OVERLAND TO THE GEODETIC CENTER OF SOUTH AMERICA
MATO GROSSO, BRAZIL

EXPLORERS CLUB FLAG NO. 99 EXPEDITION REPORT

EXPEDITION DATES: NOVEMBER 11 - 21, 2011
LEADER - THOMAS N. AMBROSE MN ‘10
ASSISTANT– NATALIE AMBROSE

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INTRODUCTION

Flag application was submitted in August 2011 with the approval granted the end of October. The original expedition route was to start at the Peru-Brazil border in Acre state of far western Brazil, continuing east for ten days on the Interoceanic Highway (Pacific coast of Peru to Sao Paulo, Brazil) some 1,500 miles to the Geodetic Center in Mato Grosso state of Brazil with Flag No. 99. A pause had been planned at the town of Vilhena in Rondonia state to seek and photograph the source of the Roosevelt River as a second expedition objective.

Inasmuch as the expedition was unable to depart the USA until approved and another two weeks was needed to outfit, obtain required Brazil land entry yellow fever inoculations, air tickets, etc., the original route had to be revised, especially considering the late October commencement of the wet season in western Brazil. The new route was to start near the Bolivia/Brazil border with the official termination upon reaching Paraguay and cover a road distance of almost 900 miles between November 11- 21. Interestingly enough, after delivering the flag to the Geodetic Center, the rainy season finally overtook the expedition which resulted in flooded roads in the Chaco of Paraguay en route to Asuncion.

Transport was by public bus, hired truck, taxi and off the road foot traverses. While the primary expedition objective was completed, the secondary proved more difficult. As a result of research findings obtained just before and during the expedition it is believed that the true source of the Roosevelt River might be impossible to locate as discussed below.
ITINERARY

The expedition commenced at 8:00 am November 11 in Miami when a TAM (Brazil) plane was boarded for a magnificent cloudless flight over the Caribbean, the jungle interior of Venezuela/Guianas, the lower Amazon river and finally into Brasilia at sunset. After making an 11:00 pm connection a perfect landing was made at Marechal Rondon Airport in Vazézia Grande, Mato Grosso at 1:00 am November 12, the end of a long and safe journey to the interior of South America.

When daylight arrived, the expedition continued by pickup truck into the center of the Pantanal a few miles from the Bolivian border, where a brief survey of the indigenous flora and fauna was conducted. This served as the starting point for the overland expedition, the route of which is indicated in green on Map No. 3.

The second overland leg was by bus from the town of Pocone to the city of Cuiaba following the route of the Rondon 1912 telegraph line as shown on Maps No. 6 and 7. Upon arrival another bus was ticketed for the climb into the Cerrado highlands locally known as the Chapada Dos Guimeraes where two days were spent in preparation for the final trip by taxi and foot traverse to the Geodetic Center.

The next leg called for a return to Cuiaba by bus to locate the obelisk which marks the Rondon Geodetic Center. After locating a historic Rondon map collection, a full day was spent doing research relating to the Roosevelt River source.

From Cuiaba a comfortable, air-conditioned long distance bus was boarded for a 12 hour, 460 mile journey along the eastern side of the Pantanal to Campo Grande. This route passed through extensive soya bean fields without a single tree in sight, making it hard to believe that once this was thick Cerrado type forest, locally known as “Mato Grosso”. Today this area is deforested and verging on an environmental disaster as a result of clear cutting. The final leg by bus covered over 200 miles to the border with Paraguay, where the expedition terminated.
PLANNING AND LOGISTICS

All road travel and lodging was arranged on a day to day basis which allowed flexibility in the itinerary. Since travel was along roads with provision vendors, no subsistence arrangements were necessary. All outfitting, including tropical clothing, money belts, luggage, medical kit, note book and geological pick was completed in the USA. Natalie Ambrose, expedition assistant, was invaluable as a Portuguese to English interpreter as little English is spoken in the interior of Brazil.

Participants were fortunate that no passports were lost as this would have required a 500 mile or longer trip to the US Embassy in Brasilia, since Cuiaba has no consular representative. While coastal Brazil has a reputation for crime, the interior proved perfectly safe for the expedition and the population was helpful and friendly.

SOURCE OF ROOSEVELT RIVER

The original plan was to visit Vilhena, Rondonia, on Highway BR-364 enroute to the Geodetic Center in order to locate and photograph the source of the Roosevelt River, which Rondon termed the Duvida or the River of Doubt.

