

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of)	
)	
Streamlining Licensing Procedures for)	IB Docket No. 18-86
Small Satellites)	
)	

COMMENTS OF AVIATION SPECTRUM RESOURCES, INC.

Aviation Spectrum Resources, Inc. (ASRI), on behalf of the Aeronautical Frequency Committee (AFC) respectfully files comments on the Federal Communications Commission’s (the “Commission’s”) Notice of Proposed Rulemaking in the above-captioned proceeding that considers the frequency bands 137 – 138 and 148 – 150.5 MHz¹. In doing so, the AFC provides the Commission with information on safety and mission critical datalink services supporting both Air Traffic Control (“ATC”) and Airline Operational Control (“AOC”) communications that will be affected by the out-of-band emissions of small satellites and spurious emissions of their associated ground stations. With implementation of a nationwide aeronautical datalink network for safety messages during flight potentially at risk, the aviation community has several technical and operational concerns that should be accounted for in the Commission’s deliberations. The AFC also notes the global implications, given the international adoption of International Civil Aviation Organization (ICAO) Standards and Recommended Practices for Very High Data Link Mode 2 (VDL M2) system for safety operations around the world.

¹ Streamlining Licensing Procedures for Small Satellites, FCC 18-44, (rel. Apr. 17, 2018 (“FCC NPRM”).

The AFC represents major and regional US commercial aircraft operators, business and general aviation, helicopter operators, service providers, and industry and trade associations².

ASRI serves as the secretariat for the AFC. Bringing together expertise from across the US aviation sector and international consultation, the AFC formulates policies and recommendations relating to the effective and efficient use of the frequency spectrum for aeronautical purposes.

This not only ensures safe and efficient air travel in the US airspace, but also supports a key enabler of the US commercial aviation industry.

I. AVIATION DATALINK SYSTEM ADJACENT TO 137 MHZ

Very High Frequency Data Link Mode 2 (VDL M2) is a digital, air-to-ground datalink technology providing connectivity for aircraft to send and receive ATC and AOC messages.

This technology is a core capability of the FAA's Data Comm program that provides Controller-Pilot Data Link Communications (CPDLC) services, which supplements voice communications with digital text messages³. The Data Comm program provides substantial benefits to the public, as well as users of the National Airspace System (NAS), such as improved efficiency, improved safety, reduction of flight delays, and lower transportation costs. CPDLC services operate in all phases of flight and its safety-related usages include aircraft pre-departure clearances at airports.

In 2018 CPDLC services will be used to support ATC-Pilot communications during tactical

² AFC membership includes: Airlines for America (A4A), Alaska Airlines, American Airlines, Air Line Pilots Association, International (ALPA), Aircraft Owners and Pilots Association (AOPA), ARINC/Rockwell Collins IMS, Aviation Spectrum Resources, Inc. (ASRI), Boeing Corporation, Bristow Helicopters, Chevron, Delta Airlines, Era Helicopters, Federal Aviation Administration (FAA), Federal Express (FedEx), Frontier Airlines, Harris Corporation, Helicopter Association International (HAI), Helicopter Safety Advisory Conference (HSAC), International Air Transport Association (IATA), JetBlue Airways, National Air Transportation Association (NATA), PHI, Inc., Societe Internationale de Telecommunications Aeronautique (SITA), Southwest Airlines, United Airlines, United Parcel Service (UPS).

³ See Data Link Communications Compliance Guide
https://www.faa.gov/about/office_org/headquarters_offices/avs/offices/afx/afs/afs400/afs470/datacomm/media/A056_Compliance_Guide.pdf

rerouting of aircraft while en route⁴. This is a safety-critical ATC procedure assuring aircraft separation and avoiding aircraft collision⁵.

Currently, more than 4,000 aircraft were equipped to participate in the FAA's Data Comm⁶ Program, and the number of CPDLC operations is steadily growing. As of January 2018, 39,000 Data Comm operations were performed per week⁷, which would average to over 2 million per year. Starting in 2018, CPDLC en route services will be gradually deployed and become available nationwide by 2020⁸. The benefits of Data Comm have shown to save an average of six minutes in airport taxi time and an average of 11 minutes of pushback delay during major weather events⁹. It is expected to save operators 10 billion USD over the life cycle of the program, and to save the FAA 1 billion USD on operating costs¹⁰. In Europe, VDL M2 is a mandatory system for data link services for the Single European Sky¹¹ for aircraft flying above Flight Level 285 (FL 285).

The VDL M2 networks uses 136.975 MHz as the Common Signaling Channel (CSC), in a standardized architecture that is defined globally by the ICAO¹². In the United States the CSC frequency is shared by two communications service providers operating under contract to the FAA and industry: Rockwell-Collins and SITA OnAir. The coexistence of two providers on the

⁴ The en route phase of flight is defined as that segment of flight from the termination point of a departure procedure to the origination point of an arrival procedure

⁵ https://www.faa.gov/nextgen/how_nextgen_works/new_technology/data_comm/

⁶ <http://www.aviationtoday.com/2017/03/02/faa-ready-review-us-air-traffic-modernization/>

⁷ See Figure 2-1. FAA Data Communications Services Roadmap (FAA, 2012)
https://www.faa.gov/about/office_org/headquarters_offices/avs/offices/afx/afs/afs400/parc/parc_reco/media/2016/160518_PARCNonVDLmode2Recs.pdf

⁸ *Id.*

⁹ *Id.* at 6

¹⁰ https://www.faa.gov/nextgen/how_nextgen_works/new_technology/data_comm/in_depth

¹¹ See COMMISSION REGULATION (EC) No 29/2009

<https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:013:0003:0019:EN:PDF>

¹² Convention on International Civil Aviation, Annex 10, Volume III at Section 6.1.2.3

same frequency is managed by a Carrier Sense Multiple Access (“CSMA”) mechanism to prevent message collisions with multiple stations on the same channel. Before transmitting, each radio transceiver monitors the power received in the assigned frequency to confirm that there are no other transmissions.

