

First Flight from Europe to the South Atlantic

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Abstract

The History of the transatlantic flights goes back to 1919 and began with a flight performed from Newfoundland to Lisbon; two weeks later another flight was performed between Newfoundland and Ireland. On 1922, the Portuguese airmen Gago Coutinho and Sacadura Cabral crossed the South Atlantic Ocean by air in a flight performed exclusively with internal means of navigation: a new instrument that consisted in a type of sextant improved with two spirit levels to provide an artificial horizon and also with the help of a “path corrector”. Despite this journey had lasted 79 days to cross South Atlantic Ocean, their flight time was only 62:26 minutes, and they’ve flown 8,383 nautical miles, using 3 different hydroplanes christened: Lusitânia, Pátria and Santa Cruz. Despite this journey had lasted 79 days, their flight time was only 62 h 26 m; they’ve flown 8,383 nautical miles using 3 different hydroplanes christened: Lusitânia, Pátria and Santa Cruz. The new artificial horizon sextant had proven itself while flying over the ocean, without external references.

Keywords

Sacadura Cabral, Gago Coutinho, Precision Sextant, Aerial Navigation

1. Background

During the World War I (1914-1918) considerable development of aeronautics occurred, although most of the results of the planning had not time to come to daylight before the Armistice. An important example is the NC-4 flying boat, designed by Glenn Curtiss and manufactured by Curtiss Aero plane and Motor Company, to become an alternative to the Allied shipping that was being threatened by submarine warfare. To fulfill the U.S. Navy requirements this fixed-wing aircraft was designed to be capable of flying between the United States and Europe on its own power, but the demonstration of the transatlantic flight capability only happened after the war was over. This expedition commanded by Albert C. Read consisted on four identical NC Flying Boats (NC-1;

NC-2; NC-3 and NC-4) began on the 8 May 1919 at the Naval Air Station Rockaway (New York), then stopping Newfoundland (Terra Nova), and continuing on the 16 May 1919 to the Azores Islands (Portugal). Due to rough weather only the NC-4 with a crew of six people took off again and landed at Lisbon, Portugal, on the 27 May 1919. This became the first fixed wing aircraft to cross the ocean, covering a distance of 4,000 km in 22 hours of flight time at an average cruising speed of 180 km/h, and total installed propulsion power of 1,600 hp. This flight however did not use any kind of astronomical navigation. As a matter of fact it was decided to dispose 60 ships every 60 miles along the route, and to use directional TSF in the case that the weather conditions did not allow to catch sight of the projectors [1]. Only two weeks later, the second successful transatlantic flight was achieved the British John Alcock and Arthur Brown using TSF. A distance of 3,040 km between Newfoundland and Ireland was flown non-stop in 16 hours using a modified Vickers Vimy IV twin-engine bomber powered by two Rolls Royce Eagle Engines, each of 360 hp. A few days after the flight both Brown and Alcock were honored with a reception at royal residence Winsor Castle during which King George V knighted them and invested them with their insignia as Knight Commanders of the Order of the British Empire. They also won the £10,000 Daily Mail Competition [2]; competition consisted as follows: “*The Proprietors of the Daily Mail have offered the sum of £10,000 to be awarded to the aviator who shall first cross the Atlantic in an aero plane in flight from any point in the United States, Canada, or Newfoundland to any point in Great Britain or Ireland, in 72 consecutive hours. The flight may be made either way across the Atlantic*” (in; Flight-Official Organ of the Royal Aero Club of the United Kingdom (1918) No. 517, Vol. X, 21 November 1918, p. 1316; the Albert C. Read flight was not eligible for the Daily Mail prize since it took more than 72 consecutive hours and also because more than one aircraft was used in the attempt. In spite of the Arthur Brown aerial navigation skills only a few observations were made revealing that both pilots had only a limited confidence in the results. Both flights referred above were conducted with the help of external means of navigation.

2. Portuguese Background for the First Flight from Europe to the South Atlantic

Only a few days after the first transatlantic flight of the American NC-4 flying boat arrival to Lisbon, during an official visit of the President of Brazil to Lisbon, the Portuguese and Brazilian governments agreed to prepare a joint aerial crossing of the South Atlantic between Lisbon and Rio de Janeiro as a way of strengthen the ties of friendship between the two countries reflecting the affinities of language, thoughts and feelings. This initiative consisted on a ~8,300 km flight with the most difficult leg taking place between Africa and Brazil. On the African side the Cape Verde Islands would be a natural option since general administration was from Portugal. Between Africa and Brazil there was a landing possibility at the Fernando Noronha Islands (Brazilian territory), however at that time it was believed that due to the lack of precision of the aeronautical navigation devices it would be almost impossible to find such a small island (less than

10 km of maximum extension) after 2,330 km of flight distance over the ocean. So, the first decision of Lieutenant Commander Sacadura Cabral, the aviator that had made the proposal to the Portuguese Government, was in favor to a nonstop flight from Praia city (Cape Verde) to the Brazilian coast. This leg would require an aircraft with a range longer than 1,500 nm [1].

