



U.S. Department  
of Transportation  
**Federal Aviation  
Administration**  
OCT 30 2013

Mr Steven Mills  
Director of Engineering  
EMS Technologies Canada Ltd.  
EMS Aviation – Ottawa  
400 Maple Grove Road  
Ottawa, ON K2V 1B8  
Canada

Reference: Letter from EMS Aviation to Federal Aviation Administration Office of Spectrum Policy and Management dated 22 October, 2013 (see enclosed).

Dear Mr. Mills:

Regarding your referenced letter notifying the Federal Aviation Administration (FAA) of your request for Federal Communications Commission (FCC) certification of new emission types for a number of your satellite communications terminals to support High Data Rate services, we would request more information. In particular, we would want to be assured your terminal transmitters, when using those new emission types, meet the requirements of appropriate RTCA, Inc. Minimum Operational Performance Standards (MOPS), in particular with respect to emissions into the frequency bands utilized by the Global Positioning System (GPS).

Please provide that information at your earliest convenience. Also, in the future, it would speed communications if you provided an Email address in your correspondence. If you have any further questions please contact Mr. Michael Biggs, Senior Electronics Engineer, Spectrum Planning and International Group, at +1-202-267-8241 or e-mail [Michael.Biggs@faa.gov](mailto:Michael.Biggs@faa.gov).

Sincerely,

*for* Ian P. Atkins  
Director, FAA Spectrum Engineering Services

Enclosure  
EMS Letter dated 22 October, 2013



EMS Technologies Canada Ltd.  
EMS Aviation - Ottawa  
400 Maple Grove Road  
Ottawa, ON K2V 1B8  
Canada

Tel. +1 613 591 9064  
Fax. +1 613 591 9120  
www.emsaviation.com

22 October 2013

Federal Aviation Administration  
Office of Spectrum Policy and Management  
ASR-1  
800 Independence Avenue, SW. Rm 7E-544  
Washington D.C. 20591  
Tel: (202) – 267-9710/9712  
Fax: (202) – 202-267-5901

Attention: Annette Allender

Reference: FAA Notification of FCC Equipment under FCC Part 87  
**HSD-128, HSD-440, HSD-X, HSD-Xi, HSD-MK2, HSD-MK3, A781, A781-MK2, and A781-MK3**  
Aeronautical Earth Station Satellite Communications Transceivers FCC ID's **K6KHSD-128,**  
**K6KHSD-440, K6KHSD-X, K6KHSD-Xi, , K6KHSD-MK2, K6KHSD-MK3, K6KA781, K6KA781-**  
**MK2, and K6KA781-MK3**

Dear Madam,

In accordance with Federal Communications Commission (FCC) Rules and Regulations, Part 87.147(d), EMS Technologies Canada, Ltd. (EMS) hereby notifies the Federal Aviation Administration of its filing with the FCC of an application for a Class II Permissive Change for the HSD-128, HSD-440, HSD-X, HSD-Xi, HSD-MK2, HSD-MK3, A781, A781-MK2, and A781-MK3 Aeronautical Earth Station Satellite Communications Transceiver models. EMS seeks to allow the introduction of High Data Rate, or HDR, services using new symbol rates and higher modulation schemes of 32QAM and 64QAM with the existing hardware platform.

Please find below the information required pursuant to Part 87.147(d)(1).

#### 1) Description of Equipment

For equipment description see attached Exhibits

#### 2) Manufacturer's Identification

The EMS model identification and the FCC Identifier for the HSD equipment are presented in Table 1. For reference, the supported Inmarsat services are included.

