorate General of Civil Aviation (DGCA). The CN235-220 may be operated as military operation which is certified by Indonesian Military Airworthiness Authority (IMAA) as CN235-220M, the certification process is conducted under the provisions of Indonesian Civil Aviation Safety Regulations (CASR). The CN235-220 airplane was type certified by the Directorate General of Civil Aviation (DGCA) of the Ministry of Communication of the Republic of Indonesia on September 28, 1998.

The CN235-220 is designed in accordance with the Indonesian Civil Airworthiness Regulation:

CASR Parts 25, "Airworthiness Standards: Transport Category Airplane", Rev. 5 issue date 10 June 2003, with exception of Paragraph 25.562: Emergency landing dynamic conditions and Subpart H: Airworthiness Standard Directed by ICAO.

CASR Part 34, "Fuel Venting and Exhaust Emission Requirements", original issue 27 December 1993.

CASR Part 36, "Noise Standards", original issue 27 December 1993

SECTION 3
BASIC AIRCRAFT SYSTEMS CONFIGURATION

To meet the general operational requirements set forth in section 1, the basic system for the proposed CN235-220M version has been formulated and is described in this section. It should be clearly recognized that the system described represents a generic approach with specific equipment selection based upon assessment of perceived mission requirements and general availability. If the general design approach set forth appears attractive, it is strongly recommended that the design phase of the acquisition program be implemented to fully characterize a complete system meeting the specific requirements.

3.1 Environmental Control System and Pressurization

The CN235-220M air conditioning system include two independent air cycle machine systems that shall provide sufficient cooling to achieve comfort temperature for aircrews and operator.

3.1.1 Air Conditioning

The basic aircraft version air conditioning system will include two independent air cycle systems. The main air conditioning system will include the air cycle system, which uses bleed air from the Lft and Rht engines, respectively, to be conditioned and circulated promptly.

3.1.2 Pressurization

The system is capable to maintain a maximum operating positive differential pressure of 3.639 psi that corresponds to an internal pressure equivalent to 7,850 ft. cabin altitude, when the aircraft is flying at 18,000 ft.

3.2 Flight Controls

Flight control systems shall consist of:

- Primary flight control system.
- Secondary flight control system.
- Auto pilot system

Dual path flight controls shall be installed and able to be operated from pilot and copilot positions.

3.2.1 Primary Flight Controls

Three control systems shall be installed:

- Aileron control system
- Elevator control system
- Rudder control system

All systems shall be mechanically operated by means of rods, interconnection units, bell cranks, quadrants and conventional cable circuits.

3.2.2 Secondary Flight Controls

Secondary flight controls shall consist of:

- Trims system
- Flaps system

3.3 Electrical System

3.3.1 General

The electrical system will consist of:

- A Direct Current (DC) Generating System
- An Alternating Current (AC) Generating System
- A Power Distribution System

3.3.2 DC Generating System

DC power is generated by:

- Two Generators of 400 Amps each, which are driven by left and right engines, will supply 28 VDC to the aircraft electrical circuits.
- Two Transformer Rectifier Unit (TRU) rated at 300 Amperes converts the AC power 115/200 VAC from 26 KVA Alternator wild frequency output to 28 VDC continuous.
- Two 37 Ah Nickel Cadmium Batteries.
- Two standby batteries each rated at 5 Ah are independent sources of DC power to support a group of avionics load during power transient (engine start or Hydraulic Pump on).

3.3.3 AC Power System

The AC power generation system consists of wild frequency system and constant frequency system (400 Hz).

The AC wild frequency power is generated by two alternators wild frequency driven by left and right engines. Each alternator has a nominal rate of 115/200 V, 26 KVA 3-phase at nominal RPM.

The AC constant frequency power is generated by:

- One unit of inverter, to produce 115 V, 400 Hz single phase to supply the Ice Detector.

The AC power shall distribute to their associated user or through their distribution equipment.

3.3.4 Distribution System

The AC and DC generated power will be distributed to their user with using power distribution system equipment (boxes, bundling and panels).

Basic distribution system to distribute, control and protect the basic DC generated power shall be implemented by using the boxes, bundles and panels.