Colonel, later Marchal, Candido Rondon (1865–1958), a Brazilian army officer, Amazon explorer and builder of the first telegraph line from the Atlantic coast to Pto. Velho in the Amazon, discovered the river in 1909 during a telegraph survey. By 1912 the line was completed with stations as indicated on Maps No. 6 and 7. He built a simple 65 ft wooden bridge across the Rio Duvida where his line crossed, near the Jose Bonificcio station. At this bridge two years later US President Theodore Roosevelt and Rondon launched their seven dugout canoes to explore the unmapped downstream extent of this river as shown in orange color on Maps No. 2 and 4.

The Roosevelt expedition commenced in 1913 from Asuncion, Paraguay cruising up the Paraguay and Cuiaba rivers to Caceres, Brazil, later crossing over the Cerrado highlands by mule train to the telegraph line at Utiarity station. Here he was joined by Rondon and together they
travelled along the telegraph line past Vilhena to the Rio Duvida canoe launch point. The Roosevelt land route is shown in red color and follows the western side of the Pantanal, while Flag No. 99 Expedition follows a similar longitudinal path along the eastern side some 98 years later.

A review of published data by the author confirms that two post-Roosevelt expeditions (Dyott 1926, and later Haskell 1992 – an Explorers Club flag expedition - using rubber rafts) presumably also launched boats approximately 40 miles downstream from the possible source. In an attempt to locate the source of the river, the author used current satellite imagery and data. Streams were difficult to trace even for an experienced surface geologist/topographer, since the flat terrain results in meandering channels mostly hidden by tropical forest. In a recent conversation with Elizabeth Haskell, co-leader of the 1992 expedition, she explained that her expedition made a preliminary airplane reconnaissance and because of the heavy forest canopy, could not identify any possible river source. Only one reference could be found, an online photo (Photo No. 2) of the so-called source, just north of Vilhena town. The reddish water of this unconfirmed location suggests runoff from nearby agri-fields with red soil.

Later, during the expeditions visit to Cuiaba a historic 1952 geographic map by Rondon (Photo No. 1) was located and studied. Since this highly detailed map indicated “multiple” sources similar to fingers on a hand, it was concluded that a main source might be impossible to locate, especially considering that Vilhena population has increased to 80,000. Urban sprawl and associated probable ground surface alterations could obliterate the true river source. In consideration of the above this secondary expedition objective was cancelled.

**PHYSICAL GEOGRAPHY**

The Geodetic Center lies in a unique east-west geographic “transition zone” (between the Amazon and Parana basins) covering a north-south distance of as little as 80 miles as indicated on the attached physiographic map (Map No. 5) prepared by the expedition. The key feature is the Cerrado (usually open land) and here a topographic plateau area which is developed into tableland and mesa type landforms.
(Chapada) as a result of uplift and later erosion. This highland has an elevation of 2,000–3,000 ft and forms a drainage divide between the Amazon basin in the north and the Rio Plata drainage basin to the south. The latter empties into the Atlantic some 1,400 miles away near Buenos Aires, Argentina.

Superimposed on the Rio Plata basin is a huge swampy seasonal wetland, known as the Pantanal. This floodplain is delineated on the north and east by increased ground elevation, while the difficult to define western limit in low lying Bolivia and Paraguay varies depending on seasonal rainfall. The Pantanal - which is almost the size of the United Kingdom - is under populated with only one town of significant size known as Corumba, Brazil, on the Paraguay River. This is the largest contiguous inland swamp on earth, covering some 89,000 sq.mi., mostly in Brazil.

Each of the three geographical areas has somewhat distinct geology and ecology. Each area exhibits different climates - the Amazon the most tropical, the Cerrado highlands the coolest, and the Pantanal with variations in response to wet and dry seasons. Fauna and flora also varies in each area and is especially prolific in the Pantanal with thousands of species.

**GEOLOGY**

The Geodetic Center of South America lies at the extreme northern end of the Parana geological basin which exhibits an elongated shape from north to south and continues into Uruguay and northeastern Argentina. Since the basin lies within the limits of the South American craton (defined as the stable interior of a continent) the Parana is classified as an intra-cratic basin as compared to the mobile geosynclinal basins present along the eastern side of the Andes. These basins were formed by down warping as the adjacent Andes were uplifted.

