NEW SERVICES VS. THE FAA: A PROBLEM IN NEED OF A SOLUTION

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ABSTRACT

Recent technological advances in amplifier design may make it possible to deliver new broadband communications services in step with the public demand for these services. However, burdensome government regulations threaten to impede full development of new services, and an unfavorable political climate may postpone the needed relief. The author proposes an interim solution which may effectively eliminate many of the restrictions faced by operators wishing to provide new communications services to subscribers.

INTRODUCTION

The extension of cable amplifier channel capacity is one of the most promising developments to occur in recent years. It comes at a time when the public demand for entertainment and informational services is increasing at a rapid pace.

Extended bandwidth cable systems with capacities from 40 to 52 channels, utilize precise interval frequency plans such as HRC, to reduce the effects of distortion caused by the increased channel loading. FCC Rules and Regulations, Part 76.610 require that all cable system carriers in the 108-136 MHz and 225-400 MHz bands, with power in excess of 10^{-5} watts be offset from aeronautical radio service carriers operating within 110 kilometers of the cable system. But, offsets or deviations from constant interval frequency plans are not practical. What technological gains promise to provide, current regulations threaten in part, to take away.

BRIEF HISTORY

During the twenty-five year period preceding 1976, no incidences of cable interference to aeronautical communications had been recorded. However, as a result of tests conducted by the Department of Commerce, Office of Telecommunications in 1974, the FAA became concerned with the potential of cable interference to aeronautical communications. The results of the aforementioned tests, published in 1974 and 1975, showed that under certain extreme conditions, interference could occur.

In April 1976, pilots flying over the cable system in Harrisburg, Pennsylvania heard whistling noises on voice frequency 118.250 MHz, in the <u>absence</u> of a desired signal. A subsequent investigation by the FCC determined that signals leaked from the cable on the nominal frequency of 118.250 MHz caused the interference. It is important to note that the 118.250 MHz signal was transmitted in the cable system at essentially the same level as visual carriers, and that the system was found to have a large number of leaks with levels significantly in excess of FCC Rules, Part 76.605.

What followed in December 1976 was an FCC Notice of Proposed Rulemaking, Docket 21006, addressing the issue of cable use of aeronautical frequencies. Comments were filed by a number of interested parties. In July 1977, the FCC issued a Report and Order requiring cable systems which used frequencies in the 108-136 MHz and 225-400 MHz bands to coordinate usage of these frequencies with any aeronautical assignments located within 110 km of the cable system. Coordination generally entailed offsetting of cable carrier frequencies from aeronautical assignments where the power level of those cable carriers exceeded 10^{-5} watts in the system.

The Rules were admittedly stringent. To paraphrase the FCC Report and Order, the offset requirements were adopted "out of an abundance of caution, until research can fill the gaps of our knowledge."

The FCC then fostered the formation of the Advisory Committee on Cable Signal Leakage, composed of representatives from the FCC, the FAA and the cable industry. Members of the Committee performed both aerial and ground based leakage measurements on a variety of cable systems, and in November 1979, published the results in the Final Report of the Advisory Committee on Cable Signal Leakage. From the results of the Report a number of interesting conclusions were drawn:

(1) Airborne and ground based leakage measurements correlated; therefore, a thorough leakage monitoring and prevention program could prevent interference in the airspace above a cable system.

(2) Signal power from multiple leaks increases by power summation; the FAA's hypothesized phased array effect was not observed to occur.

(3) Cable systems with reasonable RF integrity did not produce interference in the airspace; cable systems with many gross leaks could cause detectable levels of interference in the airspace above them.

Based on the findings of the Committee, the FCC adopted in March 1980, a Further Notice of Proposed Rulemaking which proposed relief from the burdensome regulations. Then in August 1980, a case of cable interference to aeronautical communications was reported over a cable system in Flint, Michigan.

As of this time, a total of five cases of cable-related interference to aeronautical communications have been documented. Information on the cases is tabulated below.

Location	Aeronautical Frequency MHz	Cable Carrier Frequency MHz	Power Level Watts
Harrisburg, Pennsylvania	118.250	118.250	$>10^{-4}$
Oxnard, California	135.500	135.500	$>10^{-4}$
Hagerstown, Maryland	118.250	118.250	$>10^{-4}$
Wilmington, N. Carolina	Degree and cause of interference uncertain.		
Flint, Michigan	133.250	133.250	$>10^{-4}$

Because the Wilmington case contains apparent inconsistencies, I have attempted to draw no conclusions from it. The remaining four cases had several factors in common: carrier power levels exceeded 10^{-4} watts by a significant amount, carriers were not offset from aeronautical frequency assignments, and the systems had no leakage monitoring and prevention programs in place.