The boxes are:

- Two DC power distribution system boxes and
- One battery protection system box

3.3.5 External Power

During ground operations, external DC power will be possible to be delivered into the aircraft system through the aircraft electrical receptacle.

3.4 Landing Gear

The CN-235-220M will have retractable tricycle type landing gears with tandem type main landing gear. The nose landing gear will retract forward within the non-pressurized compartment located in the lower part of the fuselage. The main landing gear, consisting of two units, will retract backwards. They will remain partially housed within the fairings, located on both sides of the central fuselage. The aircraft shall have an emergency mechanical extension system which shall release the locking systems and discharge the hydraulic landing gear circuit, allowing its extension by gravity.

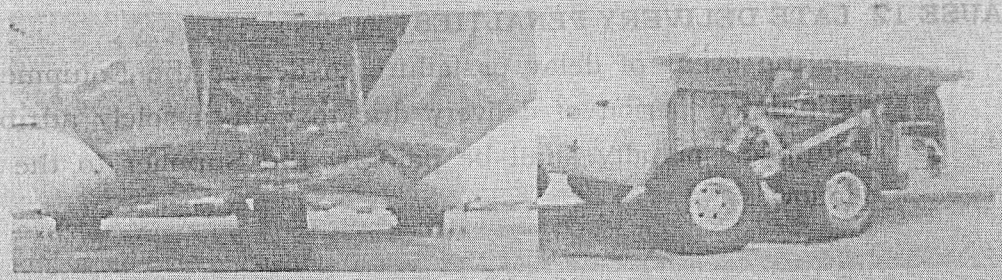

Figure 3-1 Landing gears

3.5 Lighting

The CN235-220M will be equipped with an internal and external lighting system. The internal lighting will consist of flight deck, cabin, emergency and baggage compartment lighting. The external lights will consist of: Landing, Taxi, Runway, Anti-Collision, Logo, Ice Inspection and Position lights.

3.6 Hydraulic System

The hydraulic system operates the following services:

Flaps, landing gear, nose wheel steering, normal and emergency parking brakes, ramp and ventral doors, and the propeller brake.

The hydraulic installation has a modular design to avoid weight increases and for ease of maintenance.

System components are located in aft part of the right landing gear fairing, wheel bay compartment.

3.7 Fuel System

The fuel system will be:

- Designed to achieve simplicity and reliability
- Operated with minimal crew attention
- Suitable to operate all additive and fuel types approved for engines
- Able to function satisfactorily at any altitude up to and including the maximum altitude certified for the aircraft
- Able to operate satisfactorily with fuel within ambient temperature range: -54°C to +50°C. These limits are a function of the fuel freezing point and type, and the altitude.

The fuel system will include the following subsystems:

- Fuel tanks
- Refueling and de-fueling
- Fuel supply and fuel transfer
- Ventilation
- Fuel quantity measurement.

Fuel will be stored in four integral tanks, two main tanks within the central wing, and two auxiliary ones within the outer wings. The tanks will be internally protected against corrosion and bacterial contamination through the use of an adequate treatment of their internal surfaces. Structural thickness will be appropriate to prevent damage from lightning strike.
The total capacity of the tanks will be:

Main tanks	2 x 1,020 liters
Auxiliary tanks	2 x 1,590 liters
TOTAL	2 x 2,610 liters

3.8 Ice and Rain Protection Systems

The CN235-220M will be protected against ice build-up in:

- Engine air intakes
- Wing and stabilizers
- Flight cabin windshields
- Propellers
- Pitot tubes and AOA sensors

Windscreen will be provided with a wiper system to preserve visibility.