2.1. The Decision of the Airplane or Seaplane Selection

The aircraft could be either an airplane or a seaplane; the first had the advantage for better aerodynamic performance that could provide a longer range with the same engine power or increased payload, however with a major inconvenient: the need of landing fields in case of failure. The seaplane had the advantage that could alight on water to repair any failure avoiding the loss of the aircraft. If the option falls into an airplane, all stopovers would have to be made in places previously known with suitable land for airfields or properly prepared locations for safety landings: Lisbon \Rightarrow Mogador, actually formerly known as Essaouira, western Moroccan city, 450 nm; Mogador \Rightarrow Dakar, Senegal, 1,150 nm; Dakar \Rightarrow Specified location at Brazilian Coast (to be designated by the Brazilian government), a distance always above 1,600 nm. While studying which airplane type to choose, there was however some setbacks in the planning of this Journey: the fact that the Brazilian Government did not designate a nomination of a liaison officer in order to enable all necessary Journey studies and a planning at Brazilian territory in connection with the Portuguese Government, took the Portuguese officials to believe that to achieve the desired success on this Journey, it would be previously required a reconnaissance trip to analyze and choose all possible stopovers at Brazil and also to prepare land for safe landings, if needed [1]. So, after taking into account all of these variables and after studying the direction of the prevailing winds the Portuguese Government provided a final decision for the acquisition in favor of a seaplane; next step was to proceed for a new selection: taking into account the characteristics of all seaplanes produced at that time and also the characteristics of the journey, to decide in favor of a best option to acquire (an option that could fulfil all pilots' requirements considered necessary, including a long range above 1,600 nm). By the end of 1919 Sacadura Cabral had received the confirmation from English, French and Italian aircraft manufacturers that a seaplane with such long range could not be delivered; this information affected temporarily the mission to a future better opportunity [1].

2.2. Trials of Scientific Aircraft Navigation

Sometime later Sacadura Cabral discussed the subject with his friend Gago Coutinho (Naval Commander) who was involved in cartography projects and scientific astronomy navigation; both decided to make some experiments to develop new means of aeronautical navigation. The sextant used by the navy could not be applied to aviation due to the difficulty of the sky-line definition at a normal flight altitude. Gago Coutinho developed a new model of sextant that could be used to measure the altitude of a star without the need of the sea horizon. This new instrument was called "precision sextant"

(**Figure 1**) and used an artificial horizon line, defined with the help of a water bubble [1] [3]-[12]. Another instrument called “path corrector” (**Figure 1**) [5] [6] [9]-[13] was also developed by Gago Coutinho and Sacadura Cabral in order to calculate graphically the angle between the longitudinal axis of an airplane and the direction of flight, taking into account the intensity and the direction of the winds. In March 1921 an experimental flight was made from Lisbon to Madeira (520 nautical miles—**Figure 2**). Above all, they sought to prove that air navigation could be just as accurately pursued as sea

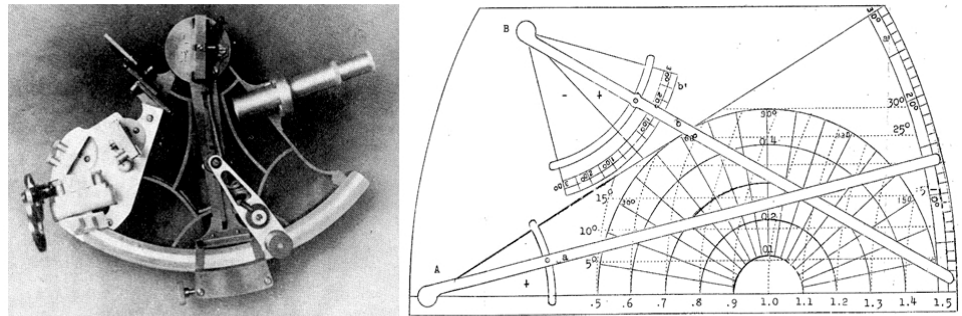


Figure 1. Precision sextant (left) and “path corrector” (right), both devices developed by Portuguese airmen Gago Coutinho and Sacadura Cabral and used by Coutinho along the First Flight from Europe to South Atlantic.



Figure 2. Portuguese Naval Aviation seaplane arrival to Funchal with Sacadura Cabral and Gago Coutinho onboard during an experimental flight from Lisbon to Madeira in order to test the accuracy of navigation devices: the precision sextant and the “path corrector”.

navigation, by deploying sextants and other available astronomical devices. The trajectory should be a perfect straight line, and to verify the position of the aircraft three ships were used to control its position. The result was a complete success. Sacadura Cabral then start to believe that the aeronautical navigation could provide the same precision of the nautical navigation, and the aircraft range could be substantial reduced to 1,260 nm, the distance from Praia to the Fernando Noronha Islands.

2.3. Seaplane Selection

Finally Sacadura Cabral got the necessary approval of the Portuguese Government, however it continued very difficult to find an adequate seaplane, this time, due to budget restrictions. Actually, the amount allocated to the mission was £5,000, a value including not only the aircraft as also the necessary transportation, spares, fuel, etc. [1]. In spite of all the restrictions and other difficulties the preparation of the mission started with the selection of the seaplane. Meanwhile, manufactures started to produce seaplanes with improved flight ranges. The final choice basically fell into a couple seaplanes: a Vickers-Vicking and a Fairey IIID; both possess Rolls-Royce engines, a predilection of the Portuguese pilots; all other characteristics were very similar and whatever the choice, the seaplane would have to be modified and adapted for the desired journey. One of the main requirements would be to carry greater load, thus lead to a wing surface increasing and to floats surface increasing; this requirement also increased the total empty weight of the seaplane. The Fairey IIID model was already equipped with variable curvature wings, allowing an easy increase in wing surface (some models fitted a 700 ft² wing surface); it would be easier to increase the floats surface. Another aspect was the fact that the price of Fairey IIID could suit the pilots' budget. A Portuguese Government proposal was made to the manufacturer for the supply of, not one, but two seaplanes with the following conditions: 1) the empty weight of each seaplane should not exceed 4,000 pounds by weight, lbs.; 2) both seaplanes should take off with a full load of 7,000 lb. and with wind not exceeding 13 knots [1]. One of these seaplanes was then prepared to the First Flight from Europe to South Atlantic. Unfortunately on its trials the seaplane did not took-off with the maximum payload specified in the contract. Several modifications were made, including engine change, the fuel tanks location (from the wings to the floats), the fuel system, and finally with the help of a little stronger wind-stronger than the specification on the contract, the Fairey III D finally flew. Days before the trip has started three test flights were made in particularly desired conditions; according to the pilots will the seaplane was again modified in order to subtract weight. There was no time to carry out fuel consumption experiences as well as speed tests with average loads [1]. **Table 1** shows the main characteristics of the seaplane "Lusitânia".