To put things in perspective, during the nearly thirty years that cable systems have been in operation, four cases of cable interference to aeronautical frequencies have been proven to have occurred. To responsible cable engineers, four cases are four too many. However, during this same period, hundreds of cases of interference to aeronautical communications were caused by over the air transmitters.

TELECABLE CORPORATION'S EXPERIENCE WITH PRIOR COORDINATION

During the period from 1977 to 1981, TeleCable performed prior frequency coordination for 168 television and data channels in the 108-136 MHz and 225-400 MHz bands in 13 cable systems. By present FCC Rules, Part 76.610, we discovered 44 potential conflicts with aeronautical assignments, a rate of approximately 25%. The conflicts were avoided either by offsetting the carrier frequencies or by simply not using the carriers in question.

We then reexamined all 168 cases under the hypothetical conditions that carriers whose maximum system power levels fell below 10^{-4} watts need not be offset, and that carrier frequency offsets from non-emergency aeronautical frequencies of 10 KHz + /T/ were sufficient. (1)

By contrast, only five conflicts remained out of the 168 channels which were examined. One of the five channels was a pilot carrier whose frequency could easily have been offset to clear the problem. The remaining four conflicts were all associated with one system. The system is located in a major metropolitan market and utilizes an HRC channelization plan.

COGENT POINTS FROM THE FCC NOTICE AND THE FINAL REPORT OF THE ADVISORY COMMITTEE

Based on data gathered during the extensive measurements conducted under its auspices, the Advisory Committee recommended that "the threshold cable system power level at which leakage integrity and frequency offset rules become applicable, should be changed from the present 10^{-5} watts to 10^{-4} watts." As can be seen from the computations presented in the Addendum, the adoption of this recommendation would allow most aural carriers and frequency modulated data carriers to operate without offset.

The FCC in its July 1977 Report and Order acknowledged that "the Radio Technical Commission for Aeronautics (RCTA)

(1) /T/ = absolute value of cable headend equipment frequency tolerance.

standards for aeronautical communications receivers specify that the response of receivers should be down by 40 dB at ±10 KHz, relative to the desired carrier."

PROPOSAL

I propose that the following interim regulatory measures be adopted:

- All cable system operators who desire to use frequencies in the 108-136 MHz frequency bands shall initiate a complete filing as required by FCC Rules, Part 76.610; users of these frequencies shall be bound by the leakage monitoring provisions of the present Rules.

- Carrier frequency offsets from non-emergency aeronautical frequencies should be reduced to 10 KHz + /T/.

- Carriers with maximum peak envelope power levels below 10^{-4} watts need not be offset in frequency.

- NCTA and the FCC jointly develop a simplified waiver process for systems desiring to use frequencies in the 108-136 MHz and 225-400 MHz bands, but unable to offset carrier frequencies. The key criteria that a cable system must satisfy should be demonstration of a suitable leakage monitoring program and the measurement of system leakage to satisfy any of the following criteria:

  (1) $10 \log I\ 3000 < -7$

  (2) $10 \log I\ \infty \quad < 64$

  (3) leakage levels at 450 meters < 10uv/meter

CONCLUSION

Significant relief from current FCC Rules Part 76.610 could be granted without posing any additional risk of interference to aeronautical communications. Relief of the form I have proposed would eliminate the vast majority of conflicts and provide a method of resolving those which remain.

REFERENCES

(1) _Final Report of the Advisory Committee on Cable Signal Leakage_, November 1, 1979.

(2) FCC Rules and Regulations, 76.610.

(3) "FCC Report and Order", Docket 21006, July 27, 1977.

(4) "Further Reply Comments of the National Cable Television Association," Re: Docket 21006, July 31, 1980.

ADDENDUM

Assume that the maximum specified rms level at the modulation envelope peak for any visual carrier on a particular cable system is + 48.75 dBmV. Adding 3 dB to allow for system level variations and subtracting 13 dB to allow for the minimum permitted visual to aural carrier level difference, the maximum aural carrier level on the system would be + 38.75 dBmV or 86.6 millivolts.

$$P = E^2/R$$

Where, P = power in watts

E = voltage in volts

R = 75 ohms, characteristic impedance of cable system elements

$$P = (86.6 \times 10^{-3})^2/75$$

$$P = 1 \times 10^{-4} \text{ watts}$$