

7.0 Project Office Field Support: Infrastructure and Logistics

Implementation and planning for field research involves activities related to both infrastructure development and logistical arrangements. Infrastructure components include instrumentation towers, laboratory facilities, ancillary buildings, and supporting structures such as access roads and walkways. Logistical planning encompasses activities such as oversight of shipping and customs procedures, coordination of vehicle use and maintenance, and other general support for field operations. The Project Office has been involved with preliminary planning for these elements since the LBA site reconnaissance trip in September 1996.

The field support that will be provided by the NASA LBA–Ecology Project Office is partly determined by the needs of the Science Team, but also is determined by the NASA responsibilities outlined in the Implementing Arrangement. The NASA responsibilities include:

- Deployment of ground–based instrumentation/infrastructure and planning of the field experiment, site selection, and use of Brazilian aircraft.
- Arrangement of the necessary support services, field facilities, laboratory space, lodging and meeting space in Brazil.
- Provision and maintenance of the LBA–Ecology remote sensing and other instrumentation to be deployed on Brazilian aircraft.
- Provisions and maintenance of the LBA–Ecology ground based instrumentation, supporting equipment, and expendable supplies.

An LBA–Ecology Project Office representative is stationed at the LBA Project Office at CPTEC near Cachoeira Paulista, SP. Additional staff members will be temporarily stationed in Brazil as needed, in locations to be determined, in order to facilitate logistical arrangements, and to oversee the construction of field facilities required for LBA–Ecology scientific investigations. All infrastructure and logistics support activities to be conducted in Brazil will be coordinated closely with the LBA Project office at INPE.

The support provided by the Project Office will change over the duration of LBA–Ecology based on the Science Team needs. The support listed here generally is designed around the specific requests of the Science Team and is being provided as a general project resource.

7.1 General Support for all Sites

7.1.1 Shipping

The Science Team has requested Project Office assistance with the shipping of equipment as well as with meeting United States and Brazilian customs requirements. Storage and shipping depots are planned in Santarém and Manaus. The Santarém depot will serve as a shipping address and long–term storage area. The Manaus depot will serve to stage

materials after customs clearance. Long-term storage will not take place at the Manaus depot.

Having queried the investigators for their shipping needs, the Project Office has decided that it will be more efficient and cost effective for the investigators to handle their shipping independent of the Project Office. The LBA–Ecology Project Office will coordinate with the LBA–Project Office at INPE to establish support for a despachante and customs agent who will assist the Science Team by providing customs information, shipping procedures and shipping addresses, and providing general support. Both United States and Brazilian customs regulations will be posted on the LBA–Ecology Web page and in the LBA Shipping Operations Manual. A freight forwarder in the private sector will handle translation and accounting issues and will bill the investigators independently. NASA–funded investigators will include their Brazilian counterpart's shipping needs in the arrangements they make with their counterpart's institutions.

The Implementing Arrangement states that INPE will serve as liaison with the Government of Brazil to obtain all necessary authorizations, entry, or re–export documentation and clearances, and to provide assistance in obtaining free customs clearance and waiver of applicable customs duties and taxes for all LBA–Ecology equipment, instrumentation and supplies, as well as to seek exemption from storage fees in the event storage becomes necessary upon arrival in Brazil.

7.1.2 GPS

An interest in having Global Positioning System (GPS) units installed at each site has been expressed. However, further information is needed regarding the level of accuracy, the number of units required, and the necessity of base stations. Once this information has been determined, the units will be considered.

7.1.3 Communications

The Science Team has requested the ability to download data as well as to access email accounts. Provision of satellite phones is intended to allow for interactive data transfer (e.g., email, FTP) in the field. Satellite phones provide stable voice and data communication worldwide through an existing commercial satellite network. The data transfer rate on these phones is 2.4 kbps and the voice rate is 4.8 kbps. Investigators will be responsible for their personal, nonemergency communication. The data transfer rate on the satellite telephone generally prohibits useful Web access. Therefore, in the towns near study areas, reliable internet service providers are being investigated.

