SCOPE OF WORK FOR INDIGENOUS ROH OF AVIONICS AGGREGATES

Introduction

1. The project will involve building the ROH solution for 106 lines of avionic aggregates of Su-30 MKI , MI 17, AN 32, and IL 76 / 78 using the standard PCB fault diagnostics procedures implemented in the form of Test Program Suites (TPS) on Automated Test Equipment which mimics the role of a avionics system test bench and are built using PXI based modular instrumentation architecture.

Grouping and Technical Specification

2. The 106 LRUs identified for the ROH development activity across the mentioned fleet have been grouped into seven categories based on their underlying singnal processing technology. The details of the LRU wise grouping , and the brief description and technical specification of the LRUs is covered in Annexure 1 and Annexure 2 respectively. **The grouping of the LRU has been done primarily to identify the modular instrumentation required for building the ATE.**

Scope of Work : Solution Architecture

3. The ROH setup for the identified LRUs across the fleets needs to be established at the owning Depots based on the model described below along with specific compliances which are annotated in the description and the indigeneous content of the solution should be a minimum of 40%. The solution engineering needs to be done on the following lines and a detailed exposition of the same in the form of Detailed Project Plan amply supported with GANTT chart(soft and hard copy) for scheduling of the work content and resource allocation :-

(a) The ATE is to be built using PXI based modular instrumentation and LabVIEW software, an industry gold standard for Test & Measurement setup, and should have the following features :-

(i) Rugged by design and the employed instrumentation should be able to withstand vibrations of 5 to 500 MHz, 0.3 g rms and shock forces upto30G, operational temperature of 0-55°C.

(ii) The PXI based modular instrument employed in the ATE should meet the testing requirements of the technology groups identified in Annexure I and their individual signal handling capability should match the actual testing requirements of each of the LRUs assigned to each of the groups.

(iii) The overall size should not exceed 2.5m x 1m x 1.2m, its weight should not exceed 400 Kgs, and it should have provision for a work table for placing the Device Under Test (DUT) and its harness.

(iv) Dedicated power supply distribution and protection system to carry out the standard diagnostic activities of the DUT.

(v) UPS backup of miimum one hour to cater for sudden power supply failure and the ATE in such circumstance should provide an option for a safe shutdown.

(vi) Abiility to initiate self test for ascertaining the serviceability of the ATE as a whole before entering the diagnostics mode of operation for the DUT.

(vii) ESD compatible and must come with 3 sets of international standard certified ESD protective gears for the operators (cap, apron, gloves and shoe covers).

(viii) Laser marking of all cables and connectors for easirer maintainability of the ATE, and the connectors employed at the ATE end for interfacing with the DUT are to be of Amphenol make.

(ix) Ease of transportation using fork lifters and hard points for cable latching during transportation by aircraft/truck.

(b) The Test Program Suite (TPS) for executing the ROH task is to be built using the standard diagnostic strategies of Functional Testing (FT), In-Circuit Functional Testing (ICFT), Out of Circuit Functional Testing (OCFT), In Circuit Testing(ICT), and Boundary Scan Testing (BST).

(c) The ROH solution is to be built using a black box approach where in using a golden LRU (serviceable reference LRU) the necessary signals of the LRU along with their signal characteristics is captured using the ATE setup and the generated data is used for the ROH / diagnostic task. The potential scope of this activity would include :-

(i) Study of the functional description of the aggregate available in the technical publication.

(ii) Input and output mapping of the aggregate using the available technical literature, system level circuit interconnect diagrams, aircraft wiring diagram, and aggregate specific circuit schematic and descriptions where ever available.

(iii) Signal charecterisation study of Cat B aggregate and establishing benchmark reference value for facilitatingFunctional Testing, In Circuit Testing, In Circuit Functional Testing, Out of Circuit Functional Testing, and Boundary Scan testing.

(iv) Identifying components with resident firmware and devising strategy to extract the firmware

(v) Failure Mode Effect Analysis and identification and localization of faults contributing to the fault scenarios.

(d) The avionics aggregates, by nature of the federated architecture, are tightly coupled. Hence, functional evaluation and ROH of the main aggregate will dictate that the developed Tester has the ability to emulate the associated aggreagtes and sensors required for undertatking the testing of the DUT.

(e) The developed ROH technology needs to be deployed on the ATE in the form of a fully automated Test Program Suite (TPS). The TPS is to be so designed that the component level fault isolation of the aggregate is achieved with bare minimal intervention of the operator.

(f) As part of the process involved in formulating the ROH technology, the BoM of the aggregate needs to be developed and source of their supply or their commercial equivalent needs to be identified and supplied.

(g) Facilities required for undertaking repairs and qualification work need to be identified and established at the owning depot complying to IPC 7711 / IPC 7721 standards which in turn should ensure that post execution of the repair tasks the repair work is MIL-STD-810 (ESS), MIL-STD-461 (EMI/EMC) compliant or is in conformance with compliance requirements specified in CEMILAC and DGAQA directives.

(h) Development of Fault Diagnosis and Repair work packages. This will be certified and qualified by the SRC of the Depot.

(j) All manufacturing and test facilities established for the contract will be the property of IAF. Repair of aggregates is to be carried out by the firm at the extablished repair facility for subsequent five years. The number of LRU arising every year for repair is tabulated in Annexure 3. Suitable skilled technecians (numbers needs to be worked out on the basis of yearly arising) needs to be deployed at these facilities for carrying out the fault identification and repair of aggregates.

Certification & Qualification

4. As part of the design and development effort and the involved certification and qualification process, the Firm through a process of Requirement Review, Preliminary Design Review (PDR), and Comprehensive Design Review (CDR) and through a consultative process involving all stake holders will be required to comply with the following :-

(a) The architecture and the Design details of the ATE is to be prepared and shared with the Self Reliance Committee (SRC) of the Depot for vetting and approval.

(b) Standard of Preparation (SOP) of the tester shall be finalised and shared with the SRC of the Depot for approval. This document shall include Bill of Materials (BOM) and Drawing Applicability List (DAL) including drawings.

(c) Quality Assurance Plan is to be prepared and share with the SRC of the Depot for approval.

(d) Qualification Test Plan (QTP) is to be prepared and shared with SRC for approval.

(e) Acceptance Test Plan (ATP) is to be prepared and shared with SRC for approval.

(f) Standard test equipment shall be used to verify the correctness of the parameters of the ATE. Airborne LRUs/subsystems shall be used for verification only when other methods and means are not available.

(g) The software requirement specifications (SRS) is to be prepared and shared with the SRC for approval.

(h) The tester software approval as per approved SRS will be done by the SRC.

(j) As part of the involved approval, following documents will be verified:

(i) Hardware and Software design document

(ii) Installation drawing

(iii) Test results and compliance charts.

Annexure 1
(Refers to Para 2)

LIST OF ITEMS FOR REPAIR / ROH

Sl No.	Item	Group
	Su-30 MKI	
1	Rack mounting frame 623-3DR	VII
2	Gyro Horizon from RIF-03 Complete Set	VI
3	HUD (PDU+UFCP)	V
4	Executing Block BI-U	IV
5	Transreceiver Of 4202R	II
6	Rate Gyro (Angular-Rate Sensor from SDU-10MK set)	VI
7	SIMVOL M	I
8	Gyro Transmitter Unit	I
9	Communication Block (BS-30-PI	IV
10	Pulse Unit of 4202R	II
11	Linear Accelaration Sensor from SDU-10MK SET	VI
12	Net Centric Digital Unit / Recorder	IV
13	Time Spacing Signal Processor	I
14	Information Distribution And Convertor Block (BRPI30PI)	IV
15	Power Supply Unit (BP-15P)	III
16	Linear Accelaration Sensor From SDU-10MK Set	VI
17	Gyro Sensor Unit From Sdu-10MK Set	VI
18	Unit From 30PI Set	IV
19	Unit Of 623-3DR Set	II
20	Unit From 623-3DR Set	II
21	Unit 539R (Auxillary Control Panel Of 623-3DR)	II
22	Hud Camera CHVC(DVRS)	VI
23	CSMU (Crash Survival Memory Unit)	IV
24	BKV-2V-1 (Altitude And Heading Reference Sensor)	I
25	Ingps (Inertial Navigational Global Positioning System)	II
26	Directional And Vertical Gyro Unit	I
27	VSO-3-1 Limiting Signal Computer	I