Table 1: Equipment Identification

Equipment Identification		Inmarsat Services			Output Power
EMS Model	FCC ID	Classic Aero	Swift64	SwiftBroadband	Watts
HSD-128	6K6HSD-128	N/A	64kbps MPDS 64kbps ISDN voice (optional) 64kbps CS data (optional)	N/A	60
HSD-440	6K6HSD-440	PRT Data 2 SCPC voice	64kbps MPDS 64kbps ISDN voice (optional) 64kbps CS data (optional)	PS Background Class PS Streaming Class 64kbps CS data AMBE 4kbps voice	60
HSD-X	6K6HSD-X	N/A	64kbps MPDS 64kbps ISDN voice (optional) 64kbps CS data (optional)	N/A	0.2
HSD-Xi	6K6 HSD-Xi	N/A	64kbps MPDS 64kbps ISDN voice (optional) 64kbps CS data (optional)	PS Background Class PS Streaming Class 64kbps CS data AMBE 4kbps voice	0.2
HSD-MK2	K6KHSD-MK2	PRT Data 2 SCPC voice	64kbps MPDS 64kbps ISDN voice (optional) 64kbps CS data (optional)	PS Background Class PS Streaming Class 64kbps CS data AMBE 4kbps voice	60
HSD-MK3	K6KHSD-MK3	PRT Data 1 SCPC voice	64kbps MPDS 64kbps ISDN voice (optional) 64kbps CS data (optional)	2 of the following: PS Background Class PS Streaming Class 64kbps CS data AMBE 4kbps voice	60
A781	K6KA781	PRT Data 1 SCPC voice	64kbps MPDS 64kbps ISDN voice (optional) 64kbps CS data (optional) ABME 4.8kbps voice (optional)	PS Background Class PS Streaming Class 64kbps CS data AMBE 4kbps voice	32
A781-MK2	K6KA781-MK2	PRT Data 2 SCPC voice	64kbps MPDS 64kbps ISDN voice (optional) 64kbps CS data (optional) ABME 4.8kbps voice (optional)	PS Background Class PS Streaming Class 64kbps CS data AMBE 4kbps voice	32
A781-MK3	K6KA781-MK3	PRT Data 1 SCPC voice	64kbps MPDS 64kbps ISDN voice (optional) 64kbps CS data (optional) ABME 4.8kbps voice (optional)	2 of the following: PS Background Class PS Streaming Class 64kbps CS data AMBE 4kbps voice	32



EMS Technologies Canada Ltd.  
 EMS Aviation - Ottawa  
 400 Maple Grove Road  
 Ottawa, ON K2V 1B8  
 Canada

Tel: +1 613 591 9064  
 Fax: +1 613 591 9120  
[www.emsaviation.com](http://www.emsaviation.com)

### 3) Antenna Characteristics

The HSD equipment is designed to operate with Inmarsat approved Satcom aeronautical antenna systems. These antennas meet the requirements of ARINC Characteristic 741 and/or ARINC Characteristic 781, and RTCA/DO-210.

### 4) Rated Output Power

See Table 1 above.

### 5) Emission Types and Characteristics

The HSD equipment emission types and characteristics are summarized in Table 2.

Table 2: Emission Types and Characteristics

Inmarsat Service	Data Rate (kbps)	Symbol Rate	Modulation Type	Signal States	Performance	Necessary	FCC	Authorized Bandwidth (kHz)
		ksym/s		(S)	Factor (K)	Bandwidth (kHz)	Designator	
Classic R/T	0.6	0.6	PI/2 BPSK	2	0.70	0.840	840HG1D	25
Classic R/T	1.2	1.2	PI/2 BPSK	2	0.70	1.68	1K68G1D	25
Classic R/T	10.5	5.25	Aviation QPSK	4	1.00	10.5	10K5G1D	25
Classic C	8.4	4.2	Aviation QPSK	4	0.81	6.80	6K80G1E	25
Swift64 TDM Signaling	3	3	BPSK	2	1.200	7.20	7K20G1D	25
Swift64	134.4	33.6	16 QAM	16	0.595	40.0	40K0D1W	45
Swift64 MPDS	134.4	33.6	16 QAM	16	0.595	40.0	40K0D1W	45
SwiftBroadband	33.6	16.8	QPSK	4	0.744	25.0	25K0G7W	225
SwiftBroadband	67.2	33.6	QPSK	4	0.744	50.0	50K0G7W	225
SwiftBroadband	134.4	67.2	QPSK	4	0.744	100	100K0G7W	225
SwiftBroadband	302.4	151.2	QPSK	4	0.660	200	200K0G7W	225
SwiftBroadband	134.4	33.6	16 QAM	16	0.744	50.0	50K0D7W	225
SwiftBroadband	268.8	67.2	16 QAM	16	0.744	100	100K0D7W	225
SwiftBroadband	604.8	151.2	16 QAM	16	0.625	189	200K0D7W	225
SwiftBroadband	420.000	84	32 QAM	32	0.625	105	110K0G7W	225
SwiftBroadband	840.000	168	32 QAM	32	0.625	210	220K0D7W	225
SwiftBroadband	504.000	84	64 QAM	64	0.625	105	110K0G7W	225
SwiftBroadband	1008.000	168	64 QAM	64	0.625	210	220K0D7W	225

