AeroAstro Inc.
Form 442, Item 4

Exhibit 1
Frequencies of Operation

(A) ***Frequencies***

The applicant requests the use of ***one*** of these three bands:

2385-2390 MHz ***or*** 2300-2305 MHz ***or*** 2305-2310 MHz.

If none of these can be licensed for the limited use described here, then the applicant requests an opportunity to discuss alternatives with the Commission. The experimental program requires a channel single 4-5 MHz wide in the approximate range 2000-6000 MHz, preferably toward the lower end of that range.

AeroAstro Inc.
Form 442, Item 10

Exhibit 2
Program of Experimentation

Purpose of this License

This license will permit AeroAstro to begin experimental work toward its proposed Satellite Enabled Notification System (SENS): a one-way data messaging service that will ultimately enable users to transmit short data messages from any location on the globe, for receipt via the Internet in near-real-time. The full system will eventually have three key components: (a) mobile ground terminals, (b) small space stations, and (c) fixed ground receiver stations. The mobile terminals will transmit spread-spectrum modulated messages to the satellites, which will act as bent pipes to relay the data down to the nearest ground receiver station.

This license is requested to facilitate development of the mobile terminals. AeroAstro expects these to have the lowest cost, complexity, size, and weight, and require the least supporting infrastructure, of any space-based communications system to date. In commercial quantities, the terminals should cost only a few dollars each to manufacture.

Small size and minimal cost will enable SENS to provide critical services not otherwise available. A global quasi-real-time service will need only two small launches of clusters of very low cost microsatellites. Thus, both the user's terminal and access costs will be very low.

This application requests authority only to operate low-power (1 watt) terrestrial spread spectrum transmitters, all sited within 6 meters of ground level or existing structures. Any requests for space-based operation will be the subject of a separate application. Experimentation under this license will provide a valuable contribution even if space-based operation ultimately proves infeasible. No commercial service will be provided under this license.

Specific Objective

AeroAstro hopes to establish the feasibility of reliable operation, over ranges adequate for earth-to-space communication, of the extremely inexpensive low-data-rate transmitters described below.

Long-Term Objectives

Ultimately SENS will be able to report basic position and status data on millions of deployed, highly miniaturized, autonomous terminals, prototypes for which will be tested under this license. These will eventually be small enough to build into a wristwatch, a bracelet, or a

shoe. Early users of SENS terminals will include hikers, hunters, surveyors, and others whose occupation or pastime puts them at risk in the outdoors. Anywhere in the United States, and eventually the world, the push of a button will provide an alert and position fix. In some applications, units will transmit automatically at fixed time intervals or in response to specified external events. SENS terminals may ultimately become a standard feature in children's shoes, military ID bracelets, and even clothing of people who travel or recreate in wilderness areas. Their families and associates can receive frequent updates via the Internet on the traveler's status and position, with histories over time.

SENS can be used to enhance personal safety and security. Older and infirm persons can use SENS to call for assistance. Children can have SENS terminals clipped to their clothing at amusement parks and similar sites where there is a risk of becoming separated from caregivers. Motorists stranded in isolated areas can summon help. Anyone can use SENS as a personal security device, possibly dangling from a key chain.

The tiny, low-cost, low-power SENS uplink terminal can be attached to packages, utility poles, cattle, fleet vehicles, railroad cars, and other deployed capital assets to monitor their positions and conditions. Trucking companies can gather data on speed, mileage, even engine temperature. Soft-drink and other vending machines can report low-stock conditions. The terminals are so low in cost and small in size that they can be distributed over an agricultural area to monitor water, fertilizer, and pesticide concentrations, along a border crossing to monitor immigration, at building doors and windows to report intruders, on smoke, heat, and flood alarms for remote monitoring, or around an airport to monitor sound levels.

In short, SENS is a completely new type of service, combining personal security, asset and resource management, communications, and remote sensing applications in a communications network. It will be a pathfinder for new services, a first point of entry for many clients into wireless and satellite-based services, and a catalyst for other similar systems. Once the system is in place, users no doubt will identify dozens of other applications.

Technical Information

Transmitters operated under this license will use direct sequence spread spectrum modulation in conformity with the technical provisions of Section 15.247. Output power will not exceed 1 watt. Antenna gain will be approximately 1.5 dBi, and in no event will exceed 6 dBi. Processing gain will exceed 10 dB. Like other spread spectrum devices, transmitters under this license can share spectrum with narrowband or other spread spectrum signals with no significant risk of harmful interference.