Sl No.	Item	Group
28	HUD General Assembly	V
29	Power Divider of N11-1-02I Unit	III

Sl No.	Item	Group
	Mi-17	
1.	Converting and Computing Unit	I
2.	Air Data Computer	I
3.	Flight Data Recorder	IV
4.	Multifunctional Display Unit	V
5.	Orientation and Indication Unit	VI
6.	Attitude and Heading reference Unit	VI

Sl No.	Item	Group
	AN-32	
1.	HF communication set (HF-9000)System	II
2.	Radio receiving unit VOR/ILS(KURS-93M)	II
3.	Invert-control block Analog to Digital & Digital to Analog convertor (BPK2V)	IV
4.	EGPWS (SRPPZ-2000)	I
5.	Selective calling system(SSB)	I
6.	Radio Alitmeter System	II
7.	Distance Measuring Equipment(KDM 706A DME System)	II
8.	TCAS (CAS-100 B) System	I
9.	TX-RX-ART-2100(Weather Radar)	II
10.	GPS (SN-4312-02) System	II
11.	Air data computer with Display (AD-32)	I
12.	R800L2E (V/UHF System)	II
13.	Multi function Display	V

Sl No.	Item	Group
	IL- 76 / 78 & AWACS	
01	Electronic Altimeter	VII
02	Unit	III

03	Air Speed Indicator	VII
04	Dual Amplifier	III
05	Junction Box	II / III
06	Headset	VII
07	Voice Message Unit	VII
08	Primus RT	II
09	RX TX PRIMUS	II
10	DME Interrogator	II
11	Actuating Unit	III
12	Temperature Regulator	VII
13	Aviation Head set X	VII
14	Potentiometer (Acceleration Sensor)	VI
15	Amplifier W/C	I
16	Ref Frequency Transmitter	II
17	Reel Control Box	VII
18	Servo valve positioner assembly	VII
19	Oxygen Reducer	VII
20	Landing Taxing Lights	VII
21	Oxygen Regulator	VII

Legend

1. **Group I**. The avionics LRUs categorized in this group has the primary function of **Signal Processing**.

2. **Group II**. The avionics LRUs categorized in this group has the primary function of **RF Processing**.

3. **Group III**. The avionics LRUs categorized in this group has the primary function of providing **power supply**.

4. **Group IV**. The avionics LRUs categorized in this group has the primary function of **A/D and D/A conversions** with some processing.

5. **Group V**. The avionics LRUs categorized in this group has the primary function of providing **display** as per the form factor required in the cockpit.

6. **Group VI**. The components categorized in this group has the primary function of acting as a **sensor**.

7. **Group VII**. The components categorized in this group are **electromechanical**.

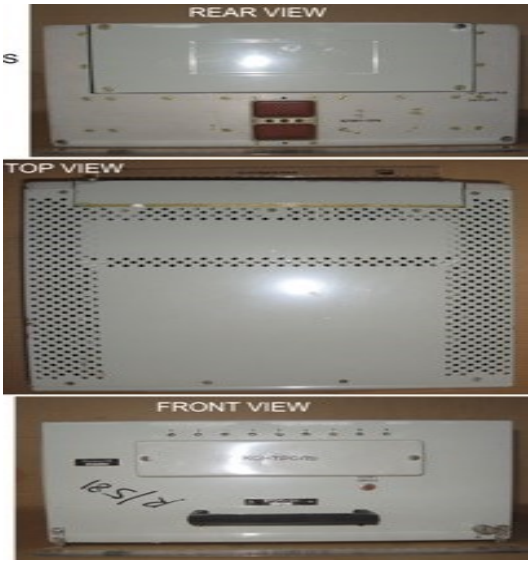
Annexure II
(Refers to Para 2)

TECHNICAL DESCRIPTION OF AGGREGATES

Sl No	Image	Part No/Description /GIG No/Purpose
	SU-30	
1		**Rack mounting frame 623-3DR/ GiG No. 837973:** Radar equipment IFF 623-3DR is mounting in this frame.The operation of 623-3DR is based on a principle of active interrogation – response. Sync pulses from RLSU trigger the equipment 623-3DR. It generates the interrogation codes of general and individual identification. The coded interrogation signal is modulated by the transmitter, which generates the UHF interrogation signals, that is radiated by directional antenna built into the RLSU antenna. The objects, equipped with transponders 4202R, receive them and after their decoding, generate outputs coded response signals. Item 623-3DR receives response signals, decodes them in compliance with the program and outputs the identification signals to interface unit as general identification signals. It interacts with the N011M radar for air to air target identification. (ii) IFF 4202R: It interacts with Item 623-3DR of interrogating aircraft.

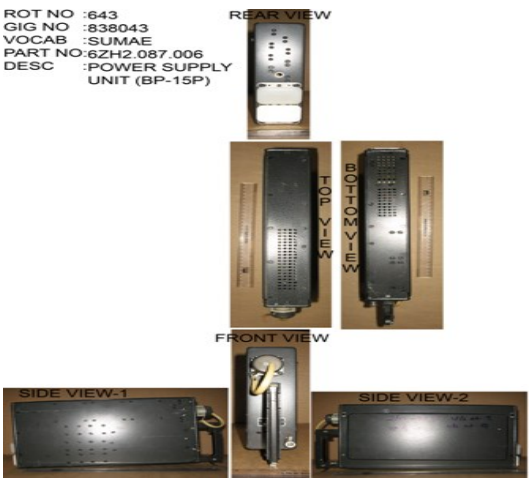
Sl No	Image	Part No/Description /GIG No/Purpose
	SU-30	
2		**Gyro Horizon from RIF-03 CompleteSet(HFRA)/ GiG No. 911956:** It provides the roll and pitch indications of the aircraft with respect to true horizontal plane. The front panel has a roll and pitch display protected by the glass. The horizon bar against the movable pitch drum gives the pitch indication and the roll indication is given by the movable index against the fixed scale. The front part also accommodates a fast erection knob.
3	 UFCP	**HUD (PDU+UFCP)/ GiG No. 912068& 592362):** **Pilot Display Unit (PDU).** It receives externalsignals from the aircraft system and utilises these signals to generate a display on the CRT. Then the display is projected onto a combining glass by an optical system. It consists of:- (a) An Optical Module. (b) Electronics Module. **UFCP (UP FRONT CONTROL PANEL)-** It is anoperational panel installed in the upper portion of the cabin to support HUD operation and avionics control and indicating functions. It provides some of functions of PS-05 control panel.

Sl No	Image	Part No/Description /GIG No/Purpose
	SU-30	
4		**Executing Block BI-U/ GiG No. 838040:** **Multi Purpose Actuating Unit (BI-U, BI-U2).** These blocks give information to block BPE/BPE-30PTM. Shape weapon character in 7 bit parallel code and transmit them. Transmission of presence, readiness, homing head lock on and separation signals to BPE and further to BTSVM-30PI. Execution of supply, preparation and launch commands in response to control commands from BPE. BI-U2 is a two point execution block, it has two channels. BI-U consists of:- (i) Control assembly - it forms the command launch/release. (ii) Synchronizing assembly - it forms symptoms and amplifying control commands of block BPE. (iii) Commutation assembly - for high current relays.
5		**TRANSRECEIVER OF 4202R/ GIG NO.-837955** **Purpose**:- Item 4202R is intended for friend or foe identification of the aircraft, in which it is installed. The transponder provides for the following:- (a) Reception and decoding of interrogation signal. (b) Producing response signals.

Sl No	Image	Part No/Description /GIG No/Purpose
	SU-30	
6		**Rate Gyro/ GIG NO.-836774** **Purpose**:- It is used to measure the angular rates acting relative to the roll, pitch and yaw axis of the aircraft and to feed an electrical signal in the form of DC voltage whose value is proportional to the angular rate and sign corresponding to the direction of the angular rate action. This consists of the following components. (i) RF rate gyro (ii) Amplifier (iii) Base
7		**SIMVOL M/ GIG NO. 837070** It is also called as **special digital computer**. The SIMVOL-M is an airborne digital computer designed tocontrol and check the entire K-Dcomplex and INCOM 1215A.It communicateswith external system RLSU, RIF, and KISS -2 M. It operates under the control of thepre-installed software. The SDC is located in the nose LG well, starboard side. The unitis intended for solving administrative, organizational and information problems for theintegrated communication complex K-DLI-01 and INCOM-1215A. The various functions of SDC are divided into four groups as follows: (a) Control over a communication complex equipment. (b) Organization and control over information exchange. (c) Information Processing. (d) The integration of devices inside a complex and in a group of adjacent complexes.