9 Fire Protection System

The fire protection system can be install by following:

- Engine nacelle fire extinguishing
- Center wing fire extinguishing line
- Cockpit fire extinguishing
- Engine nacelle fire detector
- Lavatory fire extinguishing and fire detector

.10 Basic Avionics Configuration

To support the required missions, the aircraft will be equipped with the following basic avionics systems:

- Auto Pilot System
- Communication System
- Navigation System
- Instrument System

Table 3-1 Basic Avionics Systems

System	Type [Qty.]	Manufacturer
Auto Pilot		
Auto Pilot	AP-5000R [1]	Genesys
Communication		
HF	KHF-1050 [1]	Honeywell
VHF	Included in GDR-2536	Genesys
ICS	DCVS-6100 [1]	Becker
ELT	ARTEX-406 [1]	ARTEX
Radio Tuning Unit	Included in EFIS	Genesys
Navigation		
VOR/ILS/MB	GDR-2536 [2]	Genesys
DME	DME-4000 [1]	Collins Aerospace
Radio Altimeter	ALT-4000 [1]	Collins Aerospace
Weather Radar	RDR-2060 [1]	Honeywell
TCAS	CAS-100 [1 set]	Honeywell
ADAHRS	ADAHRS [2]	Genesys
Transponder Mode-S	TDR-94 [1]	Collins Aerospace
GPS	Included in EFIS	Genesys
FMS	Included in EFIS	Genesys
TAWS	Included in EFIS	Genesys

System	Type [Qty.]	Manufacturer
Instrument		
Standby Instrument	GH-3000.2 [1]	L-3 Comm.
EFIS	IDU-680P [4]	Genesys
EICAS	Included in EFIS	Genesys

3.10.1 Auto Pilot

The CN235-220M aircraft is equipped with Auto Pilot (AP) system. The Autopilot is AP 5000R manufactured by Genesys. The auto pilot is a 3-axis digital autopilot system with automatic trim. The Autopilot System uses a central auto flight computer unit to process input data from various aircraft sensors and cockpit controls to provide steering commands for display on the Primary Flight Displays (PFDs) and send servo commands for maneuvering the aircraft.

3.10.2 Communication

The communication systems which are installed in the CN235-220M as follow:

- One set HF radio communication systems.
- Two VHF radios communication systems included in VHF Navigation Systems.
- One set Inter Communication System (ICS).
- One Emergency Locator Transmitter (ELT).
- Two sets Radio Tuning Unit included in EFIS.

3.10.2.1 High Frequency (HF) Communication

The CN235-220M is equipped with Honeywell KHF-1050 HF communication system. The HF communication provides 280,000 communication channels, spaced at 100 Hz increments in the HF band (2.0000 to 29.9999 MHz). The system receives and transmits voice or data message in Upper Side Band (USB), Lower Side Band (LSB), and Amplitude Modulation Equivalent (AME) capabilities. The system also can be able at maritime channel, programmable channel and emergency channel mode.

3.10.2.2 Very High Frequency (VHF) Communication

The CN235-220M aircraft is equipped with two (2) Very High Frequency (VHF) Communication Systems which are included in two (2) VHF Navigation Systems. The VHF Communication System provides digital voice and high-speed data communications using VHF Data Link (VDL) Mode 2. It's compatible with ARINC 750, operates in ARINC 716 data mode and is equipped to handle today's 25 kHz, 8.33 kHz and VDL Mode A communications. It also offers an all-digital audio design, which dramatically

reduces noise interference when compared with analog audio. The VHF are included in EFIS and controlled directly from Multi Function Display located on each side pilot and co-pilot instrument panel.

3.10.2.3 Inter Communication System (ICS)

The deliverable aircraft shall be equipped with one set of Intercommunication system (ICS) DCVS-6100 manufactured by Becker. The ICS is capable to integrate the functions of interphone, passenger address system, audio utilization of radio communication, radio navigation, and mission system. The ICS also provides audio management for communication between pilot, co-pilot, flight engineer (third crew), operators in the cabin and ground maintenance crew. The ICS shall be interfaced with:

- One HF Communication radio
- Two VHF Communication radios
- One DME
- Two VOR/ILS/MB systems
- TCAS
- TAWS
- Warning system

3.10.2.4 Emergency Locator Transmitter (ELT)

Transmission in an emergency condition shall be done on frequency 121.5 /243 MHz and 406 MHz giving the position information in latitude and longitude. The ELT shall be powered by a self contained battery. The battery shall be capable to power the ELT to transmit for 72 hours. The ELT is ARTEX 406 manufactured by ARTEX.