7.1.4 Permits and Related Issues

The LBA–Ecology Project Office, through its Brazil Liaison Officer, will coordinate a variety of field implementation issues with the LBA Project Office. The process of obtaining permits for working on public and private lands, including permits to collect scientific data, is one example of these implementation issues. The Science Team will be

made aware of procedures and regulations regarding such issues as hiring of local labor, licensing of drivers, export of scientific samples, and data transfer. Relevant documents will be available to investigators on the LBA–Ecology Web page or by contacting Project Office personnel. The Project Office and Science Team expect to work in compliance with host country policies in project implementation.

7.2 Ground–Based Support in Brazil

7.2.1 Proposed Intensive Study Sites

7.2.1.1 Brasília, DF

One 4 wheel drive vehicle with associated fuel, maintenance, and insurance will provide transportation for the Brasília area. It is expected that this vehicle will transport up to four people.

Two satellite phones will be provided. In addition to the satellite phones, Brasília has extensive cellular service coverage, and cellular phones may accommodate most of the Science Team communication needs. There have been no specific requests for Internet service in Brasília.

An office, storage and shipping facility (e.g. local institution or residence) will be provided. This modest facility will provide a shipping address for investigators, as well as fax, phone, and copy capabilities. Collaboration with the University of Brasília and IBGE with regards to field laboratories is intended. There are two existing field laboratories within biological reserves located within 40 km of Brasília (Figure 6.1.1). It is anticipated that these facilities will provide adequate laboratory space for LBA–Ecology investigators. The power supply is may be interrupted therefore, both facilities will be equipped with backup generators. One of these facilities is an unoccupied, residence and will require significant improvements in order to function as a laboratory. More information is needed from the Science Team as to the details of laboratory requirements in the Brasília area.

A data technician/logistics aide will be provided to assist with the maintenance of equipment, the vehicle, the office, and labs. This person will be available to the Science Team, on a limited basis, to provide additional support.

7.2.1.2 Manaus, AM

Transportation will be provided with two 4 wheel drive trucks and a passenger van, including associated fuel, maintenance, and insurance for the Manaus region. During times of peak use, additional vehicles may be rented.

Two satellite phones will be provided for the Manaus study area.

The existing UHF systems in the area will be upgraded. It is understood that these systems provide low-grade communication ability. With improvement, these systems could function fairly well for daily communications. In the near future, EMBRAPA stations hope to be connected via a nationwide ISDN satellite link that would allow Internet access. The Project Office intends to collaborate with EMBRAPA on communications issues.

A storage and shipping depot will be located in Manaus. This shipping depot will to stage materials after customs clearance.

There is an existing EMBRAPA base camp (accessed via junction at km 54 on BR 174; camp is 4 km from BR 174) near Manaus. This camp has two field houses for scientists and students. Each house has three bedrooms and two bathrooms with hot water showers. In addition, there is a kitchen/dining facility that will accommodate 30 people. Power supply is via a diesel generator. Potable water is obtained from an artesian well on site and pumped to an elevated tank. Five smaller houses are also available. There is a climate-controlled room that houses a Perkin Elmer gas chromatograph, balances, and microscopes. There is also an equipment storage room and vehicle maintenance ramps. Communications are via radio link to EMBRAPA (only during office hours).

The Project Office hopes to work out an agreement with EMBRAPA for use of this base camp for LBA-Ecology. In the event that an agreement is reached, this existing laboratory/base camp/storage facility will be upgraded, and additional office/laboratory space may be leased. More information is needed from the science team as to whether this location would serve all needs. It may also be necessary to upgrade existing weather stations, depending upon the scientific need. A data technician/logistics aide will be provided to assist the Science Team and to help to maintain vehicles and site structures.

7.2.1.3 Rondônia

Transportation will be provided with three 4 wheel drive trucks for use in the Rondônia region with the associated fuel, maintenance, and insurance. The Project Office also plans to provide a small boat and trailer.

Two satellite phones will be provided for the Rondônia area.

The Project Office will assist in locating an office, storage and shipping facility (local institution or residence). A large amount of shipping traffic is not expected at this facility, and it is hoped that arrangements can be made with a local institution to provide some office space and to meet packages.

The Project Office hopes to work out an agreement for use of base camps for LBA-Ecology. Two existing base camps would be upgraded to operate as field labs. These labs would be sparsely outfitted and likely be supplemented by some additional lab space in town. Two rental houses would provide this additional lab space, storage space, and lodging. A data technician/logistics aide will be provided to assist the Science Team.