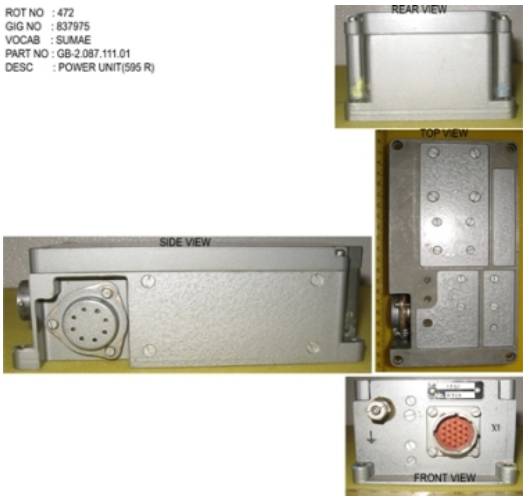
Sl No	Image	Part No/Description /GIG No/Purpose
	SU-30	
8		**GYRO TRANSMITTER UNIT/GIG NO. 836618**
9		**COMMUNICATION BLOCK (BS-30-PI) /GIG NO. 838048**
10		**PULSE UNIT OF 4202R /GIG NO. 837953** **PURPOSE:** Pulse Unit (200405R). The pulse unit is intended for decoding of interrogation signals of modes I, coding of response signals and conversion of voltage of the aircraft +27 V DC into DC and AC stabilized voltages. (c) Operative control panel (200806-1). The unit provides for the following

Sl No	Image	Part No/Description /GIG No/Purpose
	SU-30	
11	284  Fig-21.12: Linear Accelerometers	**LINEAR ACCELARATION SENSOR FROM SDU-10MK SET /GIG NO 836765** **PURPOSE:** Linear accelerometer is used to measure the linear acceleration acting on the aircraft along the measurement axis and to feed the electrical signal proportional to the linear acceleration in the form of DC voltage. The aircraft is equipped with four accelerometers for measuring linear accelerations Nz (±5 g) and four accelerometers for measuring vertical accelerations NY (±15 g). The signals from these accelerometers are applied to the FBW computer. The device is closed with a casing having a rubber gasket to ensure dust and moisture protection and plug connector to ensure coupling with the aircraft. Measuring axis index is marked on the casing. The sensitive element of the accelerometer is presented by a pendulum consisting of a moving frame suspended on the bearings. This accelerometer includes an inductance angle sensor, an amplifier and a torque to reduce the error.
12		**NET CENTRIC DIGITAL UNIT / RECORDER / GIG No-1495288** **PURPOSE:** Net centric digital unit is responsible for recording of all four video channels continuously. NCDU is installed in rear cockpitbetween Frame No.12 to Frame No.13 (Stbd side horizontal panel) in place of DVTR.

Sl No	Image	Part No/Description /GIG No/Purpose
	SU-30	
13		**TIME SPACING SIGNAL PROCESSOR/ GIG No-968543**
14		**INFORMATION DISTRIBUTION AND CONVERTOR BLOCK (BRPI30PI)/ GIG No-838047**
15		**POWER SUPPLY UNIT (BP-15P)/GIG No-838043** This unit converts the input voltage into a stabilized voltageof ±5V which is used by the integrated circuit of BS-30PI, BPE, BPE-30PTM,BTSVM-30P1 & PNP-30PI These constitute of transformers, rectifiers, and stabilizers.

Sl No	Image	Part No/Description /GIG No/Purpose
	SU-30	
16		**LINEAR ACCELARATION SENSOR FROM SDU-10MK SET/ GIG No-836764** Linear accelerometer is used to measure the linear acceleration acting on the aircraft along the measurement axis and to feed the electrical signal proportional to the linear acceleration in the form of DC voltage. The aircraft is equipped with four accelerometers for measuring linear accelerations Nz 15 g). The±5 g) and four accelerometers for measuring vertical accelerations NY (±5 g) signals from these accelerometers are applied to the FBW computer. The device is closed with a casing having a rubber gasket to ensure dust and moisture protection and plug connector to ensure coupling with the aircraft. Measuring axis index is marked on the casing. The sensitive element of the accelerometer is presented by a pendulum consisting of a moving frame suspended on the bearings. This accelerometer includes an inductance angle sensor, an amplifier and a torque to reduce the error caused by the angular acceleration. The operating principle of the device is based on the fact that a movement forcing the pendulum from the equilibrium position is created when the linear acceleration acts on the mass of the pendulum having a definite imbalance. The value and sign of the pendulum deflection corresponds to the direction of the acceleration. The angular deflection of the pendulum is converted in to an electrical signal proportional to the deflection angle. This is done with the help of the inductance angle sensor built around a RF inductance deflection converter circuit. The angle sensor signal is applied to the input of the feedback amplifier phase sensitive rectifier, converted into a DC signal and applied to the torquer of a magneto electric type. The torquer creates a compensation for the movement of inertia. The additional coil in the torquer makes it possible to tilt the motion system to feed the acceleration test signal during the ground check. The range of measurements is

Sl No	Image	Part No/Description /GIG No/Purpose
		SU-30
		as follows:- (i) Measurement range of Nz (DLU-29-5) for Yaw axis + 5 g (ii) Measurement range of Ny (DLU-31-15) for Pitch axis + 15 g (iii) Input power supply to DLU + 15V DC
17		**GYRO SENSOR UNIT FROM SDU-10MK SET/ GIG No-893941** It is used to measure the angular rates acting relative to the roll, pitch and yaw axis of the aircraft and to feed an electrical signal in the form of DC voltage whose value is proportional to the angular rate and sign corresponding to the direction of the angular rate action. This consists of the following components. (i) RF rate gyro (ii) Amplifier (iii) Base The range of measurements of different rate gyros is as follows:- (i) Measurement range (Wz) BDG-30-38 for pitch - 0-30°/Sec (ii) Measurement range (Wx) BDG-90-38 for roll - 0-90°/Sec (iii) Measurement range (Wy) DUS-35-30 for yaw - 0-30°/Sec ϕ(iv) Input power supply - 36V 400Hz3 & ±15VDC

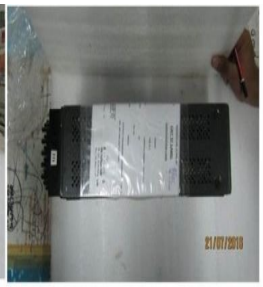
Sl No	Image	Part No/Description /GIG No/Purpose
	SU-30	
18		**UNIT FROM 30PI SET/ GIG No-838241** Mounting unit BM-30PI consists of BTsVM-30PI, BS-30PI, BPE-30PI, BP-063P, BRK-30PI, BI-U2, BRPI-30PI (2 pcs), BP-15P (2 pcs) (for station No. 1 & 2).
19		**UNIT OF 623-3DR SET / GIG No-837970**
20		**UNIT FROM 623-3DR SET/GIG No-837975** **Purpose:-** It makes a part of RLSU-30 and is designed for:- (a) Producing interrogation signals for general and individual identification. (b) Reception and decoding of response signal. (c) Transmission of code analysis result to coupling unit (N11-5-02M). **Composition:-** (a) Transreceiver with mounting frame (56R) (i) Transmitter (556R).

Sl No	Image	Part No/Description /GIG No/Purpose
	SU-30	
		(ii) Receiver (U30601R). (b) Pulse Unit (549R). (c)Response Signal Analysis Unit (5410R). (d) Power Supply Unit (595R). (e) Voltage Converting Unit (5911R). (f) Supplementary Control Panel (539R). (g) Antenna (24 vibrators co-located with N011M Ae)
21		**Auxiliary control panel 539R** The unit is intended for:- (a) Ground serviceability check of equipment and its units. (b) Setting of codes. The controls arranged on the face panel of unit (Ref Fig 11.1) are as follows:- (a) Selector switches A1, A2 (used for setting of operational & std. by code ofmode I) (b)Selector switches B1, B2 for accomplishment of ground checks of units for serviceability. (c) Serviceability indication lamp.
22		**HUD CAMERA CHVC(DVRS)/ GIG No-375938** It is also called as TV Camera. It is available at Input channel no.22 of TV Signal Conversion and Switching Unit.