3.10.2.5 Radio Tuning Unit (RTU)

The aircraft is equipped with Radio Tuning which are included in EFIS and controlled directly from Multi Function Display located on each side pilot and co-pilot instrument panel. The RTUs provide the control and monitoring capability for the radio communication and navigation.

3.10.3 Navigation

The aircraft is equipped with long range and short range navigation systems.

The long range navigation system shall consist of the Flight Management System (FMS). The flight path, directed by the FMS, shall be presented to the pilot and copilot through their Multi Function Display (MFD). The flight Director shall provide steering command to the Primary Flight Display (PFD) that shall allow the pilots to manually fly the same path taken by the

navigation system. If the auto pilot system is in engaged, the CN235-220M shall be able to fly automatically.

The short range navigation system shall consist of VOR/ILS/MB, DME, radar altimeter, Air Data Attitude and Heading Reference System (ADAHRS). The short range navigation system shall be interfaced to the EFIS for the display of range and bearing information relative to the navigation ground station.

Basic instruments assembly shall consist of air data sensor for flight director, auto pilot system, and Air Data Attitude and Heading Reference System (ADAHRS) for the electronic Flight Instrument System (EFIS). The EFIS shall collect and manage all indications associated with the navigation sensors. Three independent static pitot system shall be installed: one for each pilot and another one for the standby instrument.

The aircraft is also equipped with TAWS and Standby Instrument.

3.10.3.1 Very High Frequency Omni Range / Instrument Landing System / Marker Beacon (VOR/ILS/MB)

There will be two sets type of VOR/ILS/MB that is Genesys GDR-2536. Each receiver shall receive and process VOR, LOC, GS and MB signals providing bearing, course deviation, TO/FROM information, LOC and GS deviation, marker beacon indication and audio signals. The system shall have 160 channels for VOR operation and 40 LOC/GS channels. The GDR-2536 system also provided with VHF Communication system which is used as short range communication for pilot and co-pilot.

3.10.3.2 Distance Measuring Equipment (DME)

There will be two sets type of Distance Measuring Equipment that is Collins Aerospace DME-4000. The aircraft shall be equipped with one DME system. Distance from the aircraft to the station shall be displayed in the EFIS. Additionally, the system shall process the speed and time to the station and shall provide the corresponding identification code. The system shall be controlled by one control unit associated to the VOR receive.

3.10.3.3 Radio Altimeter

The CN235-220M shall be equipped with one set Radar Altimeter ALT-4000 manufactured by Collins Aerospace. It is capable to transmit/receive and processing FM/CW signals. The Radar Altimeter shall provide an altitude and digital (ARINC-429) signal proportionally to the CN235-220M altitude above the ground up to 2500 ft. This information shall be digitally displayed on the EFIS.

- Excessive closure rate to terrain.
- Significant altitude loss before acquiring a predetermined terrain clearance after take-off or missed approach.
- Inadvertent descent below glide slope on an ILS approach.
- Descent below selected minimum descent altitude.

The TAWS is to help preventing accidents caused by Controlled Flight Into Terrain (CFIT). The system achieves this objective by accepting a variety of aircraft input parameters, applying alerting algorithms, and providing the flight crew with aural alert messages, visual annunciation, and displays. The visual information of the terrain situation along flight intent is displayed on the combined Radio Altimeter and Terrain Display.

3.10.4 Instrument

3.10.4.1 Standby Instrument

As a backup of navigation data/display, one Standby Instrument shall be installed on CN235-220M. The Standby Instruments is GH-3900.2 manufactured by L-3 Comm. It presents standby attitude, standby airspeed and standby altitude data on a single display.

The standby probe shall provide pilot's Standby Instrument, Air Data, Over Speed Warning Switch, Speed Transducer for Flaps System, Controller Outline Cabin Air Pressure. The indicated air speed indicator is actuated solely by impact pressure which is derived as a differential pressure from measurements of total pressure and static pressure

3.10.4.2 Electronic Flight Instrument System (EFIS)

The EFIS are consists of four (4) displays, which are integrated with EICAS, TAWS, FMS, RTU and Flight Recorder Function for maintenance purpose. EFIS collect and manage all indications associated with the navigation sensors and flight instrument sensors (VOR/ILS/MB, DME, Radio Altimeter, Air Data, Attitude and Heading Reference System). The EFIS is also be able to be linked with the auto pilot system, GPS and Weather Radar Module. The EFIS shall have Built-In-Test capability.

