

**Application for Experimental Airborne Personnel Communications Service: Form 442:
Application File Ref. #: 0120-EX-PL-2006**

Purpose:

To evaluate the consequences of using PCS devices on board aircraft while in flight, assess the potential effects of RF transmissions on installed aircraft operational & navigational equipment and on the existing ground based PCS and Cellular communication network infrastructure.

The final objective of this exercise is to design, develop and demonstrate an airborne cellular access system that would have no adverse impact on any existing on board aircraft operational or navigational equipment or on any of the ground based cellular communication infrastructure.

Scope:

The scope of this evaluation will be limited to the medium and heavy group of private and corporate business jets, within the Business, Regional and General Aviation (BRGA) class of aircraft. This will ensure a very limited and controllable end user base.

The proposed airborne cellular system evaluation will be conducted under the following additional constraints:

1. The period of the proposed evaluation will be limited to no longer than 3 (three) years from the date of issuance of the FCC Experimental License.
2. The proposed area of operation of the airborne cellular systems will include all of US territories under the operational and regulatory jurisdiction of the US FCC.
3. The proposed airborne cellular system will not be operational at less than 18,000 ft. flight elevation above Mean Sea Level (MSL), while the aircraft is in flight. * This is to ensure that there is a minimum of 10,000 ft. ground clearance in any geographical region over USA.
4. For this evaluation exercise the number of installed airborne cellular systems will be limited to less than 10 (ten) aircraft.
5. The cellular operations will be conducted in cooperation with a licensed PCS operator.

RF Signaling details:

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
450-470 MHz	FX	1H00N0N	10 mW (ERP)	
902-928 MHz	FX	1H00N0N	10 mW (ERP)	
1850-1910 MHz	FX	200KGXX	8 W (ERP) * Per FAA requirement	
1930-1990 MHz	FX	200KGXX	8 W (ERP) * See explanation in next section	
1850-1910 MHz	MO	200KGXX	100 mW (ERP)	
1930-1990 MHz	MO	200KGXX	100 mW (ERP)	
1920-1980 MHz	FX	1H00N0N	10 mW (ERP)	
2110-2170 MHz	FX	1H00N0N	10 mW (ERP)	
2.4 – 2.4835 GHz	FX	1H00N0N	10 mW (ERP)	

Special Conditions:

1. In lieu of frequency tolerance, the occupied bandwidth of the emission shall not extend beyond the bandwidth limits set forth above.
2. Operation in the 1850-1910 or 1930-1990 MHz band requires prior frequency coordination with 2 GHZ microwave users and consent of PCS licensees to avoid interference.
3. The license is to consider existing incumbent Part 101 facilities in selecting the locations and specific frequencies in these bands for its tests.

Proposed method of containing RF signal inference:

A set of tests were conducted evaluating the use of RF shielding material on the window apertures of a medium business jet aircraft, to reduce the leakage of RF signals across various ISM, PCS and GSM cellular bands. It was demonstrated that shielding the windows of an aircraft on ground, potentially offers an additional isolation factor of at least 20 dB when considering interference from an on board cellular mobile operating in the 470MHZ, 900MHZ, 1900MHZ and 2.4GHZ frequency bands.

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The architecture of the experimental airborne system will be comprised of a PCS band GSM BTS aboard an aircraft operating at nominal effective radiated of 1 mW power controlling supported mobiles also operating at a nominal effective radiated power of 1mW, in an aircraft flying above 18,000 ft. MSL, with the windows shielded. All demonstrations of the proposed system will operate within these power limits. The hypothesis for evaluation is that such an architecture would offer a negligible threat of interference to the ground based CDMA or GSM networks. In addition, potential interference to ground networks from unsupported mobiles, which exist even in the absence of an on board airborne cellular network would be substantially decreased.

Further tests across a range of frequency bands for the evaluation of RF signal attenuation by shielding the aircraft windows are required. Such tests will be conducted on the ground and the nominal effective radiated power from any device required will be limited to the minimum level required for measurement and will not exceed 10 dBm.

Flight testing in cooperation with licensed PCS operators is required to obtain further data on the RF signal path loss from an aircraft with applied window shielding, as well as the impact such a airborne network would have on ground based Cellular and PCS networks. The nominal effective radiated power from on board base station and supported mobiles for such tests will be determined in agreement with the participating PCS operator , and will be limited to the minimum level required for measurement and will not exceed 100 mW. The nominal effective radiated power of mobile not supported by the onboard system will be under the control of the participating PCS operator and will not exceed 2W.

Additional tests, based on the guidelines put forward by the FAA, are also required to evaluate the effects of the proposed system upon on board aircraft communications and navigation systems. Such tests require the deliberate transmission of RF signaling in selected frequency bands up to a maximum of 8W within the test aircraft cabin. This is to simulate the worst case cumulative effect of operating multiple concurrent PCS devices, at maximum allowable power within the aircraft cabin. Such tests will be conducted with aircraft on ground and under a very controlled operating environment, for example in selected geographically remote airfield(s), outside of the ground based PCS or GSM Cellular service coverage, perhaps inside of enclosed hangar and at a time of day with least ground based RF communication traffic.

References:

1. FCC STA 0304-EX-ST-2005 issued to Honeywell International Inc.
2. FCC STA 0658-EX-ST-2005 issued to Altobridge Ltd.
3. Attached Honeywell/Altobridge document: RF Attenuation

Benefits of conducting the proposed evaluation:

The data resulting from the evaluation exercises will:

1. Assist the FCC and FAA in formulating their final decisions and identify the parameters for permitting the use of personal cellular communication units on board aircraft, while in flight.
2. Define the RF signaling and other operational limits for a permissible airborne cellular access system.
3. Develop a set of appropriate Standard Operating Procedures (SOP) for the use of PCS on board aircraft while in flight.