Sl No	Image	Part No/Description /GIG No/Purpose
	SU-30	
23		**Crash Survivable Memory Unit (CSMU)** Onboard-protected disc drive (CSMU) installed between frame no.15-16 LH side in panel no.103AL and it is designed for re-recording flight parametric data, voice data and always storing the flight data of last 25 hours last 30 minute voice data of each cabin and last 2hour of combined voice which can be down loaded in case of flight accident. It is designed to withstand severe environmental conditions in the event of an a/c crash. In CSMU unit, data are stored in 512 words per second (each word consisting of 12 digit word) on solid-state devices in two circular buffers, one for voice and other for flight data. CSMU unit is painted in bright orange colour and has metal strip with inscription " This equipment contents static sensitive devices" & light reflecting strip with inscription " FLIGHT RECORDER DO NOT OPEN ". It has an underwater locator BEACON (ULB) which starts transmitting sound waves at a frequency of 32 K Hz. immediately after coming in contact with water. The down loading of data from CSMU unit is carried out by two methods. First one by connecting (CCU) commercial computer unit (Pt no- 6610-CCU-30-8000) to the MPU through 'Ethernet' on the aircraft and down loading the data from CSMU and the second method CSMU unit directly can be connected to the CCU through special power supply unit (ground support interface unit (Pt no-6610- CCU-30-8004) and data can be down loaded in the laboratory.

Sl No	Image	Part No/Description /GIG No/Purpose
	SU-30	
24		**BKV-2V-1 (ALTITUDE AND HEADING REFERENCE SENSOR) (HFRA) / GIG NO. 839147** The navigational and piloting parameters are available to pilot in SU-30 MKI through Optro-Electronic Navigation and Targeting Integrated System 'RIF', in which twosystems take part for measuring navigational parameters as main and Standby systems.SIGMA-95 (LINS) is the main and SBKV (Strap down Attitude and Heading reference System)is the Standby system. When the main system SIGMA-95 (LINS) fails, then the SBKV providesthe data. **Purpose**: The Strap down Attitude and Heading Reference System provides the followingdata:- (a)Roll and Pitch angles (b)Gyroscopic, corrected (directional Gyro Compass) and gyro magnetic heading (c)Components of absolute angular rate (d)Components of linear acceleration (e)Components of absolute linear velocity
25		**INGPS (INERTIAL NAVIGATIONAL GLOBAL POSITIONING SYSTEM)** Its function is based on the principle of Strap down platform system. In the strap down design, the Gyros and accelerometers are connected to the structure and the Navigation computations are performed in the Analytical frame of reference. It is defined by the computations and not that which is physically materialized. It's orientation and Horizontal positions are maintained by means of computation. Like for a stabilized platform, this system has to be aligned and the navigation computations need to be initialized, once the alignment is terminated. To obtain speed rotation and acceleration around each axis the Ring Laser Gyros and accelerometers are fitted. **Purpose of INS/GPS**: Main functions of the INS/GPS are:- (a)Embedded GPS/GLONASS receiver

Sl No	Image	Part No/Description /GIG No/Purpose
	SU-30	
		management. (b) Inertial sensors management. (c) Pure Inertial Navigational Data procesing. (d) GPS/Navigation data processing. (e) Hybrid Navigation data processing. (f)INS/GPS monitoring and failure management. (g) External input/output management: - (i) MIL- STD 1553B Bus. (ii) ARINC/GOST Bus. (iii) Analogue outputs. (iv) Discrete Input/output.
26		**Directional Vertical Gyro Unit (BKV-2V-1)** **Purpose** :- DVGU is the mainframe of the system executing all principal functions such as input data measurement of main parameters and delivering and calculation, interface and BIT operations. The main functions of the system are determination and output of:- (a) Roll and pitch angles. (b) Gyroscopic, corrected (directional gyro Compass) and gyro-magnetic heading. (c) Components of absolute angular rate along the axes of DVGU installation coinciding (with accuracy up to installation error) with aircraft body axes (BA). (d) Components of linear acceleration along the axes of DVGU installation. (e) Components of absolute linear velocity. Determination of parameters is based on physical measurements of absolute angular rate, aircraft phantom linear acceleration and their subsequent mathematical processing.

Sl No	Image	Part No/Description /GIG No/Purpose
	SU-30	
27	   GIG NO : 1487690 VOCAB : SU-30 PART NO : KIVSH-468153-006-11i DESC : LIMITING SIGNAL COMPUTER VSO-3-1 WITH VER PO NO.7	**VSO-3-1 LIMITING SIGNAL COMPUTER/ GIG No-1487690** **Purpose:**- This is designed to compute true values of Angle of attack, Sideslip angles, maximum and minimum permissible values ofindicated air speed, angle of attack, vertical acceleration (g load), max permissible Mach No, Sideslip angle and transmits them to the aircraft systems. It computes the flight path angle based on the pitch angle it receives from the SIGMA-95. It monitors the serviceability of the system and sends the fail warning signals to the indicator and MFWS whenever the system fails. It is installed on PF-55 mounting bracket located in the nose wheel bay port side.
28	GIG NO :1204824 VOCAB :SUHUD PART NO:4450-1000-05 DESC :HUD    	**HUD GENERAL ASSEMBLY (HFRA)/ GIG No-1204824/ 1383347**

Sl No.	Image	Description /GIG No /Part No /Purpose
Mi-17		
GROUP I		
01		**Air Data Computer / GiG No.1448187:** **1. Purpose.** Air Data Computer (ADC) computes the flight altitude, forward air speed and vertical speed data using the parameters sense by the pitot static system. These calculated data are further delivered to the Mission Computer (MC) of the EFMIS for display in the MFDs. These data are also delivered to the AFCS for automatic flight control. **2. Technical Data.** (a) Pressure altitude range: -500 to +7000 mtrs (-1640 to +22966 ft.) (b) Relative altitude range: -300 to +7000 mtrs (-984 to +22966 ft.) (c) Indicated Air Speed range: 50 to 450 Kmph (27 to 243 knot) (d) True Air Speed range: 70 to 450 Kmph. (37.8 to 243 knot) (e) Vertical Speed range: -30 to +30 m/s (f) Static Pressure range: 308 to 806 mm of Hg

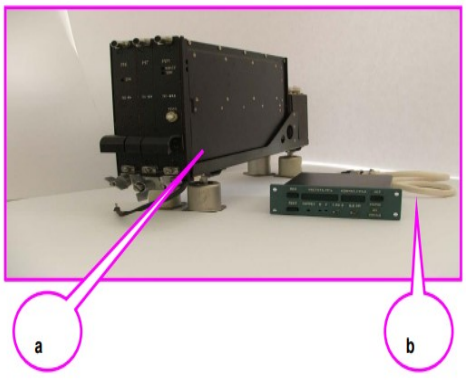
		(g) Pressure altitude error: from -500 to +1000m at 7000m ±6 m ±14 m (h) Relative altitude error: from -500 to +1000m at 7000m ±8 m ±16 m (j) Indicated Air Speed error: ±8 to± 2 Kmph(50 to 450 Kmph) (k) True Air Speed range: ± 8 to ± 4 Kmph(70 to 450 Kmph) (l) Vertical Speed error at: speed of 0 m/s speed -30 to +30 m/s ± 0.3 m/s ± 0.6 m/s (m) Static Pressure error: ± 1 mm of Hg (n) Power supply: 115 V 400 Hz single phase **3. <u>Power Supply</u>.** (a) 27 V DC from Battery Bus Bar through ADC fuse. (b) 115V AC 1phase 400 Hz AC from Inverter Bus Bar.
02		**<u>Converting and Computing Unit/ GiG No.1433309:</u>** **1. <u>Purpose</u>.** The unit performs the function of reception and calculation of input analog and event discrete signals and conversion into digital code. It also receives information from interfaced system via CCLs. The unit has a modular arrangement and comprises of: - (a) Computing and generation module MVF-1-05 (CGM). (ii) Qty two Event signal receiving modules MPD-14 (ESRM). (iii) Qty two Analog signals reception modules MPD-23 (ASRM). (iv) Power Module MP-53 (PM). (b) Two types of channels in series are used in the unit for exchange between the modules RS 422A and LVDS. 2. **<u>Technical Data</u>.** **3. <u>Power Supply</u>.**
<u>GROUP II</u>		

