The Canopy-Glider Borneo expedition

A Biodiversity Survey of the karst Forest of Sangkulirang Peninsula East Kalimantan, Indonesia

Borneo Tropical Rainforest Foundation
International Environment House 2,
9, chemin de Balexert,
CH-1219 Châtelaine,
Geneva, Switzerland.
Tel : +41 (0)22 797 3393
Fax : +41 (0)22 797 3391
Email: marinah@btrf.com

Pro-Natura International
15, avenue de Ségur,
75007 Paris, France
Tel: +33 1 53 59 97 98
Fax: +33 1 53 59 94 46
Email: pro-natura@wanadoo.fr

January 2005

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La forêt tropicale couvre environ 6% de la surface terrestre, mais abrite de 50% à 70% des espèces vivantes. La plupart, encore inconnues, se trouveraient dans la cime des arbres : la Canopée. Dernière frontière biologique à étudier, elle représente le laboratoire chimique le plus inventif de la planète.
Mais les difficultés d'accès freinent considérablement l'inventaire de la biodiversité et l'avancée des recherches.
Passer par le ciel est le meilleur moyen de percer les secrets de ces forêts.
Grâce à notre nouvel engin volant, l'Arboglisseur, la canopée se découvre davantage.

Les explorations menées par BTRF et Pro-Natura visent à :
- Accroître les connaissances sur la biodiversité ;
- Favoriser des retombées scientifiques utiles pour l'homme ;
- Nourrir l'intérêt du grand public pour les forêts tropicales.

Elles bénéficient de quinze ans d'expérience (sept expéditions internationales) et de succès médiatiques :
- Un réseau de 200 scientifiques ;
- Une couverture mondiale par une trentaine de chaînes de télévision et une trentaine de magazines ;
- Un coût pour mille téléspectateurs 2 fois inférieur à la moyenne (environ 5 € /1000 contre 10 €) pour la mission Gabon 99.

Origines de l'Arboglisseur

Pro-Natura et son partenaire Océan Vert, ont mis au point une gamme d'outils autour du Radeau des Cimes pour l'exploration des canopées. Un de ces outils, la Luge des Cimes, a été plébiscité par les chercheurs pour sa souplesse d'utilisation et sa mobilité. Il a donné naissance à l'Arboglisseur.

Intérêt du nouvel outil

Pro-Natura prolonge et améliore l'aventure dans la canopée avec l'Arboglisseur :
- Qui répond mieux aux besoins scientifiques (études sur des surfaces de forêt plus importantes, prélèvements plus nombreux et plus représentatifs, collaborations avec des projets scientifiques existants),
- Grâce à des innovations technologiques qui augmentent la mobilité et la maniabilité (combinaison air chaud – hélium dans 2 enveloppes séparées, motorisation performante)
- D'un coût moindre (logistique et personnel réduits, coopération au sein de projets existants),
- Qui offre une communication renouvelée (nouveau visuel ravivant l'intérêt des média, reportages gagnant en diversité, coopération avec des institutions prestigieuses renforçant la crédibilité des missions et l'image de leurs sponsors).

Partenariats stratégiques

Pro-Natura a tissé des liens durables avec des partenaires prestigieux (Muséum National d'histoire naturelle, Smithsonian Tropical Research Institute, etc).
Ces partenariats offrent des opportunités d'opération pour l'Arboglisseur en divers points du globe.

Calendrier

L'Arboglisseur est en cours de construction en France.
Premiers essais en France : fin 2004
Manifestation inaugurale : 1er trim. 2005
Expédition à Bornéo : Août 2005

Executive Summary

Canopy Glider's objectives

The tropical rainforest covers only 6% of the Earth. However, it is home to 50% to 70% of all species. Most of these species are still unknown and live in the Canopy. Last biological frontier to study, it represents the most inventive chemical laboratory of the Earth.

But access to the canopy is difficult, hampering efforts to research and to record the canopy's biodiversity.
Flying over the canopy is the best way to uncover the secrets of tropical rainforests.
Thanks to our innovative airship – the Canopy Glider – Canopy can at last be discovered.

The explorations BTRF will conduct in partnership with Pro-Natura aim at:
- Increase knowledge on global biodiversity;
- Leverage scientific knowledge for the benefit of mankind;
- Grab public's interest on tropical rainforest's issues.