The last 4 lines (shaded) show the new FCC Designators



EMS Technologies Canada Ltd.  
EMS Aviation - Ottawa  
400 Maple Grove Road  
Ottawa, ON K2V 1B8  
Canada

Tel. +1 613 591 9064  
Fax. +1 613 591 9120  
[www.emsaviation.com](http://www.emsaviation.com)

**6) Frequencies of Operation**

1626.5 to 1660.5 MHz transmitting  
1525 to 1559 MHz receiving

**7) Receiver Characteristics**

The receiving characteristics of the equipment meet the applicable requirement of the Inmarsat System Definition Manuals (SDMs) and RTCA/DO-210.

If this information meets with your approval, EMS herein requests that your office notify the FCC's Office of Engineering and Technology Laboratory, Authorization and Evaluation Division, in order to indicate that, pursuant to Section 87.147(d)(2) of the FCC's rules, the FAA does not have an objection to the certification of the equipment described in this letter.

If you have any questions on the above information, please feel free to contact me directly.

Sincerely,

A handwritten signature in black ink, appearing to read "S. Mills". The signature is fluid and cursive, written over a light blue horizontal line.

Steven Mills  
Director of Engineering  
EMS Technologies Canada Ltd.



EMS Technologies Canada Ltd.  
EMS Aviation - Ottawa  
400 Maple Grove Road  
Ottawa, ON K2V 1B8  
Canada

Tel. +1 613 591 9064  
Fax. +1 613 591 9120  
[www.emsaviation.com](http://www.emsaviation.com)

# Exhibits

11 March 2010

Federal Aviation Administration  
Office of Spectrum Policy and Management  
ASR-1  
800 Independence Avenue, SW  
Washington D.C. 20591

Reference: FAA Notification of FCC Equipment under FCC Part 87  
**HSD-440, HSD-400, HSD-128, HSD-X, HSD-Xi Aeronautical  
Satellite Communications Transceivers**  
**FCC I.D.'s K6KHSD-440, K6KHSD-400, K6KHSD-128, K6KHSD-X, K6KHSD-Xi**

Dear Sir,

In accordance with Federal Communications Commission (FCC) Rules and Regulations, Part 87.147(d), EMS Technologies Canada, Ltd. hereby notifies the Federal Aviation Administration of its filing with the FCC of an application for Certification of the HSD Aeronautical Satellite Communications Transceiver models referenced above.

Please find below the information required pursuant to Part 87.147(d)(1);

## 1) Description of Equipment

The High Speed Data (HSD) unit is a line replaceable unit (LRU) of the SATCOM earth station. It is packaged in an 8 Modular Concept Unit (MCU) footprint and mounted in accordance with ARINC 600.

Depending on the model configuration, the HSD supports Flight Deck Navigation and Mission Systems Access to the Internet by providing connectivity to the following INMARSAT communication services:

- INMARSAT ISDN SCPC (Single Channel Per Carrier) Service
- INMARSAT MPDS (Mobile Packet Data Services)
- INMARSAT Aero P, R, T channel data
- INMARSAT Aero C channel H+ voice
- INMARSAT SwiftBroadband (BGAN) Service

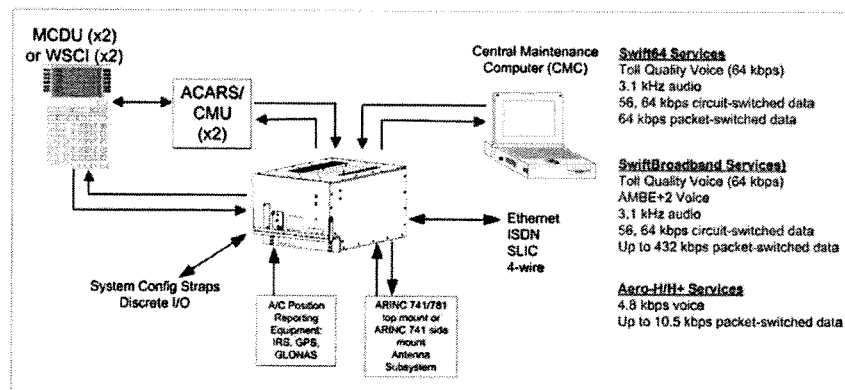


Fig 1. Sample configuration that illustrates the relationship of the HSD to other elements of the Aircraft Earth Station system