GROUP III		
GROUP IV		
03		**Flight Data Recorder (GIG No: 849572)** **(1) Purpose.** FDR is intended for collecting and recording the parameter data and storing them in case of emergency in flight. The FDR performs converting of the flight parameters, coming from the sensors, into digital code and its subsequent recording in the solid-state memory module of the ZBN-1-3 ser. 3 guarded airborne memory unit. **(2) Main Components** (a) Flight data acquisition and processing unit BSPI-4-2 ser.2 (b) Control panel PU-25-1E (c) Guarded on-board memory unit ZBN-1-3 ser.3 (d) Mounting frame RA-37K **(3) Sensors**. The flight data recorder system comprises following sensors: (a) Altitude sensor DV-15 MB (b) Indicated airspeed sensor DAS (c) Acceleration sensor ADIS-2-2 (d) Acceleration sensor ADIS-2-3 (e) Eight angular displacement transmitters MU-615A (f) Module M11A two units (g) Pressure switch MSTV-2.5 (j) Besides, flight parameters measurements are carried out also by means of sensors of helicopter standard equipment (4) **Technical specifications.** (a) Duration of the saved recorded information 50 Hrs(b) Recording rate 64 words per second. (c) Working temperature from - 60 to +60°C. (d) Time of readiness for operation after being switched on, not more than (i) At OAT from +60 to minus 40 °C 3 min. (ii) At OAT from minus 40 to minus 60 °c 15 min. (e) Continuous operating time Not more than15 Hrs **(5)Power supply**. The FDR is supplied with power from the helicopter power supply sources with a voltage from 18 to 31 V.
GROUP V		

04		**Multifunctional Display Unit (MFD/ Mi-17 V5)** Reckoning the helicopter present position (PPOS) coordinates. Correcting the reckoned PPOS using information from the global positioning system (GPS). Visual correction of PPOS with the use of typical reference points Displaying the flight route with provision for change of the image scale and quantity of the displayed layers Receiving, processing and displaying navigation information
GROUP VI		
GROUP VII		

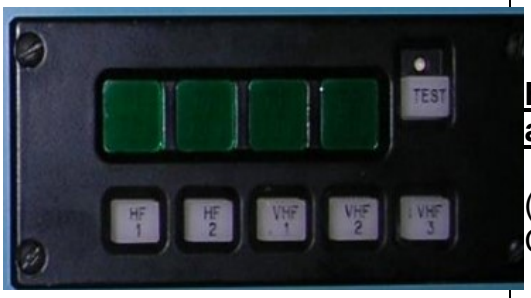
Sl No	Image	Part No/Description /GIG No/Purpose
AN-32		

1.	 (a) HF Control unit. (b) HF Transceiver unit. (c) HF Antenna Coupler Unit.	**HF9000/ HF Communication Set /** HF-9000 Radio communication system is intended to maintain long-range two-way voice communication between the aircraft crew and ATC ground stations and crew of other aircraft using programmable preset channels on discrete operating frequencies from 2.0000 to 29.9999 MHz. **Description.** HF-9000 system provides 99 user programmable preset channels & 2, 80,000 discrete operating frequencies covering the 2.0000 to 29.9999 MHz frequency range in 100 Hz steps. Power supply of HF-9000 system is switched on/off with the help of HF-OFF switch arranged on co-pilot's vertical console panel. HF-9000 system operates in combination with Selective Calling System. During operation or built-in test, HF-9000 system is capable of detecting a condition in the form of unsolicited operation requiring pilot's attention, but not preventing the use of HF-9000 system:- (a) MSG 3040 (high vswr)-for a defective antenna system. (b) MSG 3020- for antenna coupler unit high temperature. (c) MSG 5016- for power amplifier high temperature. (d) MSG 3010- for a fault in tune system. **Technical Data:** (a) Frequency range - 2.0000 to 29.9999 MHz (b) Frequency steps - 100 Hz (c) Average transmitter o/p power - 100 watt (d) Peak transmitter output power - 175 watt (e) Antenna coupler tuning time to learned frequency - 40 ms (f) Tuning time to new channels: (i) Nominal - 1 sec (ii) Maximum - 6 sec

		(g) **Receiver sensitivity**: (i) UV, LV - 0.5 μV (ii) AM - 3 μV (h) **Duty cycle**: (j) Receive - 2 min(ii) Transmit - 1 min (k) **Operating temperature range**– from - 55°C to +71°C (l) Permissible relative humidity during exposure to cyclic temperature effects within the period of 48 hours - 95%
2.	 a. Receiver Unit. b. Control Panel.	**Radio Receiving Unit VOR/ILS (KURS-93M)/.** The BSG (receiver) unit of the KURS-93M system comprises the following modules: (a) **Localizer modules (МК).** These modules are intended to receive, amplify, and convert signals of localizer and glide slope beacons of ILS landing system and navigation VOR beacons. (b) **Glide slope modules (МГ).** These modules are intended to receive, amplify, and convert signals of localizer and glide slope beacons of ILS landing system and navigation VOR beacons. (c) **Marker module (ММ)**. It is intended to select, amplify the signals of marker beacons and to convert these signals for light, audio and tone indication in the moment of flying over a marker beacon. (d) **Secondary Power Supply module (МВИП)**. It is intended to supply stabilized voltage to the system units. (e) **Shock Mounting (ВС).** The receiver units are installed in the shock mounts, which is secured to the aircraft structure. (f) **Power splitter**. It is intended for splitting the signals received by localizer and glide slope

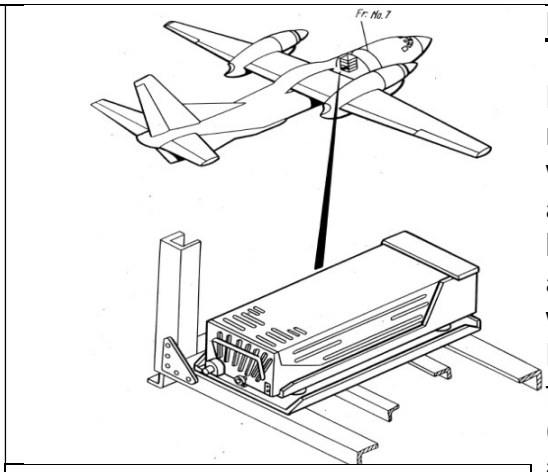
		antenna for two receiver units. (g) **<u>Localizer Antenna</u>**. It is intended for receiving the signals of landing localizer beacons and VOR beacons. (h) **<u>Glide slope Antenna.</u>** It is intended for receiving the signals of glide slope beacons of a landing system. (j) **<u>Marker Antenna.</u>** It is intended for receiving the signals of ground marker beacons.
3.		**<u>BPK-2V/Conversion and Testing unit/:</u>** BPK-2B Conversion and Testing unit is intended for receiving data in the form of analog and digital signals, converting this data and gives output in the form of analog and digital signals.The unit is interfaced with the following aircraft systems: (a) Gyro magnetic compass (GMK-1GE) (b) NLI No.1 & 2 (NPI 1 & 2) (c) AGD (Role & Pitch Signal) (d) RDR (RDR-2100 Weather Radar) (e) USHU-2K (BHI) (f) ARC-610A No.1 and No.2 (ADF-1 & 2) (g) KURS 93M No.1, No.2 (h) CAS – 100 (TCAS) (j) SRPPZ – 2000. (EGPWS) **<u>Technical data</u>**: (a) Power Supply : 27V DC (b) Power consumption : 20 W max (c) Warm-up time : 10 sec max (d) Continuous running time : 24 Hrs min