It is likely that one of these facilities will be located in Ji-Paraná and the other in Porto Velho.

7.2.1.4 Santarém, PA

7.2.1.4.1 General Santarém Support

Five 4 wheel drive vehicles with associated fuel, maintenance, and insurance will be provided. In addition, two trailers will be purchased for hauling equipment; during peak times of use, other vehicles may be rented.

A laboratory and storage facility in Santarém will be rented. This facility will be equipped with refrigerators, drying ovens, copy machines, trash cans, phone lines, fax machine, water, Internet connection, security, etc. Backup power at the laboratory will be provided with a 12-kW generator. The general lab/office space will also serve as a storage area for general field gear, GPS, portable generator, water filters, snake gaiters, propane, gas cans, etc. These items will be available to the Science Team on a sign-out basis.

At the present time, calibration standard gas cylinders and gas regulators will not be provided at the laboratory space; however, space will be reserved for these tanks. This matter is subject to discussion, and if the cost of providing the specific standards required by the Science Team is to be determined more economical, calibration standards will be provided.

Due to the great distance between Santarém and the study sites, there have been strong requests for a base camp that is close to the tower sites. Construction of a base camp is planned to accommodate lodging needs, laboratory space, and storage requests from the Science Team for the Santarém study area. It is likely that this camp will be constructed at km 84 south of Santarém (see Figure 6.17). The proposed plan for this facility would provide sleeping quarters for 10 people, located close to a bathhouse with showers, toilets, and sinks. The camp would also have a full kitchen with a separate eating room that would double as a meeting place. There would be a third main structure that would be dedicated to storage. The storage building would also provide a location to hang hammocks when the bunkhouse is full. Living quarters for a cook and for security personnel would also be built. This camp may also be the logical place to set up some dirty lab space. One satellite phone will be stationed at each of the Primary, Logged, and Pasture sites and the Santarém base camp. Three additional satellite phones will be available at the office in town on a sign-out basis. Internet service will be provided at the office in Santarém. To provide for daily field communications, existing UHF radio systems may be upgraded. Additionally, two-way radio systems will be used for communications on site.

A 12-kW generator would provide power, along with a 6-kW backup generator. A well pump will move water into an elevated cistern to maintain water pressure when the pump is not running. Propane ovens and refrigerators for this camp will also be provided.

In collaboration with the main LBA office at CPTEC, two 10–m met towers have been installed to gather specific meteorological information that will assist in the process of site selection. One is located at a pasture site near km 177 and the other in Belterra. A new 60–meter Rohn tower will likely be constructed at a presently unknown location.

A series of routine maintenance contracts will be arranged for towers, vehicles, and generators. In Santarém, routine maintenance and repair will also include the base camp. Generator maintenance will be on a weekly basis, whereas tower maintenance will occur on an annual basis.

First aid and/or tower climbing safety courses will be provided for the Science Team members that can not provide proof of having received previous such training. Science Team members are strongly encouraged to participate in first aid training before spending extensive periods of time in the field.

A site manager, a cook, a security guard/driver, and a local part–time consultant will be hired. This staff will be responsible primarily for site maintenance, automated data acquisition, translation/interpretation, permit acquisition, development of local contacts, package routing, location of reliable contractors and machinery, site maintenance, assistance with government paperwork, security, and basic transportation assistance.

7.2.1.4.2 Primary Forest Site

The Primary Forest Santarém site will have a 60–m freestanding tower. The tower will have lightning protection and a fixed climbing system. Two climbing harnesses and associated gear will be provided for this fixed track system.

The site will have two 3.5–m x 6–m scientific huts, which will likely be of brick construction. One of the huts will be air–conditioned, while the other hut will be well ventilated. A walkway constructed of rot–resistant wood will be installed between the huts and tower. The tower site will be equipped with an outhouse and some field equipment (fuel pump, first aid kit, tool kit, and fire extinguisher).