2.4. Portuguese Government Provides Three Navy Support Ships for the Journey

In order to assist the seaplane along the journey, the Portuguese Government has provide

Table 1. Main characteristics of the seaplane “Lusitânia”.

Fairey III D Lusitânia Main characteristics	
Total length	36, 9 ft
total height	13, 1 ft
wingspan	62, 9 ft
wings depth	5, 9 ft
Wings Surface	700 ft ²
dihedral	1°, 40
fuel tanks capacity	330 gallons
Oil tanks capacity	16 gallons
Engine	Rolls-Royce Eagle VIII
Power	350 hp
Maximum Speed	176 km/h

the aid of three warships: the cruisers “*República*” and “*5 de Outubro*” and the gunboat “*Bengo*”; the first one will act as support ship and it would have onboard, authorized specialists to be able to provide assistance of any kind to the pilots; this ship will also carry all kinds of necessary spare parts including fuel; the other two ships, would pay only limited service. The route plan would be as follows: the “*República*” moves from Lisbon to Cape Verde and awaits the seaplane arrival; both “*5 de Outubro*” and “*Bengo*” move from Lisbon to Las Palmas and await there for the seaplane. After the seaplane arrival to Las Palmas, one of these would move to Cape Verde to replace “*República*” and “*República*” would move from Cape Verde to Fernando Noronha Islands (340 km off the Brazilian coast) and awaits the seaplane arrival. With this plan, ships would support pilots and seaplane during almost all the way across the Atlantic Ocean. On 25 March 1922, was finally confirmed that the trip would follow the route: Lisbon, Canary Islands, Cape Verde, Fernando Noronha, and Brazil [1].

3. First Flight from Europe to the South Atlantic

All travel preparations and arrangements were finalized on 29 March 1922 and the beginning of the First Flight from Europe to the South Atlantic was scheduled for the next forthcoming day of good weather conditions, at Lisbon. Sacadura Cabral would be the pilot (front cabin seat) and Gago Coutinho would be the navigator (rear cabin seat) (Figure 3) onboard the “Lusitânia” (Figure 4). During the flight, as well as Coutinho could talk to Cabral, the two aviators communicate with each other by two written procedures: the “*Diário de Bordo*” [Logbook] and the “*Livro de Recados*” [Notes Book]; these two processes completed each other. Usually the second was mostly used for fast readings [6].

1st flight stage: Lisbon ⇒ Las Palmas (Canary Islands): At 7 h 00 m (local time) the seaplane is ready to take-off from Lisbon en route to Las Palmas (Canary Islands).



Figure 3. Sacadura Cabral (pilot) and Gago Coutinho (navigator) onboard the “Lusitânia” seaplane at Lisbon Naval Base, shortly before departure to the First Flight from Europe to the South Atlantic (Lisbon, 30 March 1922).

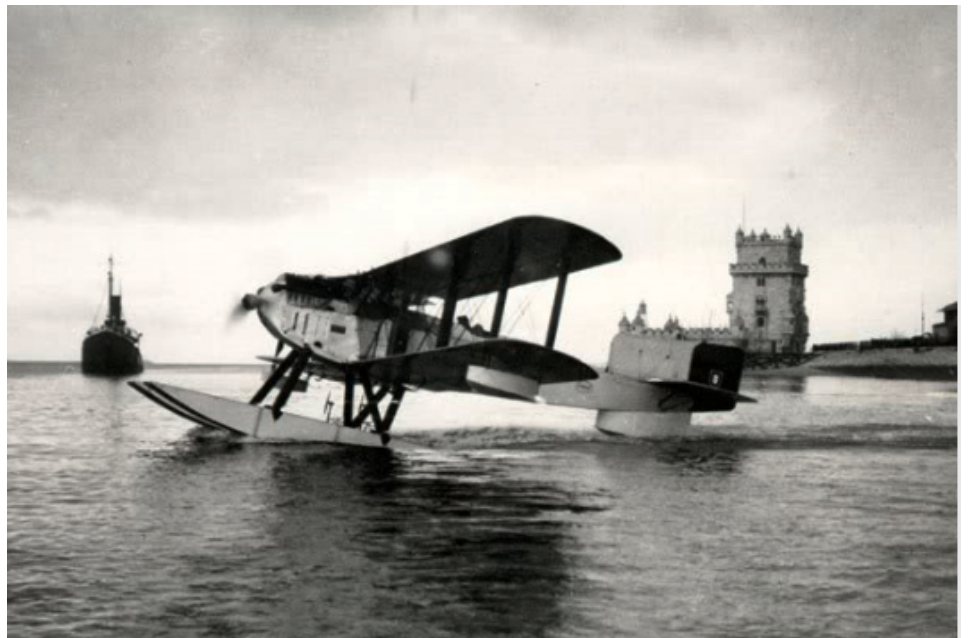


Figure 4. Sacadura Cabral and Gago Coutinho onboard the “Lusitânia”, starting the First Flight from Europe to the south Atlantic (Lisbon, 30 March 1922).