4.		**SRPPZ-2000/ENHANCED GROUND PROXIMITY WARNING SYSTEM/:** **Introduction**: SRPPZ-20000 EGPWS is an advance GPWS with enhanced features and give graphical presentation of current terrain on the 'Multi Functional Display' in 'EGPWS Mode', 'Altitude Call Outs' in the process of landing approach and warning during 'Altitude Warning Switch Mode' at premature descent during flight in the zone of the aerodrome. **Purpose**: (a) The СРППЗ-2000 enhanced ground proximity warning system (EGPWS) when interacting with aircraft avionics is used to alert the crew of a possibility of getting into a situation which can potentially result in inadvertent collision with ground or water surface. (b) Alert to the crew is implemented by means of audio and visual 'caution and warnings', as well as by highlighting on the display with colors attracting attention (bright yellow, bright red) of the areas of terrain and artificial obstacles which are potential collision hazard to the aircraft, when flying along the predictable flight path. (c) During operation, the system uses information from three data bases i.e. terrain, runways and artificial obstacles data, stored in the memory of the computer. The airports and artificial obstacles data base are to be updated regularly. The terrain database is updated for any changes available or when the flight region itself is changed. **Principle of operation**: (a) Operation of the EGPWS is based on processing of worldwide digital data of earth's terrain, already stored in the computer as well as its current location of the terrain, runways and artificial obstacle data received from GPS. (b) A visual orientation of the terrain feature in the flight zone is displayed on the MFD in

		various colors depending on high and low points of the terrain. (c) The runways in the form of segments of 'white lines' corresponding to actual runways in length and orientation, as well as artificial obstacles in the form of 'small squares with white edges' are displayed on the background of terrain map. **Technical Details.** (a) Power supply 27V DC (b) Power output 20 Watts (c) Fuse 1 Amp (d) Weight of system Not more than 2.4 Kg (e) SRPPZ-2000 Computer Not more than 1.6 Kg (f) SRPPZ-2000 Frame Not more than 0.8 K
5.		**ITsVM.464338.01-01/Selective Calling System :** The Selective Calling System (SELCAL) is designed for transmitting light and aural warning indication to the crew members from the HF radio station after receiving encoded SELCAL from the ATC controller matching SELCAL code tuned on aircraft. **Features of the Selective Calling System are**: (a) Push-Button Dialing of the Interrogation Code. (b) Electronic storage of the SELCAL code even after shut-down or disconnection of the power supply. (c) SELCAL produces event signal (ES) about reception of a call, indicating arrival/presence of a call and resets a call. (d) SELCAL allows manual coding of the

		aircraft specific SELCAL code. The SELCAL code is stored in electronic memory incorporated in the unit. (e) SELCAL has built-in test equipment (BITE) for testing its serviceability. **Technical Details:** (a) Number of call channels - 1 (b) Aural warning indication electric signal power - Not less than 100 mW at load (600±90) Ohm **Power supply voltage**: (a) Direct current - From 18 to 33V over two Independent channels (b) Alternating current - 5.5 V 400 Hz (for SELCAL Code indication and buttons illumination) **Consumed power**: (a) For 27V circuit - not more than 10W (b) For 5.5V, 400 Hz circuit - not more than 3VA (c) Readiness time after turning - not more than 10sec (d) Time of continuous operation - is not limited (e) Mean Time Between Failures - not less than 10,000 Hrs (f) Operating temperature range - from minus 40° to +55° C

6.



RAM-700A/Radio Altimeter System:

Radio altimeter is 'C' band 'frequency modulated continuous wave' (FMCW) radar, which provides a very dependable and accurate AGL (altitude of aircraft above ground level). It is very accurate and highly reliable altimeter. The equipment is compact, light in weight and utilizes all solid state circuitry. Radio altimeter performs the following functions

(a) Visual indication of current flight altitude above ground level.

(b) Visual indication of radio altimeter fault is indicated by a flag overlapping the altitude meter

(c) Llight warning of passing a preliminarily specified altitude i.e. a preset decision height (DH) and a light warning of flying below this height.

(d) Functional test in built-in test mode

Technical Details.

Sl No.	Description	Specification
1	Range of measurable altitude	0 to 1500 mtrs
2	Range of operating frequencies	4200 to 4400 MHz
3	Transmitter Power	250 mw
Sl No.	**Description**	**Specification**
4	Inaccuracy in altitude measurement in the range	
	0 – 30 mtrs	1 m ± 3%
	30 – 1500 mtrs	± 4%
5	Inaccuracy of DH signalization	± 0.5 mtrs
6	Time of continuous operation	12 hours
7	Power Consumption	80 VA (Trans-receiver)
		20 VA (Indicator)
8	Power Supply	115 V 400 Hz 1ϕ

Operation: The process of altitude measuring by the radio altimeter is achieved as follows:

Frequency modulated HF oscillations with average frequency of 4300 Hz from the transmitter through a power divider reach the transmitting antenna and is emitted in the

		direction of the ground surface. A signal reflected from the ground surface is received by the receiving antenna, passes a high-frequency switch, and a mixer. At the same time, the mixer receives a heterodyne signal as part of power supplied from the receiver through an attenuator. The mixer combines the heterodyne and the reflected signals, and produces a signal of the beat frequency difference which is amplified by the low frequency amplifier to the amount required for normal operation of the preliminary limiter. A beat signal, amplitude-stabilized by the limiter is received at the meters.
7.		**KDM-706A DISTANCE MEASURING EQUIPMENT:** **Introduction**: The KDM-706A distance measuring equipment (DME) is installed in the aircraft flying on international routes. The DME operates with ground DME and TACAN (Tactical Air Navigation) beacons. There are two KDM-706A 'Distance Measuring Equipments' installed in aircraft and controlled from KURS-93M control panel. It has reduced cockpit load for the user and improved aerospace safety. **Purpose:** The KDM 706A DME system is composed of a Transreceiver, KDI-574 Master indicators, KDI-573 Slave indicator, KURS control Panel, and the KA-60 DME Antennae. The system provides distance, ground speed and time-to-station information to the aircraft pilot, co-pilot and navigator. **The DME provides**: (a) Slant range values to the DME indicators in NM and 'Navigation Landing Indicators' (NLI) in both NM & KM. (b) Display approximate ground speed of flight and time of flying to a beacon into DME indicator. (c) Providing to Morse coded audio identification signals of selected ground beacons in the headsets of all crew members.

		Special Features: It is the product of Honeywell Incorporation, USA. Following are the special features of KDM-706A Distance Measuring Equipment. (a) There are two sets of KDM-706A Distance Measuring Equipment. (b) It has an integrated control system. The DME uses channels that are paired with VOR channels. The selection of VOR frequency on the KURS control panel automatically selects and tunes the desired DME channel, to allow checking its operability. (c) DME frequency programming is performed through KURS-93M No. 1 & 2 control panel. (d) Listening to audio signal from ground beacon is provided for all crew member provided Radio selector switch is selected in MF (CP) position on AA3 Junction box of all crew member. (e) It has two antennae located at lower fuselage between Frame no. 16- 17 and 22-23. **Principle of Operation:**The DME transmits coded pairs of interrogation pulses through the antenna. A ground beacon receives these coded pulses and decodes them and transmits in reply coded pair of pulses with a delay of 50 microseconds in synchronism with each interrogation. The reply signal of the beacon received by the DME is amplified, decoded and output into the circuit of a distance meter. The time period between the moment of transmitting of interrogation pulse and receiving reply pulse, which represents the slant distance between aircraft and beacon, is converted into numerical code corresponding with the distance value. When a beacon operates in the identification mode, DME receives beacon identification signals, which are processed by the audio identification circuit and fed into the ICS system. **Technical Specifications.** Transmitter Frequency - 1025 to 1150 MHz

		Receiver frequency - 962 to 1213 MHz Number of channels – 252 Transmitter power - 250 Watts Receiver Sensitivity - (- 85dbm) minimum Power requirement - 18 - 33V DC
8.	 	**<u>CAS-100/TRAFFIC ALERT & COLLISION AVOIDANCE SYSTEM:</u>** CAS-100 Traffic Alert and Collision Avoidance system (TCAS) is one of the most useful flight safety radio navigation equipment installed in An-32RE aircraft. TCAS monitors the airspace surrounding own aircraft through interrogating the transponder of intruding aircraft. The traffic around own aircraft is continuously monitored and analyzed by TCAS. The nearby transponder-equipped aircraft are shown on a traffic advisory display. The TCAS system gives traffic advisory alerts and vertical manoeuvring resolution advisories during danger conditions to prevent airborne collisions. TCAS can track as many as 45 aircraft, display up to 30 of them and can coordinate a resolution advisory for up to three intruders at once. The advisories are always based on the least amount of deviation from the flight path while providing safe vertical separation. **<u>Purpose and Design Features.</u>**The CAS-100 system is a traffic alert and collision avoidance system (TCAS) and it is intended to detect hazards of collision with other aircraft equipped with radar transponders of the RBS type Modes ‘A’, ‘C’ or Mode ‘S’ and to display advisories for vertical manoeuvres and the vertical speed to avoid potential collision. Two TCAS equipped aircraft will coordinate their resolution advisories using a Mode ‘S’ transponder air to air data link. The coordination ensures that complementary advisories are issued in each aircraft for the crew to promptly but smoothly follow the advisory. Since manoeuvres are coordinated, the crew should never manoeuvre in the

opposite direction of the advisory. The Mode 'S' transponder of the TCAS provides operation in ELS mode (standard surveillance), i.e. execution of the FID flight identification function, which facilitates the ATC controller to monitor the aircraft more accurately.