There are 4 EFIS (Electronic Flight Instrument System) LCD which primarily consist of:

- 2 Primary Flight Displays/Multi-Functional Displays(PFD/MFD)
- 2 EICAS/Multi-Functional Displays (EICAS/MFD)

The display from the EFIS has Synthetic Vision mode to recreate 3D display.

- Excessive closure rate to terrain.
- Significant altitude loss before acquiring a predetermined terrain clearance after take-off or missed approach.
- Inadvertent descent below glide slope on an ILS approach.
- Descent below selected minimum descent altitude.

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3.10.4 Instrument

3.10.4.1 Standby Instrument

As a backup of navigation data/display, one Standby Instrument shall be installed on CN235-220M. The Standby Instruments is GH-3900.2 manufactured by L-3 Comm. It presents standby attitude, standby airspeed and standby altitude data on a single display.

The standby probe shall provide pilot's Standby Instrument, Air Data, Over Speed Warning Switch, Speed Transducer for Flaps System, Controller Outline Cabin Air Pressure. The indicated air speed indicator is actuated solely by impact pressure which is derived as a differential pressure from measurements of total pressure and static pressure

3.10.4.2 Electronic Flight Instrument System (EFIS)

The EFIS are consists of four (4) displays, which are integrated with EICAS, TAWS, FMS, RTU and Flight Recorder Function for maintenance purpose. EFIS collect and manage all indications associated with the navigation sensors and flight instrument sensors (VOR/ILS/MB, DME, Radio Altimeter, Air Data, Attitude and Heading Reference System). The EFIS is also be able to be linked with the auto pilot system, GPS and Weather Radar Module. The EFIS shall have Built-In-Test capability.

There are 4 EFIS (Electronic Flight Instrument System) LCD which primarily consist of:

- 2 Primary Flight Displays/Multi-Functional Displays(PFD/MFD)
- 2 EICAS/Multi-Functional Displays (EICAS/MFD)

The display from the EFIS has Synthetic Vision mode to recreate 3D display.

3.10.4.3 Engine Indicating and Crew-Alerting System (EICAS)

3.10.4.3.1 Indication

The EICAS display shall provide a digital and graphical presentation of engine, fuel, hydraulic, flap, trim and other aircraft systems. A reversionary half-page EICAS display presenting essential parameters for safe flight of the aircraft will also be available to the flight crew.

3.10.4.4 Warning

The EICAS display shall provide the crew alert messages and aural annunciation of the different system failures during aircraft operation to attract the crew's attention. The messages are visually prioritized in order

- Warning – level message (red)
- Caution – level message (yellow)
- Advisory – level message (blue)

3.11 Interior Arrangement

The interior furnishing will match the inner contour of the fuselage structure and covers the control cables, the air conditioning duct and other systems to protect them against damage from operators, cargo or passengers.

Table 3-2 Basic Interior Component

Name	Quantity	Remark
Cockpit Insulation	1 set	
Cabin Insulation	1 set	
Rear Fuselage Insulation	1 set	
Cockpit Conditioning	1 set	
Cockpit Crew seat	1 set	
Third Crew Seat	1 set	
Avionic Rack Structure	1 set	
Floor	1 set	
Anti-Slip Cargo Floor	1 set	
Ceiling Structure	1 set	
Crash Axe	1 set	
Dado Panel	1 set	
Foreward Bulkhead	1 set	
Crew Life Vest	1 set	
FWD Surround	1 set	
AFT Surround	1 set	
Exit Cover	1 set	

SECTION 4
MISSION CONFIGURATION

This Section gives the description of the configuration that will be incorporated to the basic CN235-220 and allowing the aircraft to be capable of performing its primary mission as Military Transport Aircraft. Incorporation of this configuration needs to be defined specifically on the contractual clauses.