With front wind the engine is set to rotate at 1,800 rpm; after a run of 15 seconds the seaplane takes-off without difficulty transporting 220 gallons of gasoline and 15 gallons of oil. Navigators lose sight of land at 7 h 22 m and the government needle marks a route 218; the flight remain stable at an altitude of 200 meters and with a speed of 68

mph. At 8 h 30 m the Notebook refers wind from NW at 10 mph; at 9 h 00 m Notebook refers wind passing from NNW. At 9 h 13 m navigators spot a cargo ship; at 10 h 45 m observations reveal that the wind comes from the NE at 8 mph. At 12 h 00 m the observed location has the coordinates: latitude 31°27'N; longitude 13°44'W. Navigators flew 484 miles with an estimated consumption of 20 gallons per hour of gasoline; this consumption is above the expectations and worries both navigators (11% higher than expected). At 13 h 27 m calculations show a total flight of 530 miles; the engine continues working well (1,700 rpm) and the radiator temperature is 65°C; pressure and oil temperature values recorded were normal, however, the engine was discharging oil that was spreading everywhere including the faces and glasses of both navigators as well as the sextant, making observations become imperfect, in spite of the good weather. The Selvagem Grande island, Madeira was spotted at 14 h 15 m and at 14 h 57 m navigators saw the northern tip of Tenerife; at 15 h 02 m Gran Canaria Island; Cabral rises to an altitude of 2,000 meters and the island approaches. Lastly, at 15 h 37 m they had alighted in Las Palmas (Harbor de la Luz), although a stronger undulation caused the rupture of two cables that connected the wings to the floats. The Portuguese ship “5 de Outubro” was expecting the aviators inside the harbor, and it was arranged a place to make the necessary repairs and revisions. Navigators examined the Island and found that the best place to take-off from Canary Island to Cape Verde with the seaplane fuel loaded was in fact the *Baía de Gando* Gando Bay nearly 15 miles south to Harbor de la Luz [1].

2nd flight stage: Las Palmas (Canary Islands) ⇒ Baía de Gando (Canary Islands):

On 2 April at 11 h 13 m the preparation for take-off started and it was found that the floats had some water inside. The aircraft initiated the trip to Gando to refueling. During the trip no discharge of oil occurred, but *Sacadura Cabral* noticed a pitching moment nose-up of the aircraft. After refueling with 240 gallons of gasoline, the tail float plunged too much in the water. Some modifications into the floats were attempted, but on the 3 April, before departure it was found that the problem remains the same. The major concern was that at Praia city (Cape Verde) before the longest leg (to Fernando de Noronha) there was no possibility of taking the seaplane out of water to drain the floats. So the crossing of the Atlantic that had originally been designed to be the leg Praia (Cape Verde) ⇒ Fernando Noronha (Brazil) would not be feasible, especially also with the fuel consumption that the aircraft demonstrated during the flight Lisbon ⇒ Las Palmas. With these events, the course of the journey was changed from Gando ⇒ Praia City, to Gando ⇒ São Vicente [Saint Vincent] (Cape Verde). At São Vicente it would be possible to use an existing inclined plane (from Government) in order to take the seaplane out of water and to drain the floats. The extra stopover at São Vicente will allow navigators to maintain the leg Praia ⇒ Fernando Noronha only if floats could be drained and fuel consumption could be decreased [1].

3rd flight stage: Baía de Gando (Canary Islands) ⇒ São Vicente Island (Cape Verde): On 5 April at 7 h 35 m and after a regular ran the seaplane took-off with 240 gallons of gasoline on board. Shortly after take-off the government needle began to turn without stopping, making its use impossible. After brief hesitation navigators decided

to continue their path exclusively guided by the direction of the waves and by the shadows of the seaplane's masts (when there was sunny weather); 1 h 50 m after, the needle began to mark the course regularly and correctly. At 13 h 00 m their location was: latitude 22°38'N; longitude: 20°22'W; this results revealed the pilots nearly 430 miles en route to Saint Vincent; the speed was now 90 mph. At 13 h 30 m navigators found that there were still 110 gallons of gasoline. Flight was calm until the conclusion of this stage; at 18 h 18 m the seaplane arrives at the Mاتيota beach (São Vicente). The aircraft was moved to the workshop where the technicians started immediately to do the necessary improvements and confirmed the navigator's results-the fuel consumption was remains on 20 gallons per hour; such confirmation led navigators to think on the following problem: the flight from Praia to Fernando Noronha would be dependent on the winds (330 gallons with a 20 gallons per hour consumption give-16.5 hours of flight time; to reach Fernando Noronha in these conditions, the seaplane will have to guarantee a mean velocity of 80 mph to succeed). So, the only possible solution found was to make an extra stopover near Penedos [Rocks of S. Peter and St. Paul] and try to do the refueling there. The ship "*República*" would wait there for the arrival of the "*Lusitania*" [1].

4th flight stage: São Vicente Island (Cape Verde) ⇒ São Tiago (Cape Verde): On 17 of April it was conducted the flight from Saint Vicent Island to Saint James Island [Praia city] which happened with no major problems in 2 h 15 m [1].