Technical Specifications.

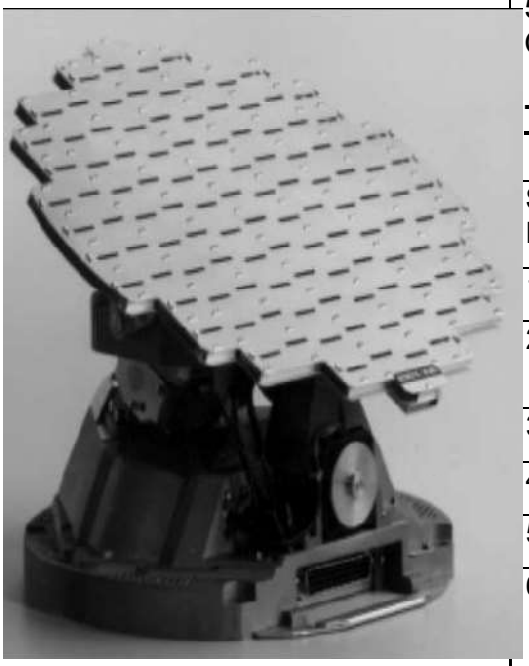
TRA-67A

1	Power input	115V AC 400 Hz 1Φ
2	Transmitter RF Power	400 Watts nominal
3	Operating Temp Range	-15 °C to +55°C
4	Storage	-55°C TO +85°C
5	Weight	6.35 KG
6	Cooling Requirements	Forced air optional

TPA-100A

1	Power requirements	28V DC or 115V AC
2	Power Input	60 Watts Maximum & 50 Watts nominal
3	Bearing accuracy	± 2° RMS
4	Transmitter RF power	400 Watts Nominal
5	Operating temp range	-55°C to +70°C
6	Storage	-55°C to +85°C

9.



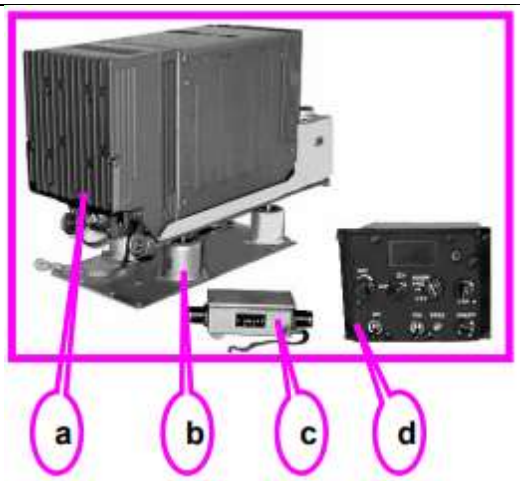
R/T071-01550-0101/Tx-RX-ART-2100/ WEATHER RADAR

Weather Radar (ART-2100)(GIG-1422109/1401132)**.**Weather Radar (ART-2100) is a Trans-receiver is intended to radiate UHF signals, receive return signals, select and to amplify. It consists of a receiver and a transmitter with antenna, designed as a single unit. It consists of three LRUs manufactured by Honeywell installed in AN-32 RE A/C. Its major components are EX-500 and CM-2000.EX-500(MFD) Per off Qty two & CM-2000 per off Qty-01 installed in An-32 RE aircraft.

Technical Specification

SL NO	Nomenclature	Details
1	Frequency	9375 ± 30 MHZ
2	Transmitter Power	6 KW (Max)
3	Pulse Width	4 Micro-Seconds
4	PRF	106.5 ± 5 HZ
5	Range	320 NM
6	Colour bands	Black, Green, Yellow, Red & Magenta
7	Range displayed	5, 10, 20, 40, 80,160, 240, 320 NM
8	Tilt Angle	±15°
9	MPEL	10 Feet & 220° Sector
10	Antenna Size	12 Inches
11	Antenna Scan Angle	100°
12	Power requirements	27V DC 2 Amps

10.		**GPS (SN-4312-02) SYSTEM:** GPS (SN-4312-02) System (GIG-1418296)isinstalled in the aircraft flying on international routes. SN4312-02 airborne equipment is a receiver of GPS NAVSTARand GLONASS satellite navigation. This system provides positioning of aircraft withinthe service area of navigation satellites. The basic principal is that a number ofsatellites in each orbit, radiate a series of precisely timed radio signals. This systemperforms various navigational tasks. Its NDB data should be updated after every 28days. It Consists of two LRUs (including GPS Amplifier MWPFC QTY-01 GIG-1418295) manufactured by State Enterprise Ukraine and installed in AN-32 RE aircraft. **<u>Technical Specification.</u>** Navigation error (0.95) : with HDOP ≤ 1.5 m Accuracy in Latitude & Longitude (GNSS):44 m Accuracy in Altitude (GNSS):70 m Accuracy in Ground speed vector (GNSS):0.3 m/s Number of radio channels: 24 Time of continuous work:24 Hrs Operating frequency range:1570 to 1610 MHz Power supply: 27V DC
11.		**<u>Air data computer with Display (AD-32) /</u>** AD-32 which produces the value of pressure altitude for the auto tilt operation mode.

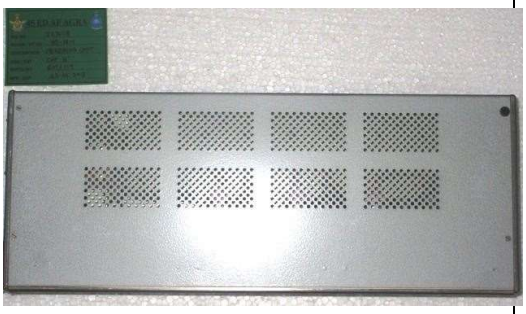
12.		**R-800L2E** V/UHF system is intended for voice and data exchange of aircraft between each other and ground tower. The radio set provides instant selection of preset and pre-tuned channels.

Sl. No	Image	Description / Part No / Purpose
	IL-76 / 78 & AWACS	
01		**ELECTRONIC ALTIMETER/ 1331351 / VBZ-SVS-A-TS-M** Used to measure altitude of the aircraft

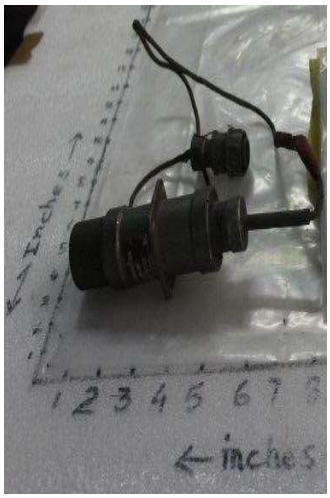
02		**UNIT / 536561 / BKN-115V** the БКН115 В voltage protection unit is designed to prevent AC or DC external power sources supplying intolerable amount of electrical power from being connected to the aircraft electrical system and disconnect the external power sources, in case in the course of operation the parameters of the electrical power go beyond the tolerated limits. In the present aircraft the voltage protection unit is used only when connecting an AG three-phase external power source.Provision is made in the voltage protection unit to perform the following: Protect from connection of a power supply source with a voltage in any phase below 108 to 114 VAC and above 123 to 129 VAC, as well as disconnect the power supply source at voltage drop down to 101 to 107 VAC and at voltage rise above 123 to 129 VAC in any phase with a time delay of 6.9 s, maximum. Protect from connection of a power supply source with a frequency below (385+5) Hz and above 410 to 420 Hz, as well as disconnect the power supply source at frequency drop down to 370 to 380 Hz and frequency rise up to 420 to 430 Hz with a time delay of (6+0,9) s. At frequency drop down to 335 to 320 Hz and at frequency rise up to 465 to 480 Hz the voltage protection unit disconnects the power source without delay. Protect the aircraft AC electrical system against connection of an external power source with wrong phase sequence. Protect the aircraft AC electrical system against connection of an external power source in case the neutral wire, in the connection cable is broken. All types of protections provided by the voltage protection unit are not reversible. To reconnect the AC external power source to the aircraft electrical system after the parameters have been normalized; it is necessary to turn off and turn on again the EXT PWR switch located on the power control panel. The voltage protection unit employs an integral self-test facility. In case of failure, with the EXT PWR switch (panel 28) set to ON, the БКН FAIL (ОТКАЗ БКН) light illuminates on the protection unit face panel.Besides, arranged on the face panel are: a handle for carrying and installation on the mount, ground connection output for connecting a bonding strip(placarded X3), button И1 PROTECTION RESET (ВОЗВРАТ ЗАЩИТЫ И1)(not operationalwith this item). Besides, receptacle X2 TEST (КОНТРОЛЬ X2) closed with a panel is also located on the voltage protection unit face panel. The receptacle is used for testing signal parameters in desired points of