The tower site will require two generators to provide primary and backup power. These generators will likely be 12–kW diesel–driven units. The generators will have a 25–m exhaust stack and will be located 1 km away from the tower to reduce the effects of emissions on the experiment. Associated fuel, maintenance, and a fuel storage facility will be provided. The Science Team will need to limit their power usage due to the cost of fuel and delivery. An open–air covered concrete or laterite pad will serve as a storage facility for excess packing crates, and a laterite access road will be provided.

7.2.1.4.3 Logged Forest Site

The Logged Forest Santarém site will have a 60–m freestanding tower. The tower will have lightning protection and a fixed climbing system. This tower and climbing system will be identical to the one on the Primary site.

The site will have one well–insulated 3.5–m x 6–m scientific hut with an air–conditioned section. A walkway, constructed of rot–resistant wood, will be installed between the hut and tower. The tower site will be equipped with an outhouse and some field equipment (fuel pump, first aid kit, tool kit, and fire extinguisher).

The tower site will require two generators for primary and backup power. These generators will likely be 12–kW diesel–driven units. The associated fuel, maintenance, and fuel storage facility will be provided. The generator will have a 25–m exhaust stack and will be located 1 km away from the tower to reduce the effects of emissions on the experiment. An open–air covered concrete or laterite pad will serve as a storage facility for excess packing crates, and a laterite access road will be provided.

A two– or three–tower canopy access system may be placed at this site. The tower canopy access system will probably be a series of 55–m towers that will be constructed before the site is logged. There would be a 20–m walkway between towers to allow for access to a larger number of trees. There are still many details to be determined regarding the canopy access system, and the final costs of installation and operation are unknown. Presently, this canopy access system is not in the budget.

7.2.1.4.4 Pasture Site

The Pasture site will have a 20–m Rohn tower. This tower will not need to be a freestanding tower. The freestanding towers are being proposed for the forested sites mainly to decrease the likelihood of treefall damage.

There will be two well–ventilated 3.5–m x 6–m scientific huts constructed. An open–air covered concrete pad will serve as a storage facility for excess shipping crates. An access road, an outhouse and pit, fuel pump, first aid kit, tool kit, and fire extinguisher will be provided.

Due to low projected power demands, a 1–kW solar energy system will be installed on this site. The system will need to be supplemented with a small diesel/gas generator during extended cloudy periods. A 6–kW diesel generator, in the event of catastrophic failure, will back up the entire system. The diesel backup generator on this site will not, however, be placed 1 km from the tower. Rather, this generator will be located 300 m on the downwind side of the predominant wind direction at the tower. The associated fuel, maintenance, and fuel storage facility will be provided. The fuel storage facility will meet Brazilian regulations that apply to the storage of fuel.

7.2.2 Other Proposed Study Areas

7.2.2.1 Belém, PA

Transportation will be provided with a 4 wheel drive vehicle, including associated fuel, maintenance, and insurance. The Project Office will be able to assist in locating and negotiating lodging and storage facilities. A comparatively low level of effort is anticipated at this study site and it is hoped that investigators will be able to arrange for their packages to be routed through their contacts in the area.

7.2.2.2 Rio Branco, AC

Transportation will be provided with a 4 wheel drive vehicle, including associated fuel, maintenance, and insurance. Two satellite phones will be provided for the Rio Branco study area. The Project Office is considering providing a storage and shipping depot in Acre, if needed. A large amount of shipping traffic is not expected here, and it is hoped that an existing facility can be used at a low cost to the project.

7.3 Airborne Sampling Support

The overall support needed for airborne sampling has not been well defined. Currently, proposed research activities involve both remote sensing and trace gas sampling. It is anticipated that a workshop will be required to focus the requirements for the needed instrumentation and mission scenarios. It is also anticipated that negotiations for use of suitable Brazilian aircraft will be required. These aircraft would need to meet the required power, cargo mass and volume, altitude ceiling, Inertial Navigation Unit (INU) and Course Deviation Indicator (CDI) capabilities, mounting options and limitations. In addition, research needs to be done regarding compliance with Brazilian civil aviation law restrictions on the mounting of equipment to the outside or underside of an aircraft. The use of modified baggage/entry doors, and limits on modifications on small aircraft also need to be researched.

The LBA–Ecology Project Office will work with the central LBA Project Office on negotiations and approval for aircraft rental and flight patterns.