5th flight stage: São Tiago (Cape Verde) ⇒ Penedos [Rocks of St. Peter & S. t Paul (Brazil): On 18 April *Sacadura Cabral* had to do three attempts to take-off due to the sea and wind conditions; two hours after departure the pilot realize that there were only 195 gallons of fuel left, meaning that they had less than 10 hours of flight time left. Instead of turning back to Cape Verde, *Gago Coutinho* and *Sacadura Cabral* decided to continue ahead and expecting a change to a more favorable wind. At 12 h 00 m the location point confers; latitude 7°41'N; longitude 26°26'W; these data revealed navigators had managed to achieve an average speed of 80 mph. At 16 h 00 m the main fuel tanks were empty and only 24 gallons existed at the gravity tank. From their observations sextant they located geographically the *Penedos* Rocks of S. Peter and St. Paul] but the problem was still remaining and consisted in having or not enough fuel. At 17 h 00 m they come in sight of *Penedos* and at the very same time of the ship "*República*" at about 8 miles to NW from *Penedos*. Notwithstanding their arrival with hardly any fuel left, one of the aircraft floaters was destroyed by the crest of a wave and the hydroplane tilted and sank soon thereafter (Figure 5). There was still sufficient time to a cutter from "*República*" to arrive and the pilots were saved together with some books, the *Gago Coutinho* precision sextant, the chronograph and other onboard devices. Figure 6 illustrates the aerial navigation route followed from São Tiago Island (Cape Verde) to Rocks of St. Peter & St. Paul (Brazil) on 18 April 1922. Thereat, the "*República*" proceeded to Fernando Noronha and the orders of the Portuguese government to the navigators, were to wait for the arrival of a new aircraft and then to proceed with the mission. Against the airmen's hopes, however, this second seaplane named "*Portugal*"

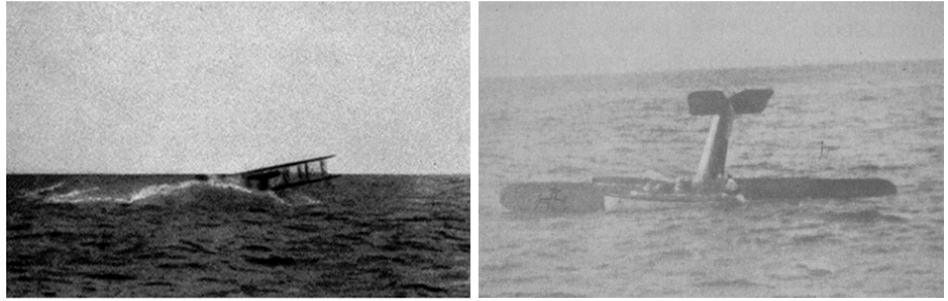


Figure 5. Photos taken onboard the ship “*Républica*” illustrating the sea landing moment of “*Lusitânia*” near St. Peter & St. Paul’s Rocks (left) and later, the seaplane sinking at the ocean (right), on 18 April 1922 [5].

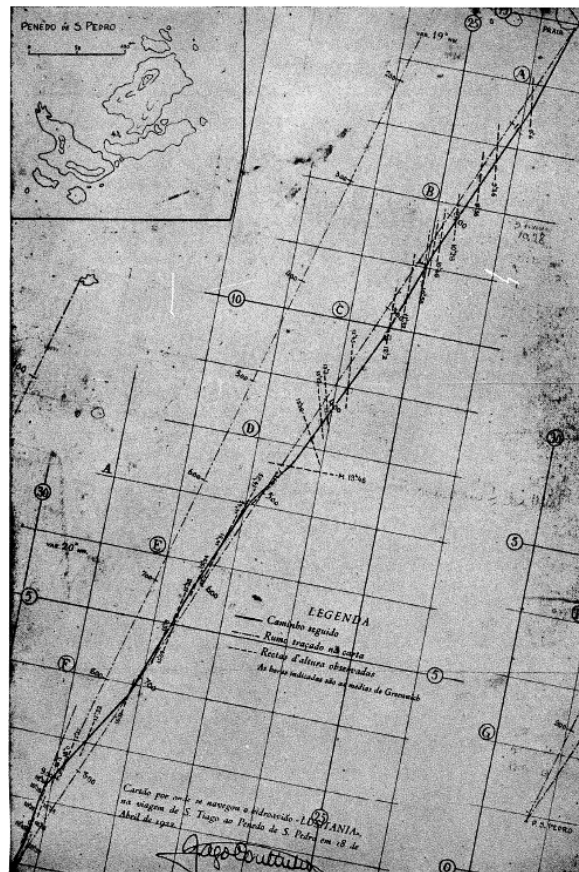


Figure 6. Reproduction of the original Card assigned by Admiral Gago Coutinho, illustrating the aerial navigation route followed from São Tiago Island (Cape Verde) to Rocks of St. Peter & St. Paul (Brazil), on 18 April 1922 [1] [5].

ended up in Fernando Noronha, because of weather related complications in the unloading attempts at St. Peter & St. Paul’s Rocks and the fact that the ship’s passengers could not wait for favorable weather for more than two days. It was decided, therefore, to fly back from Fernando Noronha to St. Peter & St. Paul’s Rocks where the “*Lusitânia*” sank and then again to proceed to Fernando Noronha and onwards to Recife [1].

