EXHIBIT A

development of radiolocation systems for the detection of, and defense against, aircraft employing low-observable (stealth) technology. DOD also indicated that it had a critical need for radars in the VHF or UHF region for foliage penetration since the physics of penetration through foliage requires such wavelengths.[419]

The only allocations to the radiolocation service in the VHF band are to a few discrete frequencies in the 154-161 MHz part of the spectrum and the secondary allocation in the 216-225 MHz band. In the near future, 5-10 years, new radiolocation service allocations are unlikely even though new radar spectrum requirements may develop as a result of the DOD advanced research activities. If developed, such VHF radars would be without primary allocation status, and would have to be designed to minimize interference, or used outside the United States.

RADIOLOCATION USAGE AND REQUIREMENTS IN THE 420-450 MHZ BAND

The 420-450 MHz band is excellent for long-range search and surveillance and, to a lesser extent, target tracking. The large antennas required for good angular resolution generally limit operations to land or ship-based installations.

The Air Force Ballistic Missile Early Warning System (BMEWS) has been the backbone of the U.S. missile defense system for over 30 years. The BMEWS radars are located in Clear, Alaska; Flyingdales, UK; and Thule and Sonderstrom AFB, Greenland, and are used for search and tracking. The radars operate in the 420-450 MHz band, and they have been modernized over the years. Technical improvements on the BMEWS radars may continue over the next 5-10 years. Spectrum requirements will continue over the next 10 years for the BMEWS. In the future, the BMEWS spectrum requirements for the 420-450 MHz band may be reduced if spaceborne radars can perform the early warning function.

The Air Force Pave Paws, or AN/FPS-115, radars are used for detection and tracking of submarine launched ballistic missiles (SLBM), and for satellite tracking. Four phased array radars were installed between 1982 and 1987 in the United States. Other elements of the Pave Paws system are the Perimeter Acquisition Radar which was developed in the 1960's and 1970's as a Safeguard anti-ballistic missile (ABM) radar and the AN/FPS-85 SPACETRACK radar.

The AN/FPS-115 Pave Paws radars and the Perimeter Acquisition Radar use the 420-450 MHz band, and are expected to operate for the next 10 years. The older AN/FPS-85 may be phased out. Some modernization may occur to these radars, and the spectrum requirements will likely continue.

The shipborne AN/SPS-40(V) is an older radar used by the Navy and USCG for air search and surveillance of air targets at long-ranges. The AN/SPS-40(V) radar has been modernized, and it can be expected to be used for the next 10 years.

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[419] *Id.* at 10.

The frequency 449 MHz is allocated for use by wind profiler radars to measure the atmosphere near the surface of the Earth. The radars measure wind speed and direction as a function of time and altitude, information that is useful to aviation. NOAA is planning a network to cover the United States.[420]

The DOD indicated in its comments on our *Inquiry* that "[A]dvanced research in radiolocation is being performed in the bands ... 400-500; 390-940 ...MHz."[421] As discussed in the VHF sub-section, DOD has long-range spectrum requirements for UHF radars for anti-stealth and foliage penetration radars. When considering all of the classified and unclassified current and planned systems, it can be concluded that the military agencies are expected to continue their extensive use of the 420-450 MHz band for long-range search and surveillance radars for at least the next 10 years.

RADIOLOCATION USAGE AND REQUIREMENTS IN THE 902-928 MHZ BAND

The 902-928 MHz band allocation is shared by Federal and non-Federal users. Both military and non-Federal radiolocation services use the band, sharing with the fixed service, the amateur service, Part 15 devices, and ISM.

The Navy operates the AN/SPS-49(V) as a shipborne air search radar onboard a variety of ships including all aircraft carriers and the AEGIS Ticonderoga class cruisers. The AN/SPS-49(V) is a modern all-solid state radar, and since a large number have been deployed in the fleet, it is likely that operations will continue through the next 10 years. Thus, the 902-928 MHz band will be a spectrum requirement for this radar over the next 10 years.

As noted above, DOD indicated in its comments that "Advanced research in radiolocation is being performed in the bands ...390-940... MHz."[422]

The Air Force has indicated that it "... uses the 902-928 MHz band to track missiles at test ranges, a capability that is important because it provides real-time tracking capability of manned and unmanned vehicles in test and training areas."[423]

The predominant radiolocation activity in the 902-928 MHz band is non-Federal LMS operations, licensed by the FCC. Whereas there were very few assignments in 1980, there are now over 6,800 frequency assignments. The adoption of final rules and standards by the FCC in 1994 should provide for more LMS growth in the band. There are two basic LMS systems:

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[420]MARKEY, *supra* note 125, Enclosure at 13.