EMS Technologies Canada Ltd.  
EMS Aviation - Ottawa  
400 Maple Grove Road  
Ottawa, ON K2V 1B8  
Canada

Tel. +1 613 591 9064  
Fax. +1 613 591 9120  
www.emsaviation.com

## 2) Manufacturer's Identification

	Input	
Product Description	Power	Service Type
HSD-128	DC	2xSW-64
HSD-400	AC	4xSW-64;2xSBB
HSD-440	Dual	2xClassic;2xSW64;1xSBB
HSD-X	AC	1xSW-64
HSD-Xi	AC	2xSW-64;1xSBB

## 3) Antenna Characteristics

The HSD is designed to operate with Inmarsat approved Satcom aeronautical antenna systems. These antennas meet the requirements of ARINC characteristics 741 and/or 781 and RTCA/DO-210.

## 4) Rated Output Power

60W

## 5) Emission Types and Characteristics

Service	Data Rate (kbps)	Symbol Rate ksym/sec	Modulation Type	FCC DESIG	Auth BW
Classic F/T	0.6	0.6	P/2 BPSK	840HG1D	25
Classic F/T	1.2	1.2	P/2 BPSK	1K68G1D	25
Classic F/T	10.5	5.25	Aviation QPSK	10K5G1D	25
Classic C	8.4	4.2	Aviation QPSK	6K80G1E	25
Sw ift64: TDM Signaling	3	3	BPSK	21K0G1D	25
Sw ift64: Mini MAMBE Voice	5.6	2.8	Offset QPSK	7K20G1E	45
Sw ift64	134.4	33.6	QAM16	40K0G1E	45
Sw ift64 MPDS	134.4	33.6	QAM16	40K0G1D	45
Sw iftbroadband	33.6	16.8	QPSK	25K0G7W	225
Sw iftbroadband	67.2	33.6	QPSK	50K0G7W	225
Sw iftbroadband	134.4	67.2	QPSK	100KG7W	225
Sw iftbroadband	302.4	151.2	QPSK	200KG7W	225
Sw iftbroadband	134.4	33.6	QAM	50K0D7W	225
Sw iftbroadband	268.8	67.2	QAM	100KD7W	225
Sw iftbroadband	604.8	151.2	QAM	200KD7W	225





EMS Technologies Canada Ltd.  
EMS Aviation - Ottawa  
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Ottawa, ON K2V 1B8  
Canada

Tel. +1 613 591 9064  
Fax. +1 613 591 9120  
[www.emsaviation.com](http://www.emsaviation.com)

**6) Frequencies of Operation**

1626.5 to 1660.5 MHz transmitting  
1525 to 1559 MHz receiving

**7) Receiver Characteristics**

As defined in the Inmarsat System Definition Manuals (SDMs) and RTCA/DO-210 as applicable.

If this information meets with your approval, EMS herein requests that your office notify the FCC's Office of Engineering and Technology Laboratory, Authorization and Evaluation Division, in order to indicate that, pursuant to Section 87.147(d)(2) of the FCC's rules, the FAA does not have an objection to the certification of the equipment described in this letter. If you have any questions on the above information, please feel free to contact me directly.

Sincerely,

A handwritten signature in dark ink, appearing to read "R. Halka". The signature is fluid and cursive, written over the printed name.

Ron Halka  
Director of Business Process Improvement and Quality  
EMS Aviation Ottawa



EMS Technologies Canada Ltd.  
EMS Aviation - Ottawa  
400 Maple Grove Road  
Ottawa, ON K2V 1B8  
Canada

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Fax: +1 613 591 9120  
www.emsaviation.com

12 April 2010

Federal Aviation Administration  
Office of Spectrum Policy and Management  
ASR-1  
800 Independence Avenue, SW  
Washington D.C. 20591

Reference: FAA Notification of FCC Equipment under FCC Part 87  
**HSD-MK2, and HSD-MK3, Aeronautical Earth Station  
Satellite Communications Transceivers  
FCC ID's K6KHSD-MK2 and K6KHSD-MK3**

Dear Sir,

In accordance with Federal Communications Commission (FCC) Rules and Regulations, Part 87.147(d), EMS Technologies Canada, Ltd. (EMS) hereby notifies the Federal Aviation Administration of its filing with the FCC of an application for certification of the HSD-MK2 and HSD-MK3 Aeronautical Earth Station Satellite Communications Transceiver models referenced above.