4.1 Mission System Equipment

The CN235-220M will be equipped with optional avionic equipment that comply with the needed of requirement.

Table 4-1 below shows the optional system component of the CN235-220M Military Transport Aircraft.

Table 4-1 Optional System Equipment

System	Type [Qty.]	Manufacturer
Communication		
VHF/UHF	GTR-25000 [2]	Genesys
Navigation		
ADF	ADF-4000 [1]	Collins Aerospace
Recording		
CVR	CVR-120R [1]	Universal
FDR	FDR-25 [1]	Universal

4.1.1 VHF/UHF (Very High Frequency / Ultra High Frequency)

The GTR-25000 V/UHF Radio Communication System is manufactured by Genesys Aerosystem. Single GTR-25000 V/UHF system consists of three individual units; Control, Transceiver/Receiver, and Antenna.

The GTR-25000 V/UHF Radio Communication system is:

- 10-25 Watt, 30-960 MHz Com
- 10 Watt FM mobile bands (FAA Civilian Limit)
- 10 or 25 (military) Watt FM 30-88 MHz
- 25 Watt AM ATC bands, 118-156 MHz and 225-400 MHz

One GTR25000 will be installed in plain communication mode and the other one is possible in secure communication mode as optional feature.

4.1.2 Automatic Direction Finder (ADF)

The ADF-4000 manufactured by Collins Aerospace is a system consists of receivers controlled by control unit directly from EFIS. The system has two different operation modes ANT or ADF and provides bearing to the station signals to the EFIS. The corresponding audio output will be provided to the Intercommunication System (ICS).

4.1.3 Cockpit Voice Recorder (CVR)

The CN235-220M aircraft is able to be equipped with a Cockpit Voice Recorder. The recorder has solid state memory recording device that will record all voice, audio signal, and warning for a continuous period of 120 minutes. Recording in excess of this time is automatically overwrites (erase) previous data.

4.1.4 Flight Data Recorder (FDR)

The CN235-220M aircraft is able to be equipped with a Flight Data Recorder. The recorder has solid state memory recording device that will record records a flight data for a continuous period of 25 hours. Recording in excess of this time is automatically overwrites (erase) previous data.

4.2 Interior Arrangement

To support the required missions, the CN235-220M interior will be equipped with additional equipments and be arranged in accordance with dedicated configuration.

All of additional equipment will be installed to the aircraft in taking into account their requirement on temperature, pressure, humidity, vibration, acceleration, electromagnetic compatibility and maintenance accessibility. The ergonomic aspect, loading and unloading operation and optimum weight distribution will also be taken into consideration.

Table 4-2 Optional Interior Component

Name	Quantity	Manufacturer
Soft Side Wall Lining	1 set	
Placard 1 set		
Sun Guard	1 set	
First Aid Kit	2	Scott Aviation
Crew Life Raft	1	RFD Beaufort
Hand Fire Extinguisher	3	Walter Kidde
Portable Oxygen Bottle	3	BE Aerospace
Portable Breathing Equipment	2	BE Aerospace

4.2.1 Troop / Paratroop Interior Configuration

The aircraft can transport up to 49 troops by using three row troop seats. When the central row is not in use, the aircraft shall carry 34 fully equipped troops (paratroopers).

There are two static anchor cables along the cabin allowing jumping through the paratroop doors and rear ramp. The CN235-220M can also air drop paratroops by free fall from paratroop doors as well as rear ramp.

Table 4-3 Troop / Paratroop Interior Component

Name	Quantity	Manufacturer
Lavatory	1	
Single Troop Seat	7	
Double Troop Seat	19	
Double Troop Special	2	
Static Line	1 set	
Passenger Life Vest	49	