The Parana basin developed during Paleozoic-Mesozoic geologic eras and is filled with sediments from Ordovician period up to Cretaceous. Many of the central and southern areas are covered by Triassic lava flows of basalt such as those that form the Iguazu Falls on the Iguazu River. Paleozoic sediments alone can reach 6,500 ft in thickness. The
Flag No. 99 Expedition road route was totally in the confines of the Parana basin.

Outcrops of sedimentary rocks near the Geodetic Center in Chapada dos Guimaraes (Chapada means tableland in Portuguese) are well exposed along the escarpment which parallels the structurally uplifted and later eroded southern edge of the Mato Grosso plateau. Well bedded and massive, very hard sandstones are common and provide the resistant rock layers over which numerous waterfalls develop (see Photo No. 5). Rock types found in the Chapada appear to be typical of those of the Parana Basin and ranging from basal coarse conglomerates passing upward into finer grained sediments often comprised of interbedded quartzitic sandstones to very hard indurated clay to silty sandstones and hematites (iron ore). Most rocks are typically red in color except for thin beds of soft multi-colored clays. Several rock samples were collected and photographed in the field.

In the Pantanal wetlands which lie directly south of the Chapada, alluvial sediments cover the underlying bedrock. Since rivers are too shallow to erode through this cover, no exposures of the older rocks were seen along the expedition route.

**GEODETIC CENTERS**

The expedition was aware that two locations, some 28 air miles apart claim the title of “Center of South America” – sometimes termed “geodetic”, sometimes “geographic.” According to Webster’s Dictionary these are one in the same – both relate to “geodesy” which is defined as “that branch of applied mathematics which determines exact positions of points and the figures and areas of large portions of the Earth’s surface, or the shape and size of the Earth, and the variations of terrestrial gravity”.

The first location lies at 600 feet elevation in the center of Cuiaba, the capital of Mato Grosso founded in 1797 as a gold camp and now a booming city of 600,000. According to historical records, in 1909 Marshal Rondon determined that the continental center of South America was here. While the survey method used by Rondon is unknown, it may relate to his laying out the trans-Mato Grosso
telegraph line the same year. According to Encyclopedia Britanica, in those Rondon years all geodesic work was based on land surveys made by triangulation methods employing a geodesic coordinate system. Rondon erected a small brick monument here with a metal plaque showing coordinates as Latitude 15° 35’ 36” S and Longitude 56° 06’ 05” W. In 1975 the survey office of the Brazilian Army confirmed this location as the center and later a tall obelisk was erected at the site (see Photo No. 9).

The second location lies at 2,560 feet elevation in the Chapada dos Guimarães highlands northeast of the city of Cuiaba. The site is indicated by a small simple cement marker at Latitude 15° 28’ 48” S and Longitude 55° 41’ 17” W. The marker may have been set in the 1970’s when roads made this area more accessible, although it may have been marked earlier. This location termed the “Mirante” (or “Lookout”) has great natural beauty with a panoramic view of the Pantanal lowlands to the south as shown on Photo No. 7.

To determine the center of any large continent apparently is no easy task. Even the experienced and highly regarded U.S. Geological Survey (USGS) states that “there is no generally accepted definition of a geographic center and no uniform or reliable method for determining it.” The USGS defines a center as “the center of gravity of the surface, or that point on which the surface of an area would balance if it were a plane of uniform thickness – this point of balance is the area’s center of gravity”.

It is noteworthy that the Geographical Center of North America was established in North Dakota in 1931, by the USGS although it does not recognize it as an exact location. Apparently, the reason is that any attempt to determine the center of a landmass the size of the North American continent (this should apply as well to South America), with its variable and complex topography can only be an approximation and is complicated by other factors including the curvature of the earth. In 2005 a field check by an independent party of this 1931 USGS Center resulted in a 16 mile discrepancy.
CONCLUSIONS AND ACCOMPLISHMENTS

On the basis of the above data, the exact determination of any continental Center is somewhat vague and leaves room for error. Accordingly, the 28 mile discrepancy between the Cuiaba and Chapada Centers is relatively minor considering the size of South America where distances are measured in thousands of miles. To help resolve this matter, the expedition contacted the Instituto Brasileiro do Geografia e Estatistica (IBGE) in Rio de Janeiro. Their lengthy reply in Portuguese mirrors the USGS comments on the determination of a center, and while some data may have been lost in translation, in short the IBGE concludes that “a geodetic center can vary depending on the parameters used” and therefore failed to specify which of the two centers is correct.