Please find below the information required pursuant to Part 87.147(d)(1).

#### **1) Description of Equipment**

The EMS HSD-MK2 and HSD-MK3 Aeronautical Earth Station (AES) satellite communication transceivers support the Inmarsat Classic-Aero H+, Swift64, and SwiftBroadband aeronautical satellite communications services. These transceivers meet the applicable requirements of RTCA/DO-210D "Minimum Operational Performance Standards for Geosynchronous Orbit Aeronautical Mobile Satellite Services (AMSS) Avionics".

Both the HSD-MK2 and the HSD-MK3 are product derivatives of the FCC authorized and FAA Technical Standard Order (TSO C-132) authorized HSD-440. The HSD-MK2 transceiver replaces one of the HSD-440 channel cards with a version that provides two Inmarsat Aero H+ voice channels versus one. The HSD-MK3 transceiver replaces the other HSD-440 channel card with a version that provides multiple Inmarsat services on the same circuit card assembly.

The following provides a brief description of the HSD-MK2 and HSD-MK3 transceivers. When used, the abbreviation HSD refers to either model of transceiver. Where distinction is necessary, the appropriate model name is used.

The EMS HSD is the transceiver of an Aeronautical Earth Station (AES) which incorporates the satellite data unit and the high power amplifier functions of the AES. The SDU is packaged in an eight Modular Concept Unit (8-MCU) enclosure as defined in ARINC Specification 600. The SDU contains 2 channel card circuit card assemblies (CCA), a data input/output CCA, a control processor CCA, an RF input/output module, an RF power amplifier, a multi-voltage output power supply, and interconnection wiring. The channel cards provide the interfaces between the user voice or data and the Inmarsat L-band satellite signal. Multiple L-band signals are produced on each channel card. The HSD-MK2 and HSD-MK3 differ in the type and capability of channel card used. The data input/output CCA provides the interface between user data and voice circuits, and the channel cards. The control processor CCA provides the interface to the aircraft and controls the overall operation of the AES. The RF input/output module combines the L-band signals from the channel cards and distributes the receive signal from the AES diplexer/low noise amplifier. The power amplifier provides the high power RF signal gain with a nominal maximum output power of 60 watts.

The relationship between the HSD transceiver and the other subsystems of the Aeronautical Earth Station is illustrated in Figure 1.

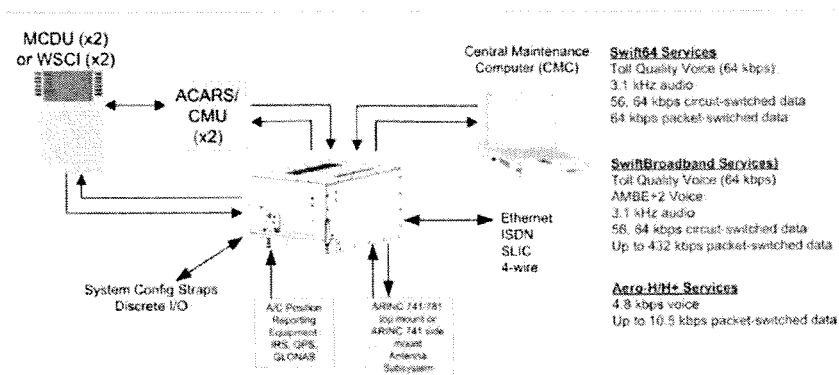


Figure 1: Aeronautical Earth Station

## 2) Manufacturer's Identification

The EMS model identification and the FCC Identifier for the HSD equipment are presented in Table 1. For reference, the supported Inmarsat services are included.

Table 1: Equipment Identification

Equipment Identification		Inmarsat Services		
EMS Model	FCC ID	Classic Aero	Swift64	SwiftBroadband
HSD-MK2	K6KHSD-MK2	PRT Data 2 SCPC voice	64kbps MPDS 64kbps ISDN voice (optional) 64kbps CS data (optional)	PS Background Class PS Streaming Class 64kbps CS data AMBE 4kbps voice
HSD-MK3	K6KHSD-MK3	PRT Data 1 SCPC voice	64kbps MPDS 64kbps ISDN voice (optional) 64kbps CS data (optional)	2 of the following: PS Background Class PS Streaming Class 64kbps CS data AMBE 4kbps voice

## 3) Antenna Characteristics

The HSD equipment is designed to operate with Inmarsat approved Satcom aeronautical antenna systems. These antennas meet the requirements of ARINC Characteristic 741 and/or ARINC Characteristic 781, and RTCA/DO-210.

