

Exhibit K

Operational Description

NOTICE: The contents of this document are proprietary to Rockwell Collins, Inc. and shall not be disclosed, disseminated, copied, or used except for purposes expressly authorized in writing by Rockwell Collins, Inc.

NOTICE: The technical data in this document (or file) is controlled for export under the Export Administration Regulations (EAR), 15 CFR Parts 730-774. Violations of these export laws may be subject to fines and penalties under the Export Administration Act.

NOTICE: The following software was used to produce this document: Microsoft Word 2003 SP2

NOTICE: © Copyright 2008 Rockwell Collins, Inc. All rights reserved.

Rockwell Collins, Inc.
400 Collins Rd. NE
Cedar Rapids, Iowa 52498

CAGEC 4V792

1 Operational Description

1.1 Name and Address [2.1033(c)(1)]

The name and address of the manufacturer of the HST-21X0B High Speed Satellite Transceiver and applicant for certification is Rockwell Collins, Inc., 1300 Wilson Boulevard, Suite 200, Arlington, Virginia 22209.

1.2 FCC Identifier [2.1033(c)(2)]

FCC ID	Description
AJK8222232	HIGH-SPEED SATCOM TRANSCEIVER (Type Number HST-2110B)
AJK8222234	HIGH-SPEED SATCOM TRANSCEIVER (Type Number HST-2120B)

1.3 Type or Types of Emission [2.1033(c)(4)]

The HST utilizes the following types of emissions:

Table 1 – Emission Types

Data Rate	Symbol Rate	Modulation Type	Emission Designation
3000 bps	3000 sym/sec	Unfiltered BPSK	5K60G1D
134400 bps	33.6k sym/sec	16-QAM	40K0D1D 40K0D1E 40K0D1W
268800bps	2 x 33.6k sym/sec	16-QAM	80K0D1D 80K0D1E 80K0D1W
604800bps	4.5 x 33.6k sym/sec	16-QAM	180K0D1D 180K0D1E 180K0D1W
33600 bps	0.5 x 33.6k sym/sec	Pi/4 QPSK	20K0D1D 20K0D1E 20K0D1W
67200 bps	33.6k sym/sec	Pi/4 QPSK	40K0D1D 40K0D1E 40K0D1W
134400 bps	4 x 33.6k sym/sec	Pi/4 QPSK	80K0D1D 80K0D1E 80K0D1W
302400 bps	9 x 33.6k sym/sec	Pi/4 QPSK	180K0D1D 180K0D1E 180K0D1W

1.4 Frequency Range [2.1033(c)(5)]

The HST transmitter frequency range is 1626.5 MHz to 1660.5 MHz. The receiver frequency range is 1525 MHz to 1559 MHz.

1.5 Range of Operating Power Values [2.1033(c)(6)]

The HST-2110B channel has a maximum transmitter output power of 159 mW (22 dBm) for all rates in section 1.3 except for 3000bps for which the maximum transmitter output power is 22.4 mW (13.5 dBm) (measured at the HST output terminals).

The HST-2120B channel has a maximum transmitter output power of 79 mW (19 dBm) for all rates in section 1.3 except for 3000bps for which the maximum transmitter output power is 11.2 mW (10.5 dBm) (measured at the HST output terminals).

The HST-2110B and HST-2120B carrier transmit output power adjustment range is from 0 dB to -28.5 dB.

At a system level, this signal is amplified by the HPA contained within the SRT-2100B and transmitted through the High Gain antenna. The SRT-2100B considers the current antenna gain, and controls the HST output gain in order to maintain the desired EIRP. During Swift64 operation the 3000 bps BPSK channel operates at a fixed EIRP of 14 dBW while the 134400 bps 16QAM channel is initially established at a maximum EIRP of 22.5 dBW and subsequently adjusted to a lower power by the network. During SwiftBroadband operation the satellite network commands the output EIRP of the QPSK and 16QAM channels in real-time based on link margin, elevation angle to satellite and several other variables resulting in a range of operating EIRP from 10 dBW to a maximum of 20 dBW.