They have the advantage of a fifteen years experience (seven international expeditions) and of successful and effective media coverage:
- 200 Scientifics' network;
- Media coverage by some thirty TV broadcasts and some thirty press;
- Twice lower cost per viewer than the industry average of 10 €/1000 viewers for the Gabon 99' mission.

Canopy Glider's background

To explore the canopy, Pro-Natura and partner Ocean Vert have built a toolset based on the Treetop Raft. One of these tools – the Canopy Sledge – was particularly practical for researchers because of its ease-of-use and its mobility. It has inspired the Canopy-Glider, a smaller and more high-performance machine.

Why a New Tool?

Pro-Natura furthers and improves the canopy adventure with the Canopy-Glider
- A tool that better addresses scientific needs (studying larger forest areas, larger and more representative sampling, partnership with existing scientific programs);
- With significant technology improvements increasing mobility and ease-of-use (combination hot air – helium in two separated envelops, high performance motorization);
- Of a lower cost (less logistics and staff, partnership with existing projects);
- Renewed Media Opportunity (new visual appeal, documentaries more various, partnerships with prestigious institutions increasing missions' credibility and coverage for sponsors).

Strategic Partnerships

Pro-Natura has built strong partnerships with prestigious institutions (French Museum of Natural History, Smithsonian Tropical Research Institute, etc.).
These partnerships offer operations opportunities for the Canopy Glider at different interesting spots in the world.

Schedule

The Canopy-Glider is being assembled in France.
Trials: Fall 2004
Public inauguration: Early 2005
Target date for the Borneo expedition: August 2005

Context

It is estimated that humid tropical forests, that cover only 6% of the continental area, harbour more than half of the world living species.

The scientific community and, increasingly, the general public have become familiar with the idea that the canopy, this relatively inaccessible part of the forest that has escaped serious investigation, is where most of the world Biodiversity resides.
The canopy is the 'last frontier' for field biologists.

The scientific investigation of the canopy has over the years involved ingenious devices in only a tiny portion of the tropical and equatorial forest canopies. While forests under these latitudes are shrinking rapidly, practically everything remains to be discovered in canopy Biodiversity.

The success and scientific legibility of our last canopy expedition (Panama 2003) can be shown in the few lines sent to the organisers by Professor Edward O. Wilson:

' *I'm delighted to be associated with the project as Patron and thereby to be associated with one of the most exciting field projects in Biodiversity and ecology ongoing-or even imaginable. I was very impressed by all that I saw, by the international character of your team, its inspirational goals, and the unquestionable value of the databases it is producing*.'

The Canopy Glider project intends to substantially enrich knowledge on tropical Biodiversity. We also intend to excite and engage people in canopy science by reminding them that science is fun and an adventure in the unknown.

Historical background

Several successful missions

In previous Canopy missions we have developed various innovative ways to access the canopy, collectively known as the “Canopy-Raft” and contribute to a larger research program, which aims to compare the tropical canopies at various locations around the world.

- **1986 – French Guyana**
- **1989 – French Guyana**
- **1991 – Cameroon**
- **1996 – French Guyana**
- **1999 – Gabon**
- **2001 – Madagascar**
- **2003 – Panama**

The multidisciplinary scientific nature of the Canopy Raft programme allowed a highly detailed interdisciplinary study of the selected areas. It has brought together 200 scientists from a broad range of specialisation from all over the world. The combination and interaction of their skills and knowledge have resulted in a unique integration of their research.

The mobility of our technology has allowed scientists to carry out detailed high-level comparative study of the chosen forest area. It has also offered the possibility of studying and comparing the canopies of the Americas and Africa.

Rationale & Objectives

A large number of organizations are conducting various kinds of inventories throughout the world, including Biodiversity studies, rapid assessments, etc. The results of these studies are being used for a wide range of scientific research programmes, conservation planning initiatives, and many other important applications.

In nearly all cases these inventories generate valuable data. However, most standard inventory methods have proven inadequate for gathering certain kinds of critical information.

In particular, little has been done to provide field biologists and inventory teams with innovative techniques to improve and expand their ability to generate a full array of data from components of ecosystems that are especially hard to access. This is especially true for work in tropical forests, where most Biodiversity lies but where ecosystems are structurally complex and difficult to work in.