## 4) Rated Output Power

60 watts



EMS Technologies Canada Ltd.  
EMS Aviation - Ottawa  
400 Maple Grove Road  
Ottawa, ON K2V 1B8  
Canada

Tel. +1 613 591 9064  
Fax. +1 613 591 9120  
www.emsaviation.com

## 5) Emission Types and Characteristics

The HSD equipment emission types and characteristics are summarized in Table 2.

Table 2: Emission Types and Characteristics

Inmarsat Service	Data Rate (kbps)	Symbol Rate ksym/s	Modulation Type	Signal States (S)	Performance Factor (K)	Necessary Bandwidth (kHz)	FCC Designator	Authorized Bandwidth (kHz)
Classic R/T	0.6	0.6	PI2 BPSK	2	0.70	0.840	840HG1D	25
Classic R/T	1.2	1.2	PI2 BPSK	2	0.70	1.68	1K68G1D	25
Classic R/T	10.5	5.25	Aviation QPSK	4	1.00	10.5	10K5G1D	25
Classic C	8.4	4.2	Aviation QPSK	4	0.81	6.80	6K80G1E	25
Swift164: TDM Signaling	3	3	BPSK	2	3.50	21.0	21K0G1D	25
Swift164: Mini MAMBE Voice	5.6	2.8	Offset QPSK	4	1.29	7.20	7K20G1E	45
Swift164	134.4	33.6	16 QAM	16	0.60	40.0	40K0G1E	45
Swift164 MPDS	134.4	33.6	16 QAM	16	0.60	40.0	40K0G1D	45
SwiftBroadband	33.6	16.8	QPSK	4	0.74	25.0	25K0G7W	225
SwiftBroadband	67.2	33.6	QPSK	4	0.74	50.0	50K0G7W	225
SwiftBroadband	134.4	67.2	QPSK	4	0.74	100	100K0G7W	225
SwiftBroadband	302.4	151.2	QPSK	4	0.66	200	200K0G7W	225
SwiftBroadband	134.4	33.6	16 QAM	16	0.74	50.0	50K0D7W	225
SwiftBroadband	268.8	67.2	16 QAM	16	0.74	100	100K0D7W	225
SwiftBroadband	604.8	151.2	16 QAM	16	0.66	200	200K0D7W	225

## 6) Frequencies of Operation

1626.5 to 1660.5 MHz transmitting

1525 to 1559 MHz receiving

## 7) Receiver Characteristics

The receiving characteristics of the HSD equipment meet the applicable requirement of the Inmarsat System Definition Manuals (SDMs) and RTCA/DO-210.

If this information meets with your approval, EMS herein requests that your office notify the FCC's Office of Engineering and Technology Laboratory, Authorization and Evaluation Division, in order to indicate that, pursuant to Section 87.147(d)(2) of the FCC's rules, the FAA does not have an objection to the certification of the equipment described in this letter.

If you have any questions on the above information, please feel free to contact me directly.

Sincerely,

Ron Halka  
Director of Business Process Improvement and Quality  
EMS Aviation Ottawa



EMS Technologies Canada Ltd.  
EMS Aviation - Ottawa  
400 Maple Grove Road  
Ottawa, ON K2V 1B8  
Canada

Tel: +1 613 591 9064  
Fax: +1 613 591 9120  
www.emsaviation.com

4 May 2010

Federal Aviation Administration  
Office of Spectrum Policy and Management  
ASR-1  
800 Independence Avenue, SW  
Washington D.C. 20591

Reference: FAA Notification of FCC Equipment under FCC Part 87  
**A781, A781-MK2, and A781-MK3, Aeronautical Earth Station  
Satellite Communications Transceivers  
FCC I.D.'s K6KA781, K6KA781-MK2, and K6KA781-MK3**

Dear Sir,

In accordance with Federal Communications Commission (FCC) Rules and Regulations, Part 87.147(d), EMS Technologies Canada, Ltd. (EMS) hereby notifies the Federal Aviation Administration of its filing with the FCC of an application for certification of the A781 Aeronautical Earth Station Satellite Communications Transceiver models referenced above.

Please find below the information required pursuant to Part 87.147(d)(1).