6th flight stage: Fernando Noronha Islands (Brazil) ⇒ Penedos Rocks of St. Peter & S.t Paul (Brazil): On 11 May the navigators resume flight stages with the new seaplane “*Portugal*” in a stage that began in the opposite direction related to the general plan of Journey. Five hours after take-off, the aviators sighted St. Peter & St. Paul’s Rocks from about 15 miles, however heavy rain make them decide to skip this 15 miles distance and turn back towards their refueling ship “*República*” located in route at azimuth 25 NE, 70 miles from Fernando Noronha. About 1 h 50 m later the engine stopped due to fuel carburation hiccups, leading to a forced sea landing. *Sacadura Cabral* managed to restart the engine for some 55 minutes but, before they could take-off, the engine stopped never to restart again. As the floaters began to sink slowly, one of the airmen sat on the engine to reduce the rear weight on the floaters. Meanwhile, the “*República*” had realized something had gone wrong and sent radio messages to all ships nearby announcing a probable incident. About 1 h 20 m later, when Coutinho and Cabral’s hopes were vanishing under fatigue and sleepiness, a distant light in the dark emerged to which they responded with two gun shots. They were rescued by the freighter “*Paris City*” on its way from Cardiff to Rio de Janeiro [1].

7th flight stage: Fernando Noronha Islands (Brazil) ⇒ Recife (Brazil): During the night of 2 June the Portuguese ship “*Carvalho de Araújo*” arrived to Fernando Noronha carrying onboard a third seaplane Fairey 17 named “*Santa Cruz*” (Figure 7), so that navigators could continue its journey. On June 5 *Sacadura Cabral* conducted the “*Santa Cruz*” in flight along 4 h 32 m without incidents, from Fernando Noronha to Recife. It was thus completed the crossing of the South Atlantic [1].

8th flight stage: Recife (Brazil) ⇒ Baía [Salvador, Bahia]: On 8 June navigators onboard the seaplane “*Santa Cruz*” made a quiet and calm flight of 5 h 30 m from Recife to Baía, with an average speed of 67 mph. The weather was splendid. The navigator’s

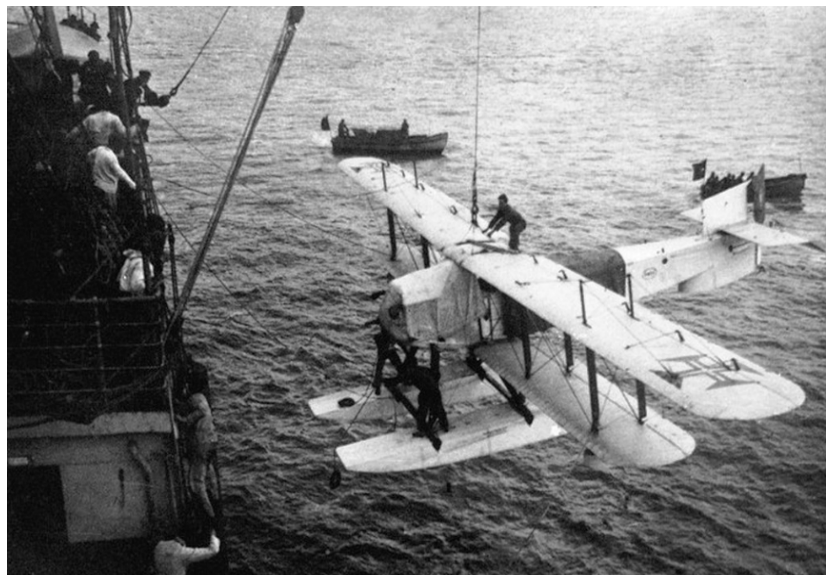


Figure 7. Photo of the third seaplane “*Santa Cruz*” being assembled at sea, near Fernando Noronha Islands [2].

reception in this city was delirious [1].

9th flight stage: Baía [Salvador, Bahia] ⇒ Porto Seguro: Due to adverse weather conditions, Coutinho and Cabral remained five days at Baía; on 13 June they made a quiet flight stage lasting 4 h 03m till Porto Seguro. During take-off maneuver two of the cables connecting wings to floats broke making the seaplane less resistant during the flight; even so their decision was to continue the flight stage, a mixture of anxiety and crazy for wanting to end the Journey as soon as possible. The flight stage route flew over important historical locations in the Portuguese discovery of Brazil: São Jorge dos Ilhéus, Olivença, Belmonte, Santo António, Santa Cruz and finally Porto Seguro. On 14 June the seaplane was properly repaired [1].

10th flight stage: Porto Seguro ⇒ Vitória: On 15 June a new flight stage was held comprising 260 nm from Porto Seguro en route to Vitória: once again, this flight stage route flew over important historical locations in the Portuguese discovery of Brazil: Caravelas, Porto Alegre and finally Porto Seguro. The ship “*Carvalho de Araújo*” was expecting the navigators at the harbor of Vitória. The seaplane was tied to “*Carvalho de Araújo*” bow [1].

11th flight stage: Vitória ⇒ Rio de Janeiro: The last flight stage of this journey was held on 17 June 1922, comprising a 250 nm flight between Vitória and Rio de Janeiro. During the flight, after passing over the Cape of São Tomé, navigators caught a rain and fog zone; sometimes *Sacadura Cabral* was forced to descend the seaplane below 50 meters of altitude in order of not to lose the coastline. The entire flight stage was carried out under a thick fog. At 17 h 01 m navigators spotted one of the islets at the entrance to the *Baía de Guanabara* [Guanabara Bay] but the dense fog made him lose this reference; minutes later and with less dense fog, navigators discovered that they were flying over the Bay of Guanabara, quite near the city of Rio de Janeiro. *Sacadura* decides to circle the city and after that resolve land the seaplane in front of the Ilha das Enxadas, where were the hangars of the Aviação Marítima Brasileira Brazilian Maritime Aviation. It was thus completed the journey that became known as the First Flight from Europe to the South Atlantic [1]. Since seaplane finish it's sliding in water, the engine was turned off and were immediately hoisted the flags of Portugal and Brazil and were fired 21 shots with flare gun [6] [14] (Figure 8). Figure 9 presents a Portuguese propaganda of the Aerial Journey. Table 2 presents an all stage flights resume of the First Flight from Europe to the South Atlantic. This 3rd seaplane received his “*Santa Cruz*” baptismal name by the wife of Epiácio Pessoa [15], the President of Brazil. Figure 10 illustrates Gago Coutinho (left) and Sacadura Cabral (right) with the President of Brazil Epiácio Pessoa (center).