The Canopy-Glider represents a technological breakthrough capable of overcoming previous limitations for collecting data. It can assist in efforts to document, study and conserve Biodiversity in the following ways:

- **By broadening the scope of analyses of global Biodiversity;**

- **By optimizing the potential for studying and collecting information within ongoing Biodiversity assessment programmes;**

- **By promoting new and more extensive field studies than those possible with existing methods.**

Stating that:

- Many more systematic baseline studies on Biodiversity are needed to generate reliable data for scientific and conservation initiatives, especially in areas that are remote and difficult to access;

- A collaborative environment now exists that favours a coordinated effort to face the challenges of Biodiversity analysis and conservation;

- Emerging Programmes to undertake biological surveys and long-term ecological monitoring on an unprecedented scale are in the final stages of design or are already under way;

- The assessment of Biodiversity using standard field surveys is a difficult and time-consuming task, often necessitating rapid assessment techniques to provide estimates of key parameters. To close the knowledge gap, even on a local scale, would require an inordinate amount of time and funding. Financial investment in Biodiversity projects is generally limited and maximum efficiency is therefore necessary.

BTRF and Pro-Natura are aiming at:

- Enhancing capacity for efficient field surveys by developing a specialized technology that will accelerate the exploration required for and study of systematics, ecosystem composition and processes, conservation appraisal, species mapping and many other important endeavours;

- Creating partnerships and facilitating access to expertise through globally coordinated scientific initiatives on biological diversity.

Promote cross-sector partnerships that make optimum use of complementary skills, resources and experience by:

  - Bridging the gap between the scientific and conservation sectors;

  - Enhancing the attractiveness and visibility of conservation activities;

  - Attracting new sources of funding for these activities, especially from donors whose main interests may not previously have been in conservation.

Enhancing capacity building in Biodiversity assessment tools and methods thanks to an innovative approach to field-survey methodology

Emerging forest canopy science views the canopy as an ecosystem in its own right (many abiotic and biotic characteristics of the upper canopy are different from other forest layers) where one can find a specialized fauna (mainly arthropods) and flora that are exclusive to the canopy. Despite the increasing number of canopy studies, the role that information from canopies can play in scientific research and conservation assessments has been largely overlooked.

Alternatively, the canopy can be viewed simply as the upper layer of the forest. Even with this "tree-top" vision of the canopy, forest inventories would be greatly facilitated if one could work efficiently from above as well as from the ground.

A new tool devoted to sampling activities and focused on forest canopies in a complementary and innovative approach to standard field-survey method is much needed.
The Canopy-Glider is the perfect tool for such an expanded survey methodology.

Creating partnerships with ongoing scientific & conservation initiatives and adding significantly to the effectiveness of Biodiversity inventory activities and research Programmes

The Canopy-Glider can greatly enhance the study of large trees and the diverse array of organisms that inhabit the forest canopy.

While small plots can often provide sufficient information to study the dynamics of most tropical forests, larger areas are required to study the spatial distribution patterns of trees and the dynamics of individual species – an important aspect now possible thanks to the Canopy-Glider.

The Canopy-Glider provides a faster, more reliable method than those currently available for visually locating the positions of the trees or canopy-dependent organisms, recording and mapping them, etc.
The Canopy-Glider is a powerful and efficient sampling tool that can also be used to sample and assess genetic variability within or between populations.

Low altitude flights can facilitate a wide variety of activities

- Continuous flights can be used for:
    - Aerial photography for canopy tree identification, detailed mapping, etc.;
    - Census of trees, or of other organisms such as large vertebrates (birds, primates, etc.);
- Step-by step flights with short stops in the canopy can be used for:
    - Collection of flowers, fruits and leaves of trees and lianas, epiphytes;
    - Periodic sampling and census of canopy dwelling organisms using traps, pre-established stations, etc.
- Longer-term stops in the canopy can be used for:
    - Set up of recording stations for biophysical and biochemical parameters;
    - Placement of traps for pollen, air-borne organisms, insects, vertebrates, etc.

The Canopy-Glider can also serve to conduct activities in non-forest areas, such as large animal census work in open habitats.

The Canopy-Glider is both a fully operational sample-collecting tool and a seductive visual element around which television Programmes, photos, PR events, etc. can be designed.