In any event, Flag No.99 Expedition accomplished the primary objective of reaching both centers of South America and it must be concluded that the true center remains an enigma as does the one in North America. Along the way new information was gained and recorded relating to the physical geography and geology of the area. Maps from 1912 showing the Rondon telegraph system were obtained and are now available for future historical reference. The land route to the River of Doubt (Rio Duvida) followed by the 1913 Roosevelt/Rondon Expedition has been indicated on a modern base map for the first time.

While the source of the Roosevelt River eluded us, this famous river stands as a tribute to the brave and adventurous explorers, still active in the waning age of ground exploration, which soon was replaced by air reconnaissance exploration in the early 1900s. Today, while satellite imagery leaves few if any surface locations on earth truly unknown, some on-ground geographic exploration is still of value for details and verification. This is where the Explorers Club expeditions can contribute to our knowledge.
REFERENCES

Instituto Brasileiro do Geografia e Estatistica (IBGE) in Rio de Janeiro.


SEDTUR (Secretaria de Desenvolvimento do Turismo do Estado de Mato Grosso), Cuiaba.


AUTHOR’S BIO

Thomas Ambrose holds BS and MS degrees in Geology and has worked as an international exploration and natural resource geologist for many years. His on the ground experience has included Cuba, Colombia, Ecuador, Trinidad and Tobago, Puerto Rico, Singapore, and Indonesia. As an example of his South American exploration, in the 1970’s, Ambrose and his helicopter pilot were the first people to ever land and conduct surface geological sampling on several of the mountaintops in the remote Sierra de Chribiquete in the equatorial Colombian Amazon, since these steep vertical-sided chimney rocks are not accessible by foot. Today these mountains are controlled by the FARC (Fuerzas Armadas Revolucionarias de Colombia) rebels which discourage settlement and tourism, resulting in a pristine and under-explored area. Ambrose is a member of the Southern Florida Chapter of The Explorers Club, resides in Ocean Ridge, Florida, and can be reached at realthora@yahoo.com.
MAP INDEX FOR FLAG REPORT NO. 99
MATO GROSSO, BRAZIL

NO. 1  SOUTH AMERICA INDEX MAP SHOWING LOCATION OF REPORT
DETAIL MAPS
SCALE – GRAPHIC AS SHOWN

NO. 2  REGIONAL MAP SHOWING TOWNS, RIVERS AND
MOUNTAINS (SERRA)
SCALE 1: 800,000

NO. 3  AREA MAP SHOWING SOUTH AMERICA GEODETIC CENTER,
OVERLAND ROUTES OF 1913-14 ROOSEVELT-RONDON AND
2011 EXPLORERS CLUB FLAG NO. 99 EXPEDITIONS
SCALE: 1: 4,000,000

NO. 4  AREA MAP SHOWING RIVER ROUTE OF 1913-14
ROOSEVELT- RONDON EXPEDITION DOWN RIVER (NORTH)
FROM NEAR VILHENA, RONDONIA. ROOSEVELT RIVER
SOURCE AREA ALSO INDICATED
SCALE 1: 2,000,000

NO. 5  AREA MAP SHOWING THE PHYSIOGRAPHIC FEATURES OF
THE 2011 FLAG NO. 99 EXPEDITION AREA IN MATO GROSSO,
BRAZIL
SCALE 1: 4,000,000

NO. 6  HISTORIC 1912 MAP BY RONDON COMMISSION SHOWING
LOCATIONS OF TELEGRAPH LINES BETWEEN CUYABA
(CUIABA) AND PTO VELHO.
SCALE UNKNOWN

NO. 7  DETAIL MAP SHOWING TELEGRAPH LINES AND STATIONS
IN REPORT AREA
SCALE UNKNOWN
1914 Roosevelt-Rondon Expedition launched canoes in this area.
AMAZON DRAINAGE BASIN
(TAPAJOS AND XINGU RIVERS INTO AMAZON
--- 1300 MILES TO ATLANTIC OCEAN )