4. A Portuguese Milestone in Transatlantic Aviation with New Technologies

The Portuguese airmen had just completed the First Flight from Europe to the South Atlantic; for first time in the history of aviation, it was turned possible flying over the Atlantic Ocean, exclusively supported on internal means of navigation devices. Although

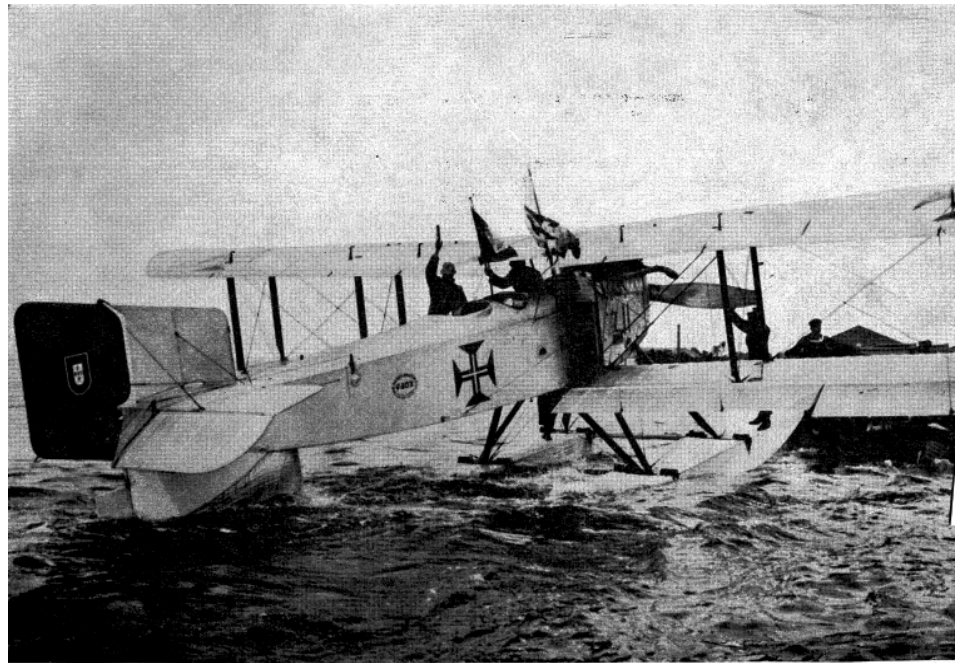


Figure 8. Photo of the “Santa Cruz” finishing the arrival at Rio de Janeiro on 17 June 1922 [14].



Figure 9. Propaganda of the First Flight from Europe to the South Atlantic, achieved by Gago Coutinho and Sacadura Cabral, along 30 March and 17 June 1922.

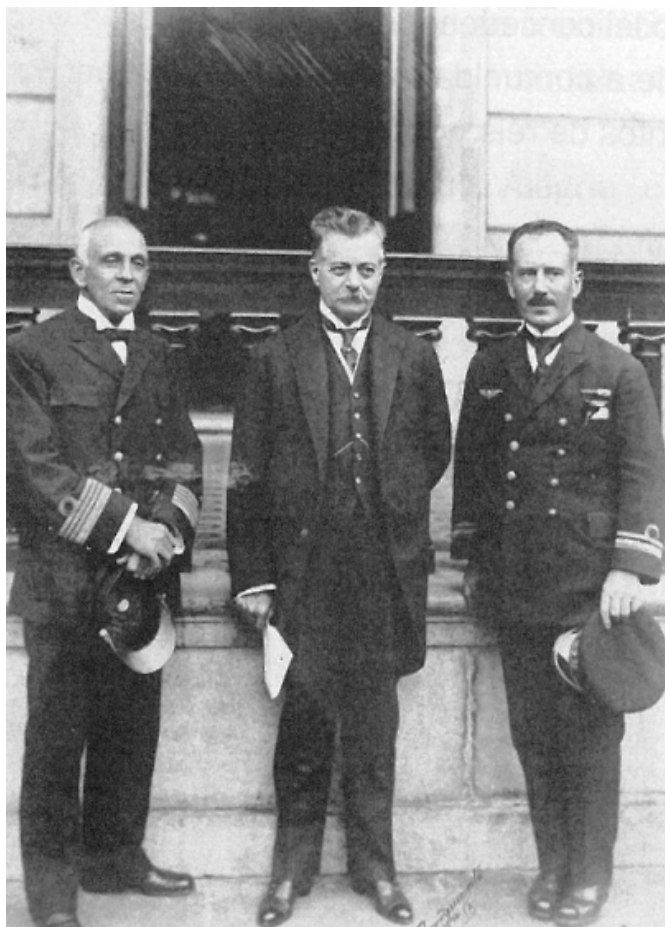


Figure 10. Gago Coutinho (left) and Sacadura Cabral (right) together with the Brazilian president Epitácio Pessoa (center) [14].

Table 2. Stage flights resume of the First Flight from Europe to the South Atlantic.