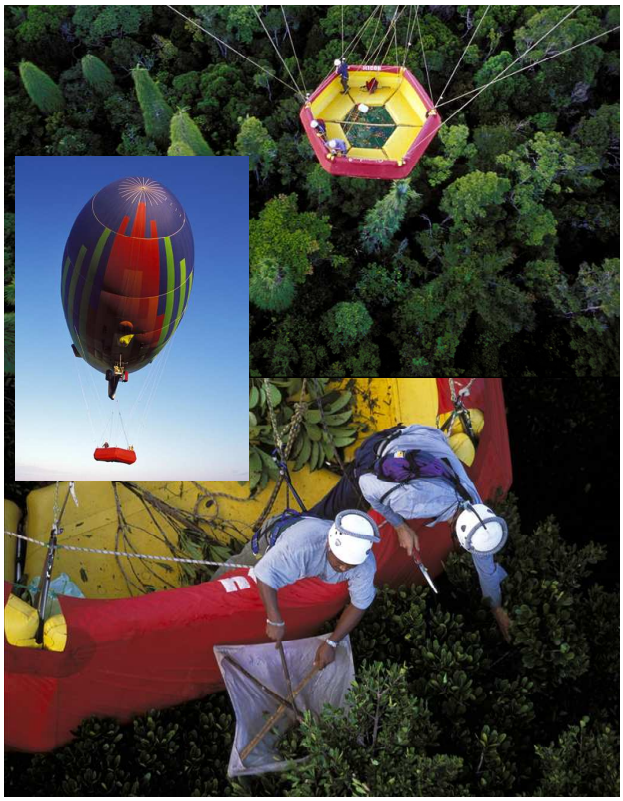
Its role in ongoing Biodiversity Research and Development programmes offers a unique opportunity to communicate environmental values in combination with innovative, cutting edge scientific research.

By linking their image to existing international Biodiversity programmes, donors will benefit from the reputation of well-known leading institutions.

Development of the Canopy-Glider

The Canopy-Glider project builds on the proven utility of the Canopy-Raft, which opened new frontiers in the development of innovative investigation techniques of tropical forests canopies.
Development of the Canopy-Glider is scheduled for early 2005.

Canopy-Glider background



The "*Tree-top Raft*", named after the famous inflatable working platform (the "*Radeau des cimes*" in French), is currently the only mobile tool available for accessing the canopy. This mobility has allowed scientists to carry out detailed inventories and comparative studies of several species-rich forest areas.
Each mission conducted using the *Tree-top Raft* offered unparalleled opportunities to test new techniques of exploration and to assess a part of the local Biodiversity that was previously all but ignored.
One of the most efficient tools developed thus far is the "*Canopy-Sledge*", first used with great success in 1996 during the French Guyana mission. This inflatable structure is smaller than the raft, making it possible to skim over the canopy suspended below the larger airship, thus serving as a moving observation and sample-collecting platform, which allows scientists to observe and gather data and samples of the flora and fauna.

The *Canopy-Sledge* has been used with a hot air dirigible with a volume of 8,500 cubic meters, originally designed to transport the Canopy-Raft and place it on top of the trees. The hot air dirigible cannot, however, cover large areas because its range is limited.
A smaller and more high-performance machine was clearly needed to increase mobility, ease of use and the range of investigation.

Technical characteristics of the Canopy-Glider

The Canopy-Glider is being designed to allow 3 persons to move in contact with the canopy for periods of 2 to 3 hours without interruption (usually in the morning or at night when wind velocity is lowest).
It will be simple to stop whenever necessary to make observations, gather samples, conduct analysis, photograph or film the canopy, etc.