MATO GROSSO

CERRADO
(PLATEAU & TABLELANDS)
DRAINAGE DIVIDE

SO. AMERICA
GEOPETIC CENTER

PLAN Alto do

MATO GROSSO DO SUL

THE PANTANAL
(FLOOD PLAIN WETLANDS)

BRAZIL

THE PANTANAL
(PARAGUAY AND PARANA RIVER SYSTEM
--- 1400 MILES TO ATLANTIC OCEAN )

MAP NO. 5
To RIO DE JANEIRO

REPÚBLICA DA BOLÍVIA

MAP NO. 7
NO. 1  TITLE BLOCK OF HISTORIC 1952 STATE OF MATTO GROSSO GEOGRAPHIC MAP PUBLISHED UNDER DIRECTION OF RONDON

NO. 2  UNCONFIRMED SOURCE OF ROOSEVELT RIVER NEAR VILHENA, RONDONIA

NO. 3  START OF 2011 OVERLAND FLAG NO. 99 EXPEDITION IN THE FLAT BRAZILIAN PANTANAL, NEAR THE BORDER WITH BOLIVIA

NO. 4  ESCARPMENT ALONG SOUTH EDGE OF ELEVATED MATO GROSSO PLATEAU, MARKING NORTH LIMIT OF PANTANAL LOWLANDS. NOTE MASSIVE, HORIZONTAL BEDS OF TYPICAL REDDISH SANDSTONES AND CERRADO DRY-FOREST-TYPE VEGETATION

NO. 5  200 FOOT WATERFALL OVER EDGE OF CERRADO TABLELAND IN CHAPADA DOS GUIMARAES AREA NORTH OF CUIABA

NO. 6  VIEW SOUTH TO EXTENSIVE PANTANAL LOWLANDS, SHOWING CERRADO SAVANNAH-TYPE VEGETATION, NEAR GEODETIC CENTER

NO. 7  EXPLORER CLUB MEMBER T. N. AMBROSE AND NATALIE AMBROSE WITH FLAG NO. 99 AT A GEODETIC CENTER OF SOUTH AMERICA

NO. 8  SURFACE OUTCROP OF BEDDED VERY HARD (INDURATED), RED CLAYEY SANDSTONE AT GEODETIC CENTER

NO. 9  OBELISK IN CUIABA, BRAZIL MARKING RONDON 1912, GEODETIC CENTER

NO.10  EXPEDITION FLAG RETURN PRESENTATION AT SOUTHERN FLORIDA CHAPTER MEETING, MIAMI, DECEMBER 2011. T. N. AMBROSE 2ND FROM LEFT
Award of Flag 99

Thomas N. Ambrose, MN '10
Overland to the Center of South America

The Explorers Club Flag is a symbol of courage and fidelity. The award of the flag is a significant accomplishment. Since 1918, the flag has been carried to all of the Earth's continents, as well as under the sea and into the stars. To date, 850 explorers have carried the flag on over 1450 expeditions. A select handful of the 202 Explorers Club flags have been framed and now decorate the Club house in New York. These include flags carried by Roy Chapman Andrews, Bob Bartlett, Thor Heyerdahl, Naomi Uemura, and miniature flags carried aboard the Apollo 8 and Apollo 15.

Your expedition will now become part of the rich history attached to this flag. Earlier expeditions include:

Cdr. Finn Ronne 1939 U. S. Antarctic Expedition
Donald S. McClain 1959 Museum-McClain-Green So. Pacific Expedition
Donald S. McClain 1961 Museum-McClain-Green So. Pacific Expedition
Kenneth M. Kamler 1989 Mt. Vinson/Aconcagua Ice Climbing Expedition
Stanley Spielman 2000 XINGU 2000 Brazil
D. Clark Wernecke 2001 The Gault Project / The Gault Site(41BL323)
Kenneth M. Kamler 2004 Madagascar Flora and Fauna Survey
Stanley L. Spielman 2005 Matis Indians, Peru/Brasil '05
Linford L. Lougheed 2006 Madagascar Botanical Diversity
Albert Yu-Min Lin 2010 Valley of the Khans Project, 2010 Expedition
Charles F. Thompson II 2011 Berbice River of Guyana

You can take pride in joining this illustrious group and in your broader membership and participation in exploration.

Lorie M.L. Karnath
President

Constance Dife
VP for Flag and Honors