#### **1) Description of Equipment**

The EMS A781 Aeronautical Earth Station (AES) satellite communication transceiver supports the Inmarsat Classic-Aero H+, Swift64, and SwiftBroadband aeronautical satellite communications services. The A781 meets the applicable requirements of ARINC Characteristic 781 "Mark 3 Aviation Satellite Communication Systems" and RTCA/DO-210D "Minimum Operational Performance Standards for Geosynchronous Orbit Aeronautical Mobile Satellite Services (AMSS) Avionics".

The A781 transceiver system consists of an A781 Satellite Data Unit (SDU), an SDU Configuration Module (SCM), and an optional Flange Mount Power Amplifier (FMPA). The SDU is packaged in a six Modular Concept Unit (6-MCU) enclosure as defined in ARINC Specification 600. The SDU contains 2 channel card circuit card assemblies (CCA), an RF power amplifier, a voice and data processor CCA, a control processor CCA, a multi-voltage output power supply, and interconnection wiring. The channel cards provide the interface between the user voice or data and the Inmarsat L-band satellite signal. Multiple L-band signals are produced on each channel card. The various models of the A781 (A781, A781-MK2, and A781-MK3) differ in the type and capability of channel card used. The voice and data processor CCA provides the interface between user data and voice circuits and the channel cards. The control processor CCA provides the interface to the aircraft and controls the overall operation of the SDU. The power amplifier combines the RF signals from the channel cards and provides signal gain. The amount of gain depends upon whether or not the SDU is configured to operate with the external the Flange Mount Power Amplifier (FMPA). The FMPA provides additional RF gain with a nominal maximum output power of 32 watts. The SDU Configuration Module provides configuration information for the SDU, and the Universal Subscriber Identity Module (USIM) cards necessary for SwiftBroadband operation.

The interconnection between the A781 transceiver and the other sub-systems of the Aeronautical Earth Station is illustrated in Figure 1 and Figure 2 for operation with and without the FMPA respectively.

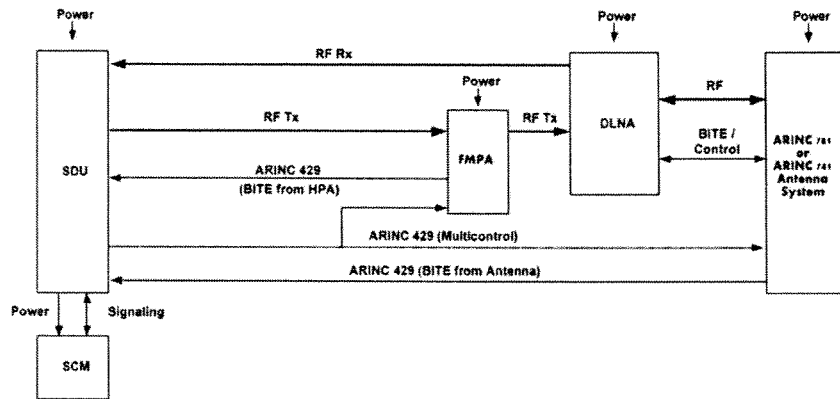


Figure 1: A781 Transceiver with External Power Amplifier

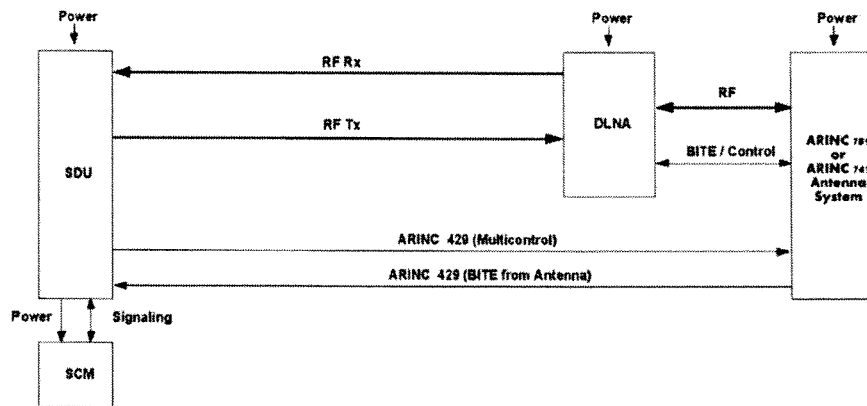


Figure 2: A781 Transceiver without FMPA Power Amplifier

## 2) Manufacturer's Identification

The EMS model identification and the FCC Identifier for the A781 equipment are presented in Table 1. For reference, the supported Inmarsat services are included.