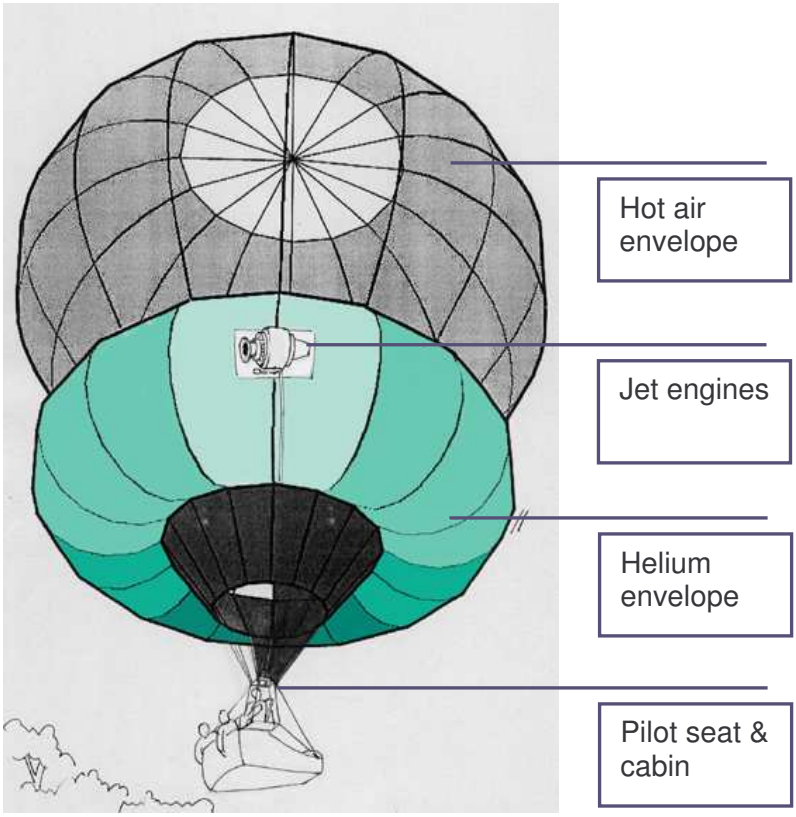
Lift and displacement

The Canopy-Glider will use a combination of a hot air dirigible and a helium balloon. This option takes advantage of the fact that:

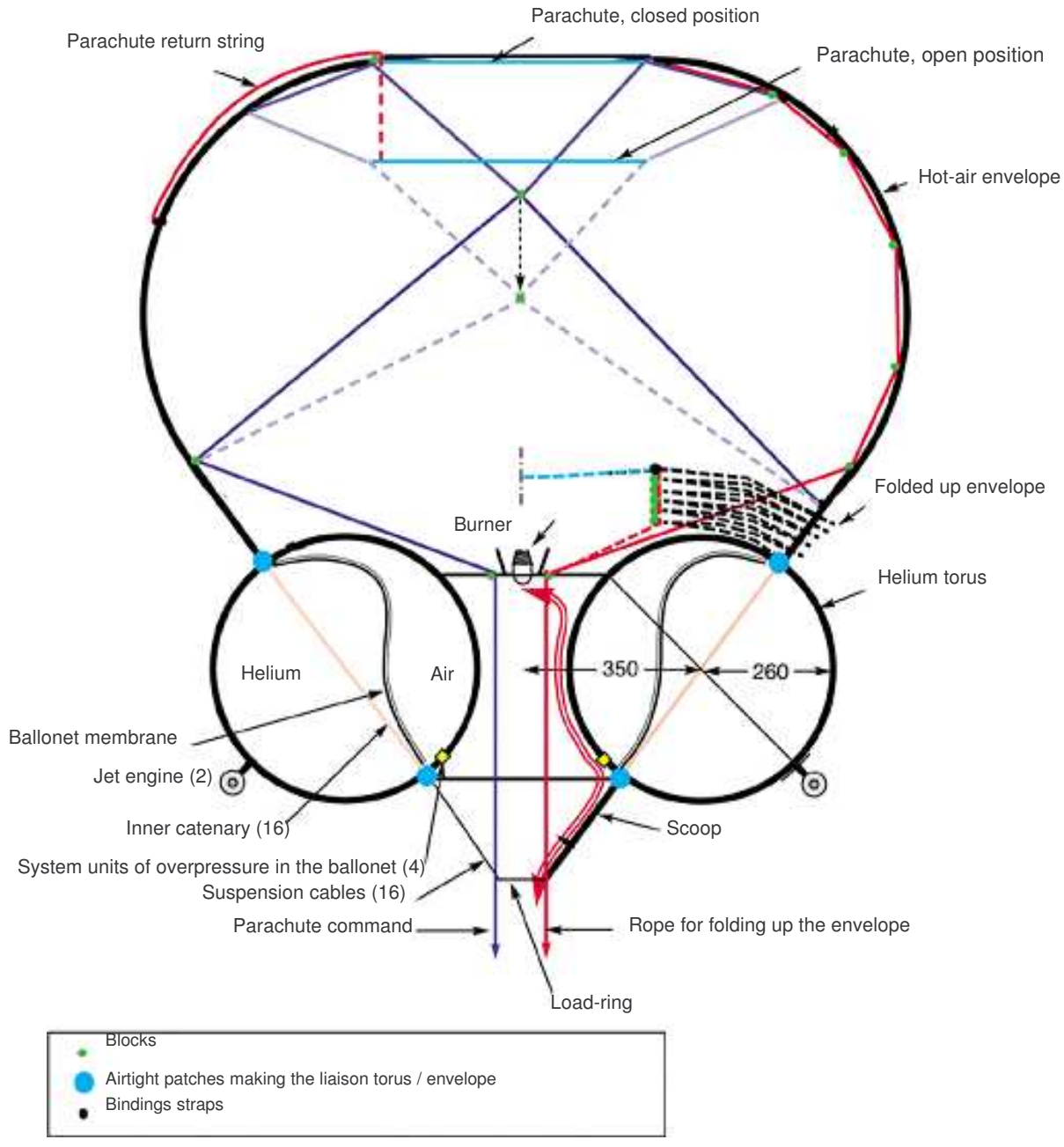
- Hot air allows for accurate vertical manoeuvring (rapid change in air temperature induces rapid lift change), with propane gas used to heat the air in the envelope;
- Helium allows an increase in cruising range because helium's greater lift reduces both structural weight and propane gas consumption, so flight duration is increased.