II. AVIATION CONCERNS RELATED TO SMALL SATELLITES

In assessing compatibility between small satellites emissions and aviation services, the Commission needs to consider the impact on both the ground and the aircraft stations using VDL M2. Should a VDL M2 station experience an elevated noise floor due to out-of-band or spurious emissions, it will create gaps in coverage or reduce the serviceable range in which the aircraft is able to communicate through the datalink with air traffic control facilities and airline operational centers. Therefore, the ATC or AOC message may experience a delay in transmission or be unable to receive the packet. In a worse case where the unwanted emissions are strong enough to cause harmful interference to be above a standardized threshold¹³, the VDL M2 system will recognize the channel as occupied and will not transmit any messages¹⁴.

A. Space-to-earth transmissions in 137-138 MHz from small satellites

There is concern that frequency assignments close to the band edge of 137 MHz will cause harmful interference to the VDL M2 CSC at 136.975 MHz. The quantity of small satellites that could be transmitting on adjacent frequencies, as well as a potential increase in duty cycle, will cause unwanted energy into the on-tune receive of the VDL M2 CSC. The transmission bandwidth of the signal, and the type of emission will also factor into the amount of unwanted energy. Should the unwanted energy transmitted by one small satellite or multiple be strong

¹³ Convention on International Civil Aviation, Annex 10, Volume III at Section 6.4.3.2.

¹⁴ If an aircraft is unable to send an acknowledgement after receipt of a message, then the message will not be classed as received by the network, blocking any further communications.

enough, it will cause harmful interference to the VDL M2 CSC. An additional concern to the VDL M2 system is the frequency oscillator drift and fault conditions for the small satellites if not properly regulated and monitored, especially given previous small satellite issues¹⁵. Frequency drifts or faults which may cause more unwanted energy to be transmitted in the on-tune receive of the VDL M2 CSC would increase the risk of a significant impact to data link services.

As this is related to a current World Radio Conference 2019 agenda item, it should be noted that no adjacent band compatibility studies have been conducted in either International Telecommunications Radiocommunication Sector (ITU-R) Working Party (WP) 7B and Working Party 5B on the adjacent AMS(R)S frequency band which operates the VDL M2 system. Such studies are needed to ensure that VDL M2 is not impacted. Additionally, the AFC notes there are discrepancies between the bandwidth mentioned in the NPRM¹⁶ and the transmission bandwidth in Document 7B/326 Annex 05 ITU-R SA.[SHORT DURATION NGSO - SHARING STUDIES]¹⁷. A larger transmission bandwidth will result in a wider out-of-band domain, that may require greater mitigations, such as a large frequency separation to prevent any impact to adjacent band services.

B. Earth-to-space transmissions in 148 – 150.5 MHz from ground stations

The emissions from the ground stations may also cause interference to the VDL M2 system. The VDL M2 antenna is generally located on the under-belly of the fuselage. While an aircraft is en route, it may travel in direct line of sight of the main beam of a ground station.

¹⁵ See Enforcement Advisory on Satellite Communications Licensing, Public Notice DA 18-368

¹⁶ “a typical small satellite space segment mission uses a bandwidth of less than 100 kilohertz” FCC NPRM at 58.

¹⁷ Signal Bandwidth is 25 kHz per carrier, ITU-R Annex 5 to Document 7B/326 Preliminary draft new Report ITU-R SA.[SHORT DURATION NGSO - SHARING STUDIES], Table 8-9

Should the spurious emissions be strong enough, it could cause harmful interference at large distances around the ground stations.

The AFC acknowledges the Commission requiring a “passively safe”¹⁸ system, in which the satellite would only transmit if commanded by the ground station. This would give aviation some information on the possible locations where small satellite transmissions that could adversely affect VDL M2 CSC communications. Should aviation receive harmful interference, this information will become helpful in identifying the responsible party based on licensing information, as each ground station would be paired with a corresponding frequency.

SUMMARY

The Commission should consider the concerns raised by the AFC when assessing co-existence between aviation systems and small satellites. Evaluating the impact to the safety of aviation and the flying public, the Commission is urged to consider all possible methods of mitigating interference to aviation safety datalink communications both domestically and globally. Since both aviation and satellites transmissions are international in nature, it is very important to consider any global implications. It is for the public benefit that VDL M2 data link services are provided uninhibited.

Respectfully submitted,

By: /s/ Andrew Roy

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¹⁸ Streamlining Licensing Procedures for Small Satellites, FCC 18-44, (rel. Apr. 17, 2018 (“FCC NPRM”) at paragraph 40