Terminal data message length is restricted to 128 bits. Data rate is 100 bits/second, for a maximum transmission time per message of 1.28 seconds, with a very low duty cycle. Output RF power will be approximately -33 dBm/Hz.

Development Process

AeroAstro will take advantage of SENS's extraordinary flexibility by developing the system in a stepwise manner, according to fixed milestones in the following sequence. ***This application requests authority only for the first two steps below.***

1. A simple ground-based line-of-sight demonstration with a small number of terminals and receiver/decoder stations. This phase is now under development. With a timely grant of this application, it should be operational around the end of 1999 or early in 2000.

2. The same system demonstrated with an airborne receiver.

3. A single operating satellite demonstrating the system in orbit. AeroAstro has arranged with Arianespace for a free piggyback payload launch in 2001-2002. AeroAstro is prepared to fund construction of the satellite from its own resources.

4. The entire constellation of spacecraft will be launched to provide global coverage.

System development will take approximately 5 years.

About AeroAstro

AeroAstro's record of accomplishments amply qualify it to carry out the work described in this application.

Since its founding in 1988, AeroAstro has focused exclusively on lowering the cost of working in space so as to make space activities accessible to a broader community. The company has brought space to students at high school through post-graduate level, scientists operating on very limited research budgets, small start-up businesses, and the general public. In doing so, AeroAstro has pioneered new uses of space and spacecraft that are appropriate to our low cost, highly accessible approaches to aerospace engineering.

AeroAstro's first satellite, ALEXIS, is a small spacecraft developed for the Los Alamos National Laboratory to provide high resolution maps of low-energy x-ray sources and ionospheric physics. AeroAstro designed and built the spacecraft bus and the ground station, and also supported the launch and ground operations activities. ALEXIS was launched in April 1993 and is still operational over six years later, far exceeding its design lifetime of six months.

HETE (High Energy Transient Experiment) is a small satellite developed at AeroAstro for the Massachusetts Institute of Technology. Its mission is detection and observation of high energy events in the gamma ray, X-ray, and UV spectra. AeroAstro provided the spacecraft bus, ground stations, and all payload integration and tests. HETE was launched but lost due to a Pegasus XL failure on November 4, 1996.

TERRIERS (Tomographic Experiment using Radiative Recombinative Ionospheric Extreme Ultraviolet and Radio Sources) is AeroAstro's most recently completed satellite, developed at AeroAstro for Boston University. Its mission is to demonstrate global ionospheric tomography and to utilize this technique for the study of ionospheric/ thermospheric processes. AeroAstro provided the spacecraft bus, ground stations, and all payload integration and tests. TERRIERS launched successfully in May 1999.

AeroAstro built the S-band spacecraft radios and S-band tracking ground stations for each of the three spacecraft described above, and developed internally all of the software for both the spacecraft and ground stations. In addition, AeroAstro recently built a set of S-band radios for the Swedish FREJA spacecraft, which have been functioning in orbit for more than 6 months.

In 1997, AeroAstro completed the system architecture and design for a LEO spacecraft-based messaging system for an Australia-based firm, KITComm. This system shares some design features with the proposed SENS system, although it is substantially more complex.

Through the NASA Small Business Innovation Research (SBIR) program, AeroAstro is developing compact, power-efficient, inexpensive X-band radios for nanosatellites. The initial design phase has been completed and prototyping is beginning, with an ultimate objective of developing a product suitable for commercialization. These X-band transponders were also recently selected to provide Earth/Space communications for the NASA New Millennium Program's ST5 mission. This mission, the Nanosatellite Constellation Trailblazer, will provide validation of innovative, new technologies for future space missions.

AeroAstro has performed dozens of system designs and studies for organizations including Jet Propulsion Laboratory, Los Alamos National Laboratory, Naval Research Laboratory, NEC, Canadian Space Agency, NASA, Nissan, Philips Labs, and numerous U.S. universities. The company has also developed numerous spacecraft system components for these clients, including sun sensors, NiCad and Li-Ion batteries, mass memories, processor boards, power controllers, cold gas thrusters, electromagnetic torquers, and attitude control software.