[421]DOC Comments at 9.

[422]*Id.*

[423]POLLACK, *supra* note 379, Enclosure at 6.

EXHIBIT B

SPECTRUM USE SUMMARY
137 MHz - 10 GHz

Compiled by

NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION

as of July 15, 1996

FREQUENCY (MHz)	NONGOVERNMENT ALLOCATION	NONGOVERNMENT USE	GOVERNMENT ALLOCATION	GOVERNMENT USE
			Space Research ((space-to-space) 410-420)	1985. Fixed links are used in this band for transmission of airport windshear data, flood warning and other environmental data, for law enforcement, for public dissemination of weather warning and disaster information, and for other critical activities. There are also radio astronomy observations at several sites across the U.S.
420-450	Amateur Amateur Satellite (FN664 435-438)	Amateur weak signal modes (432-433), television (420-432, 438-444), repeaters (442-450), auxiliary links (433-435). There is also some use of spread spectrum and other modes. Amateur satellite activities are conducted (435-438) under RR 884. Land mobile systems are operated along the Canadian border in accordance with US 230.	RADIOLOCATION	This band is used for long-range surveillance on land-based, ship, and airborne platforms. These uses are essential to the nation's early warning capability, law enforcement, and tracking objects in space. These systems operate with very high power and wide bandwidths. This band is becoming increasingly important for detection of low observable targets. This band is the only military radiolocation band currently available for this frequency sensitive function. The frequency 449 MHz has been authorized for Federal use of wind profilers. Rapid implementation of this use is expected. NASA and military use of telemetry and telecommand is also extensive.
450-470	LAND MOBILE Earth Exploration-Satellite (US201 460-470) *Space Research and Space Operations (FN668 450 MHz)*	Remote pickup broadcast (450-451, 455-456) Public safety, industrial, land transportation (451-454, 456-459, 460-462.5375, 462.7375-467.5375, 467.7375-470) Domestic public (454-455, 459-460) Personal (462.5375-462.7375, 467.5375-467.7375)	Meteorological Satellite (460-470) Earth Exploration-Satellite (US 201 460-470) *Space Research and Space Operations (FN668 450 MHz)*	GOES and TIROS satellite downlinks for integration of data collection platforms operate in this band. Veteran's medical programs depend upon the use of biomedical telemetry and telecommunications in conjunction with nongovernment medical activities.
470-512	BROADCASTING LAND MOBILE	TV channels 14-20, Public safety, industrial, Land transportation, Domestic public		
512-608 and 614-806	BROADCASTING	TV channels 21-36, and 38-69, Auxiliary broadcasting		
608-614	RADIO ASTRONOMY		RADIO ASTRONOMY	There are few Federal assignments in this band for other than experimental use. However, radio astronomy usually involves passive operations that do not require an assignment. This band is used for international collaborations in Very Long Baseline Interferometry and will continue to be used for this purpose as the VLBA antennas come on line. The band is also used for observations by the Air Force Radio Solar Telescope Network.
806-902	LAND MOBILE	Private land mobile (806-824, 851-869, 896-901) Domestic public land mobile (824-849, 869-894) Aeronautical public correspondence-airphone (849-851, 894-896) General purpose mobile (901-902)		This band is used for high-power U.S. Navy shipborne long-range search radars under footnotes US288 and G2. These radars serve a critical role in defense of the fleet.
902-928	Amateur	Amateur weak signal modes (902-904), digital communications, repeaters, spread spectrum and other modes (904-928). Automatic vehicle monitoring (902-912 and 918-928 as authorized by FN US216), ISM, and Part 15 spread spectrum devices. This band is also used for a variety of ISM applications, particularly industrial heating and food processing.	RADIOLOCATION Fixed (G11) Mobile (G11)	This band is used predominantly for military radiolocation systems. These include low-power devices, such as those for tactical and nontactical intrusion detection at military facilities, and high-power radars used for long-range search, many of which are employed on U.S. Navy ships and aircraft or at shore stations. These radars serve a critical role in defense of the fleet. Federal mobile communications applications include video surveillance for law enforcement missions, transmission of infrared scanner imagery during overflights of disaster areas, and use of high power packet radio systems. Fixed use includes point-to-point TV links for monitoring unmanned ports of entry along borders. Though most low capacity links will be moving to the 932-935 MHz and 941-944 MHz bands, this band will continue to be used for a variety of resource management, power administration and law