EMS Technologies Canada Ltd.  
 EMS Aviation - Ottawa  
 400 Maple Grove Road  
 Ottawa, ON K2V 1B8  
 Canada

Tel: +1 613 591 9064  
 Fax: +1 613 591 9120  
 www.emsaviation.com

Table 1: Equipment Identification

Equipment Identification		Inmarsat Services		
EMS Model	FCC ID	Classic Aero	Swift64	SwiftBroadband
A781	K6KA781	PRT Data 1 SCPC voice	64kbps MPDS 64kbps ISDN voice (optional) 64kbps CS data (optional) ABME 4.8kbps voice (optional)	PS Background Class PS Streaming Class 64kbps CS data AMBE 4kbps voice
A781-MK2	K6KA781-MK2	PRT Data 2 SCPC voice	64kbps MPDS 64kbps ISDN voice (optional) 64kbps CS data (optional) ABME 4.8kbps voice (optional)	PS Background Class PS Streaming Class 64kbps CS data AMBE 4kbps voice
A781-MK3	K6KA781-MK3	PRT Data 1 SCPC voice	64kbps MPDS 64kbps ISDN voice (optional) 64kbps CS data (optional) ABME 4.8kbps voice (optional)	2 of the following: PS Background Class PS Streaming Class 64kbps CS data AMBE 4kbps voice

### 3) Antenna Characteristics

The A781 equipment is designed to operate with Inmarsat approved Satcom aeronautical antenna systems. These antennas meet the requirements of ARINC Characteristic 741 and/or ARINC Characteristic 781, and RTCA/DO-210.

### 4) Rated Output Power

32 watts

### 5) Emission Types and Characteristics

The A781 equipment emission types and characteristics are summarized in Table 2.



EMS Technologies Canada Ltd.  
 EMS Aviation - Ottawa  
 400 Maple Grove Road  
 Ottawa, ON K2V 1B8  
 Canada

Tel. +1 613 591 9064  
 Fax. +1 613 591 9120  
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Table 2: Emission Types and Characteristics

Inmarsat Service	Data Rate (kbps)	Symbol Rate ksym/s	Modulation Type	Necessary Bandwidth (kHz)	FCC Designator	Authorized Bandwidth (kHz)
Classic R/T	0.6	0.6	F/2 BPSK	0.840	840HG1D	25
Classic R/T	1.2	1.2	F/2 BPSK	1.68	1K68G1D	25
Classic R/T	10.5	5.25	Aviation QPSK	10.5	10K5G1D	25
Classic C	8.4	4.2	Aviation QPSK	6.80	6K80G1E	25
Swift64: TDM Signaling	3	3	BPSK	21.0	21K0G1D	25
Swift64: Mini MAMBE Voice	5.6	2.8	Offset QPSK	7.20	7K20G1E	45
Swift64	134.4	33.6	16 QAM	40.0	40K0G1E	45
Swift64 MPDS	134.4	33.6	16 QAM	40.0	40K0G1D	45
SwiftBroadband	33.6	16.8	QPSK	25.0	25K0G7W	225
SwiftBroadband	67.2	33.6	QPSK	50.0	50K0G7W	225
SwiftBroadband	134.4	67.2	QPSK	100	100K0G7W	225
SwiftBroadband	302.4	151.2	QPSK	200	200K0G7W	225
SwiftBroadband	134.4	33.6	16 QAM	50.0	50K0D7W	225
SwiftBroadband	268.8	67.2	16 QAM	100	100K0D7W	225
SwiftBroadband	604.8	151.2	16 QAM	200	200K0D7W	225

#### 6) Frequencies of Operation

1626.5 to 1660.5 MHz transmitting  
 1525 to 1559 MHz receiving

#### 7) Receiver Characteristics

The receiving characteristics of the A781 equipment meet the applicable requirements of the Inmarsat System Definition Manuals (SDMs) and RTCA/DO-210.

If this information meets with your approval, EMS herein requests that your office notify the FCC's Office of Engineering and Technology Laboratory, Authorization and Evaluation Division, in order to indicate that, pursuant to Section 87.147(d)(2) of the FCC's rules, the FAA does not have an objection to the certification of the equipment described in this letter.

If you have any questions on the above information, please feel free to contact me directly.

Sincerely,

Ron Halka  
 Director of Business Process Improvement and Quality  
 EMS Aviation Ottawa