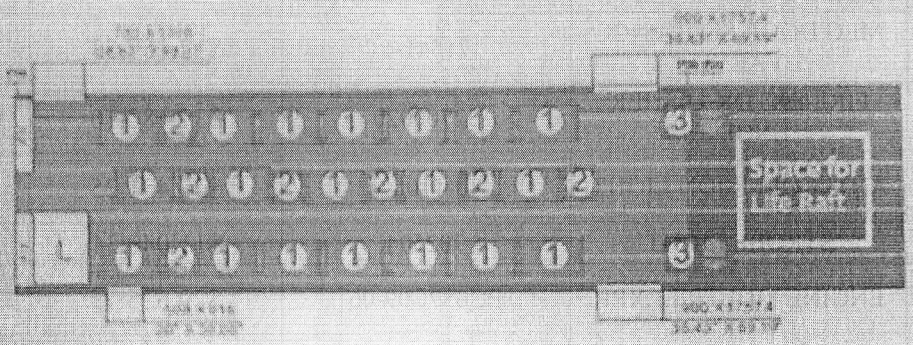

Figure 4-1 Typical CN235-220M Troop Configuration

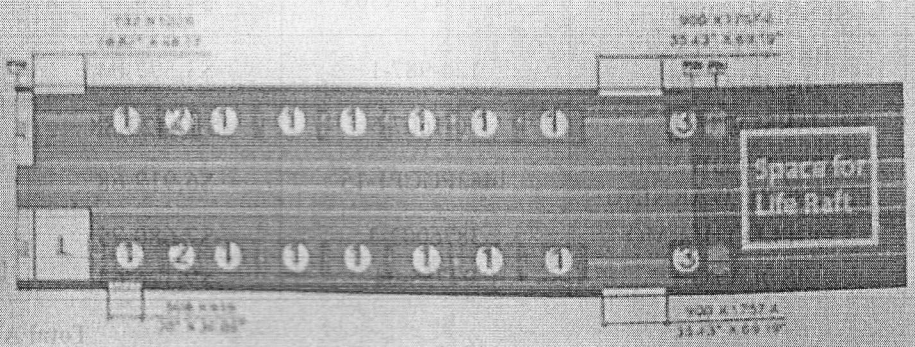

Figure 4-2 Typical CN235-220M Paratroop Configuration

Notes:

1. = Double Troop Seat
2. = Single Troop Seat
3. = Double Troop Seat Special

AV = Avionic Rack
L = Lavatory

3.10.3.4 Air Data Attitude & Heading Reference System

The CN235-220 shall be equipped with 2 (two) Air Data Attitude/Heading Reference Systems (ADAHRS) manufactured by Genesys. This system includes the following units:

- 2 Pitot Static Probes
- 2 ADAHRS module
- 2 Magnetic Sensing Unit
- 2 Outside Air Temperature

Two basic pressures, static pressure and total pressure is used to actuate the instruments described above. The static pressure is the atmospheric pressure at the flight level of the CN235-220M, while the total pressure is the sum of the static pressure and the impact pressure, which is the pressure developed by the forward speed of the CN235-220M. The pitot-static tubes on the CN235-220M combine both the pitot and static pressure sensing ports onto a single probe. The LH probe shall provide Airspeed indicator, Altimeter, and Rate of Climb on a pilot side. The RH probe shall provide Airspeed Indicator, Altimeter, Rate of Climb on co-pilot side.

3.10.3.5 Transponder Mode-S

The CN235-220M aircraft is equipped with one transponder system which is to reply and decode mode 3/A, C and S interrogations. The Transponder has receiver center frequency of 1030 MHz and transmitter frequency of 1090 MHz.

3.10.3.6 Flight Management System

The CN235-220M aircraft is equipped with one Flight Management System which is included in EFIS and it is able to connect with auto-pilot system. The Flight Management System provides the aircraft crew with centralized control of the aircraft navigation sensors, lateral and vertical flight guidance and steering, database management and flight planning.

The FMS accepts position information from up to five long-range navigation sensors as well as a VOR and scanning DME sensor. The data from these sensors are used to determine the best computed position. This position is used by the FMS for navigating the aircraft along a programmed flight plan. Flight plans are created using the navigation database. The database locates waypoints along an entered route and combines these waypoints to form a flight plan.

3.10.3.7 Terrain Awareness Warning System (TAWS)

The CN235-220M aircraft is equipped with one Terrain Awareness Warning System which is included in EFIS. The TAWS System provides pilot and co-pilot visual and unique aural warnings and alerts associated with the following conditions:

- Excessive rates of descent with respect to terrain.