A qualified person must pilot the Canopy-Glider. 2 ultra-light, powerful and totally innovative gas jet engines will power it.
It will be fitted with a sampling basket inspired by the "canopy sledge" and designed to facilitate intensive and continuous work in the canopy.

Hot air envelope	1 500 m^3
Helium torus	350 m^3
Total weight	365 Kg
Estimated net lift	600 Kg
Max speed	20 Km/h
Flight duration	2 to 3 h
Fuel usage	Propane
Cruising range	10 Km



Glider section



International Media interested

USA	ABC	Belgium	RTL
‘	NBC	‘	VRT
‘	CNN	Germany	ZDF
‘	Bloomberg Television	‘	MDR
‘	National Geographic Channel	‘	Focus TV
UK	BBC World Service	‘	3Sat
‘	BBC	‘	Arte
‘	Channel 4	Austria	ORF
Brazil	TV Globo	‘	Discovery Channel
France	TF1	Italy	RAI
‘	France 2	‘	RTI Mediaset
‘	France 3	Spain	TVE
‘	Canal +	Japan	NHK
‘	M6		

In the print media, numerous newspapers and magazines have been involved so far, including:

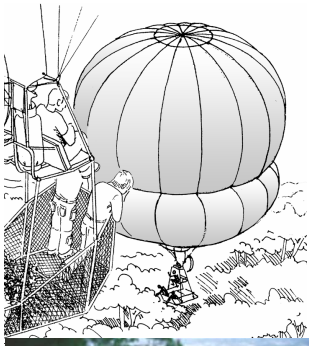
UK	Harpers & Queen	‘	L’Express
‘	The Financial Times	‘	Science et Vie
‘	The Times	‘	Air France Magazine
‘	The Sunday Telegraph	USA	The New York Times
‘	The Sunday Times	‘	Magazine
‘	Kew Magazine	‘	The Washington Post
‘	Geographical Magazine	‘	National Geographic
‘	Manufacturing Chemist	‘	New Scientist
‘	British Airways “High Life Magazine”	‘	Mother Natures
‘	British Journal of Photography	Japan	Sapio Magazine
‘	GEO	‘	Seven Seas
‘	Le Monde	‘	Copel 21
France	L’Expansion	‘	Japan Airlines Magazine
‘	Paris Match	Germany	Focus
‘	Le Point	‘	Spiegel

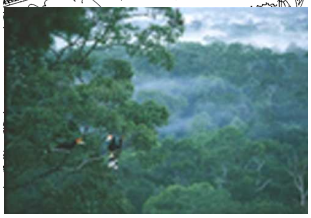
TV audience of Canopy-Raft Missions

Audience figures have been provided by Medialink & J. Walter Thompson.