		the circuit when tracing and correcting troubles.
03		**AIR SPEED INDICATOR / 855571/ KUS-730/1100** Used to display airspeed inside cockpit.
04	Item Code : 793357 Sec Ref No : Part No. : 2UE-6B Description : DUAL AMPLIFIER REAR VIEW  SIDE UPPER VIEW  FRONT VIEW  SIDE VIEW 	**DUAL AMPLIFIER / 793357 / 2UE-6B**

05		**JUNCTION BOX / 907032 / N-20**
06		**HEADSET / 850054 / GSSHA18**
07		**VOICE MESSAGE UNIT / 46563 / RI-65-10**

08	 GIG NO: 785265 VOCAB: STA REF/PART NO: MI585300001 DESCRIPTION: PRIMUS RT	**PRIMUS RT / 785265 / MI585300001** The basic function of the Receiver – Transmitter unit in Primus-500 is to generate a high level RF Pulse to be used by antenna for transmission and to amplify the received signals to a level where it can be used by indicator for display
09		**RX TX PRIMUS / 785271 / MI-585-300-1**
10		**DME INTERROGATOR / 223108 / BI16-1** These distance measuring equipment are fitted in IL-76 ac to find out the slant distance of the aircraft with respect to the ground beacon to which it is tuned. The maximum range is 200 Nautical miles for SD-67M & 370 KM to SDK-67.

11		**ACTUATING UNIT / 900173 / BI-2A**
12		**TEMPERATURE REGULATOR / 354689 / TER-1M**
13	 GIG NO. : 1376762 PART NO. : 1018K866-001 DESCRIPTION : AVIATION HEAD SET X PUBLICTION : RMM AEW-A-61-00-00-00E-310B-A-FM	**AVIATION HEAD SET X / 1376762 / 1018K866-001** Communication on MSA

14		**Potentiometer (Acceleration Sensor)/ GIG No-64922** **Functionality.** It provides vertical and horizontal 'g' reading to FDR. **Technical Specifications** Horizintal – (-1.5 to 1.5 g) Vertical – (-2 to +5g)
15		**BUNPP /Amplifier W/C/ GIG No-34834** Receive signal from combined course indicator (NPP) and further feed to Auto-pilot system for proper functioning of AFCS **Technical Specifications** Voltage - 27 V DC,36 V AC, 400Hz **Operating Temperature Range** -50^0 C TO $+60^0$ C
16		**P1V-MK Ref Frequency Transmitter/ GIG No-346123** The frequency synthesizer feeds the receiver exciter unit with very stable low frequency and generates required frequency for formation of carrier frequency during transmission. **Technical Specifications** Frequency range- 2-23.9999 MHz (can be extended upto 27.9999 MHz within receive mode) Frequency spacing : 100 Hz Total no. of channels : 2,20,000 Power supply : AC115±7Vor200V±12V, 400Hz±20&DC 27V± 2 V

17		**REEL CONTROL BOX / 1175113 / 340-89-40-90195-101** Fuel reel control mechanism of refueling pod
18		**SERVO VALVE POSITIONER ASSEMBLY / 1049170 / 340-89-21-90060-101** Servo control valve of refueling pod

19		**OXYGEN REDUCER / 44493 / KR 26A** Mechanical item used to reduce pressure of oxygen
20	PT NO:- MiG-21/ MPRF-1M DES:- LANDING LIGHT (LH) GIG NO:- 114912 	**LANDING TAXING LIGHTS / 114912 / MPRF1M** Landing and taxi light of aircraft
21		**OXYGEN REGULATOR / 798789 / KP24M** Oxygen regulator

Annexure III
(Refers to Para 3(j))

QUANTITY ARISING PER YEAR FOR REPAIR

Sl No.	Item (SU-30MKI)	QTY per year
1	Rack mounting frame 623-3DR	8
2	Gyro Horizon from RIF-03 Complete Set(HFRA)	8
3	HUD (PDU+UFCP)	8
4	Executing Block BI-U	8
5	Transreceiver Of 4202R	8
6	Rate Gyro (Angular-Rate Sensor from SDU-10MK set)	8
7	SIMVOL M	8
8	Gyro Transmitter Unit	8
9	Communication Block (BS-30-PI	8
10	Pulse Unit of 4202R	8
11	Linear Accelaration Sensor from SDU-10MK SET	8
12	Net Centric Digital Unit / Recorder	8
13	Time Spacing Signal Processor	8
14	Information Distribution And Convertor Block (BRPI30PI)	8
15	Power Supply Unit (BP-15P)	8
16	Linear Accelaration Sensor From SDU-10MK Set	8
17	Gyro Sensor Unit From Sdu-10MK Set	8
18	Unit From 30PI Set	8
19	Unit Of 623-3DR Set	8
20	Unit From 623-3DR Set	8
21	Unit 539R (Auxillary Control Panel Of 623-3DR)	8
22	Hud Camera CHVC(DVRS)	8
23	CSMU (Crash Survival Memory Unit)	8
24	BKV-2V-1 (Altitude And Heading Reference Sensor) (HFRA)	8

Sl No.	Item (SU-30MKI)	QTY per year
25	Ingps (Inertial Navigational Global Positioning System)	8
26	Directional And Vertical Gyro Unit	8
27	VSO-3-1 Limiting Signal Computer	8
28	HUD General Assembly (HFRA)	8

Sl No.	Item (MI-17)	QTY per year
1	Converting and Computing Unit	60
2	Air Data Computer	30
3	Flight Data Recorder	30
4	Multifunctional Display Unit	60
5	Orientation and Indication Unit	30

Sl No.	Item (AN-32)	QTY per year
1	HF communication set (HF-9000)System	20
2	Radio receiving unit VOR/ILS(KURS-93M)	20
3	Invert-control block Analog to Digital & Digital to Analog convertor (BPK2V)	6
4	EGPWS (SRPPZ-2000)	5
5	Selective calling system(SSB)	10
6	Radio Alitmeter System	20
7	Distance Measuring Equipment(KDM 706A DME System)	20
8	TCAS (CAS-100 B) System	35
9	TX-RX-ART-2100(Weather Radar)	20
10	GPS (SN-4312-02) System	20
11	Air data computer with Display (AD-32)	8
12	R800L2E (V/UHF System)	40

Sl No.	Item (IL-76/78/AWACS)	QTY per year
01	Electronic Altimeter	10
02	Unit	10
03	Air Speed Indicator	5
04	Dual Amplifier	5
05	Junction Box	5
06	Headset	30

07	Voice Message Unit	25
08	Primus RT	10
09	RX TX PRIMUS	15
10	DME Interrogator	5
11	Actuating Unit	30
12	Temperature Regulator	10
13	Aviation Head set X	5
14	Potentiometer (Acceleration Sensor)	10
15	Amplifier W/C	5
16	Ref Frequency Transmitter	8
17	Reel Control Box	5
18	Servo valve positioner assembly	5
19	Oxygen Reducer	20
20	Landing Taxing Lights	40
21	Oxygen Regulator	10