Therefore, the power output at the antenna terminals (equivalent to the HPA output minus coax loss) varies depending on antenna gain, and may approach an absolute maximum of 45 Watts under conditions of low antenna gain.

1.6 Maximum Power Rating [2.1033(c)(7)]

According to Section 87.131, UHF aircraft earth stations with emission designator G1D, G1E, and G1W are permitted a maximum of 60 Watts per carrier. Although the HST transmits a signal with emission designator of D1D, D1E and D1W, it operates in the same frequency band and should logically be expected to conform to this requirement.

The HST operates as an exciter in the system and does not determine the maximum output power. System gains are controlled by logic in the SRT-2100B to maintain a desired EIRP. The desired EIRP for the 3000 bps Swift64 control channel is 14 dBW. The initial EIRP for the 134400 bps 16QAM channel is 22.5 dBW, and may be reduced to lesser levels if link margins warrant. During SwiftBroadband operation the satellite network commands the output EIRP of the QPSK and 16QAM channels in real-time based on link margin, elevation angle to satellite and several other variables resulting in a range of operating EIRP from 10 dBW to a maximum of 20 dBW.

Under conditions of reduced antenna gain, the HPA contained within the SRT-2100B may be driven to its **maximum rated output power of 45 Watts** (combined output power of all carriers) in order to maintain the desired EIRP. If the antenna gain falls to the extent that the EIRP of all carriers can no longer be maintained without exceeding the rated output power of the HPA, carriers are dropped according to priority to prevent overdriving the HPA.

1.7 DC Voltages and Currents [2.1033(c)(8)]

The DC input voltages and currents to the final RF amplifier of the HST-2110B and HST-2120B are as follows:

Unit	DC Supply Voltage	Maximum Supply Current	Typical Measured DC Supply Current
HST-2110B or HST-2120B	+12 VDC	0.5 A	0.35 A

1.8 Schematics and Circuit Diagrams [2.1033(c)(10)]

All RF circuitry is contained on the channel card and RF Output module. The complete schematics for these modules are contained in “*Exhibits E1 and E2 – Schematics*”. The channel card and amplifier are interconnected as shown in Figures 2 and 3 in “*Exhibit D – Product Description*”.

1.9 Nameplate Label Drawings [2.1033(c)(11)]

The proposed front panel nameplate content and location is contained in “*Exhibit A – Nameplate Label Drawings*”.

1.10 Equipment Photographs – External [2.1033(c)(12)]

Internal and external photographs of the HST-2110B and HST-2120B are contained in “*Exhibit C – External and Exhibit I - Internal Photos*”.

1.11 Digital Modulation System [2.1033(c)(13)]

The HST-2110B and HST-2120B each utilize three different modulation types as described below:

3000 BPS Digital Modulation

Used for registration and call setup / teardown.

Modulation: BPSK

Pulse Shape Filtering: None

The bit sequence from the FEC encoder modulates an intermediate frequency using BPSK. The intermediate frequency is then up-converted to L-band for transmission.

Bit Rate	Symbol Rate	Modulation Type
3000	3000	BPSK

Up to 604800 BPS

Used for user data communication.

Modulation: Square 16-QAM / Pi/4 QPSK.

Pulse Shape Filtering: Square root raised cosine filter with roll-off factor of 0.25.

The 4-bit symbol sequence output from the FEC encoder is mapped into a square 16-QAM or Pi/4 QPSK intermediate frequency and is then up-converted to L-band for transmission.

Bit Rate	Symbol Rate	Modulation Type
604800 bps	4.5 x 33600	16-QAM
302400 bps	9 x 33600	Pi/4 QPSK

1.12 Required Measurements [2.1033(c)(14)]

The data required by 2.1046 through 2.1057, inclusive, measured in accordance with the procedures set out in 2.1041, is provided in "**Exhibit F - Test Report**".