As an example Shell’s Canopy-Raft TV report – ‘*Les Nouveaux Mondes*’ – has been used to date by 11 broadcasters world-wide (February 1999) with a total project audience of almost 60 million world-wide. This equates to an approximate cost per thousand (total cost of campaign divided by total project audience in thousands) of £3.

On average the industry considers that an efficient cost per thousand would be around £7/£8.





The Canopy-Glider Initiative for Biodiversity Assessment in Borneo (East-Kalimantan)

By providing data collected in the same manner in several regions of Borneo, this effort will massively increase the availability of Biodiversity information.

The Canopy-Glider Initiative for Biodiversity Assessment In Borneo will be launched in 2005.

The initiative will target its research to areas in East-Kalimantan where Biodiversity is poorly known and biological data are needed to assist in making sound decisions regarding development of natural resources. Standard protocols and methodologies in assessing Biodiversity will be used to gather data on species abundance and distribution. The Programme will bring biologists from diverse countries and cultures together in a common effort to assess tropical forests' natural resources.

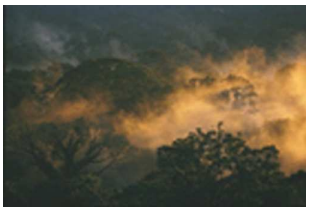
By tracking species diversity, patterns can be discovered. Because assessing techniques will be standardized, data and information from each site will be compared to information from other sites to detect natural or human-made impacts on Biodiversity. Any detected patterns can become warning signs to scientists, policy makers, industry and development leaders, local communities and others interested in the health of forests.

Exploration of hardly touched areas of almost impenetrable limestone hills

BTRF/PNI will design and carry out a 4-week Canopy-Glider mission in which an integrated team of Indonesian and expatriate scientists work collaboratively to prepare a rapid ecological assessment (REA) of at least one site identified in the Site Assessment mission.

Intensive sampling protocols will be tested in the **Sangkulirang peninsula** in East Kalimantan and adapted for large scale inventories.

The Sangkulirang peninsula includes the most extensive limestone formations in Borneo (and indeed in the whole of Southeast Asia outside Irian Jaya). Squat limestone hills, dramatic escarpments, tower karst of isolated hills of 100-150 m, deep river eroded gorges and sharp needles of weathered rock comprise a breathtaking landscape, a wilderness area barely touched by human hands.



The Kalimantan Karst Forests in Indonesia are considered among the most megadiverse areas of the world. The Sangkulirang Peninsula is one of the most important conservation priorities of Indonesia and is recognized both as an IUCN Center of Plant Diversity as well as a WWF Global 200 Ecoregion.

A multi-taxon assessment Programme that aims to document elements known to be critical to overall Biodiversity and ecosystem health will be designed.

This will strengthen the design of the proposed BTRF Integrated Protected Areas System Plan, and demonstrate the broader applications of the Canopy-Glider tool. The REA will produce the original biological and environmental data necessary to design a site-based conservation demonstration project. The results from the Canopy-Glider mission will be produced in an Internet-based format that will be accessible to a wide range of users.

The REA mission will also provide selected representatives from Indonesian research institutions, government agencies, NGOs, journalists, and community-based organizations with an opportunity to experience directly the irreplaceable benefits in the Borneo rainforest; the risks to these astounding ecosystems; and opportunities to create a viable integrated conservation system plan for Borneo.

The Canopy-Glider expedition in Borneo will form the foundation for the BTRF Documentation, Communication, and Public Awareness Program by demonstrating the unique tools that can be applied to inform public opinion and mobilize practical conservation action through multi-media technologies.

Borneo expedition budget

Budget estimate (1) : € 300 000

Including :

- **Mission preparation** **75 000**
- **Expedition running cost** **150 000**
- **Logistics and transportation** **50 000**
- **Coordination & Monitoring** **25 000**

(1) Excluding communication costs

Contacts

Fundraising & Communication

Marinah EMBIRICOS
Vice-President
Borneo Tropical Rainforest Foundation
Phone: + 41 79 371 9007
Fax: + 41 27 775 3801
Email: marinah@btrf.com

Project Co-ordinator

Olivier PASCAL
Programme Director
Pro-Natura International
Phone: +33 1 53 59 97 98
Mobile: +33 6 03 25 32 61
Email: ol.pascal@freesurf.fr