1922	Stages	Flight Time (h:m)	Flown Distance (nm)	Speed (mph)
30 March	Lisbon ⇒ Las Palmas	08:37	703	82
02 April	Las Palmas ⇒ Gando	00:21	15	--
05 April	Gando ⇒ S. Vicent	10:43	849	79
17 April	S. Vicent ⇒ S. Tiago	02:15	170	77
18 April	S. Tiago ⇒ Penedos	11:21	908	80
11 May	Fernando Noronha ⇒ Sea	06:34	480	72
05 June	F. Noronha ⇒ Recife	04:32	300	67
08 June	Recife ⇒ Baía	05:30	380	69
13 June	Baía ⇒ Porto Seguro	04:03	212	52
15 June	Porto Seguro ⇒ Vitória	03:40	260	71
17 June	Vitória ⇒ Rio de Janeiro	04:50	250	52
		62:26	4527	72.5

their journey had lasted 79 days, the actual flight time was just 62 hours and 26 minutes. Sacadura Cabral and Gago Coutinho were received as heroes by huge crowds at several Brazilian cities: Rio de Janeiro, São Paulo, Santos, Belo Horizonte, Pará and Maranhão.

The aviation pioneer Santos Dumont became a personal friend of both Portuguese navigators (Figure 11). In a letter he wrote about both: “*A imensa travessia aérea Lisboa-Rio de Janeiro veio mais uma vez confirmar a audácia lendária Portuguesa e nos mostrar também os grandes talentos científicos da nova geração Portuguesa. Salvê! Gago Coutinho e Sacadura Cabral*”; “[The immense Lisbon-Rio de Janeiro Air Crossing has once again confirmed the legendary Portuguese audacity and also show to us, the great scientific talents of the new Portuguese generation. Hail! Gago Coutinho and Sacadura Cabral]” (Figure 12).

The opinion of Santos Dumont concerning the First Flight from Europe to the South



Figure 11. Gago Coutinho (left) and Sacadura Cabral (right) together with the Brazilian aviation pioneer Santos Dumont [1].

<p><i>A imensa travessia aerea Lisboa-Rio de Janeiro veio mais uma vez confir- mar a audacia lendária portuguesa e nos mostrar tambem os grandes talentos científicos da nova geração portuguesa.</i></p>	<p><i>Salve! Gago Coutinho & Sacadura Cabral, à bordo "Lutetia" 3-8-1922 Santos Dumont</i></p>
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Figure 12. Santos Dumont letter praising and uplifting Sacadura and Coutinho [6].

Atlantic was also recorded by a French journalist in 1922, as follows: “*Le raid de Coutinho et Sacadura fut mathématiquement réalisé. L’entreprise n’avait rien de commun avec les tentatives précédentes. Il ne s’agissait pas de tenter le hasard ou la chance, mais d’accomplir une traversée, tout comme le ferait un courrier, avec des escales fixes, ravitaillement, etc. Les Portugais accomplirent merveilleusement la tâche qu’ils s’étaient tracés. Ils ne s’écartèrent pas un seul instant de leur route, ne louvoyèrent pas une mille, suivirent scrupuleusement leur itinéraire et leur horaire*”; “[The journey performed by Coutinho and Sacadura was mathematically conducted. The Portuguese assignment had nothing in common with the previous attempts (both Atlantic Crossing, performed on 1919). They were not challenging (their life’s) by chance or luck; instead they performed the journey as if they were travelling on a ship, with established fuel supplies and predetermined stopovers. The Portuguese accomplished wonderfully the task they were drawn. They did not turn aside their course for a single moment, not even for one mile; they resume their flight by scrupulously following their route and time schedule]” [6].

On August 1922 Santos Dumont visits Lisbon and gives a Press interview concerning to the First Flight from Europe to the South Atlantic and the scientific navigation devices: “*Foi uma admirável prova de audácia e de espírito desportivo: Entretanto, ela vale porque resolveu um grande problema da aeronáutica. Depois disso, entendo que estão resolvidas todas as questões científicas aeronáuticas. Não há mais dúvidas nem receios, nem mais problemas. O que pode subsistir são os acidentes de motor, mas esses serão eternos e dar-se-ão em todas as circunstâncias*”; “[It was an admirable proof of courage and sportsmanship: however, its great value is because it was solved a big problem of aeronautics. After that, I understand that all aeronautical scientific issues are solved. There are no doubts or fears, no more problems. What can subsist are engine failures, but these are eternal and shall happen along all circumstances]” [6]. Gago Coutinho and Sacadura Cabral received several Portuguese and Foreign Honoristic Insignias. **Figure 13** illustrated the Award Ceremonies of the: (above, left): “*Grand Cross of the Ordem Militar da Torre, Espada, Valor, Lealdade e Mérito*”; (above, right): the “*Grand Cross of the Ordem Militar de Santiago da Espada*”; (bottom, right): the “*Commander Cross of the Legion d’Honneur*” at France; (bottom, left) illustrates the Honoris Causa of both airmen, at Faculdade de Engenharia do Porto [Faculty of Engineering of Oporto].

5. Conclusion

The First Flight from Europe to the South Atlantic was performed by two Portuguese navigators; this Journey was conceived as well for the first time with exclusive use of astronomical navigation when flying out of sight of land was described. The navigation methods and instruments were tested during short flights, and then applied with quite success to the flight between Lisbon (Portugal) and Recife (Brazil) in 1922. For the first time in the history of the aviation the crossing of the South Atlantic had been achieved and using an instrument that enabled an aero plane position to be determined by astronomical navigation when flying out of sight of land.

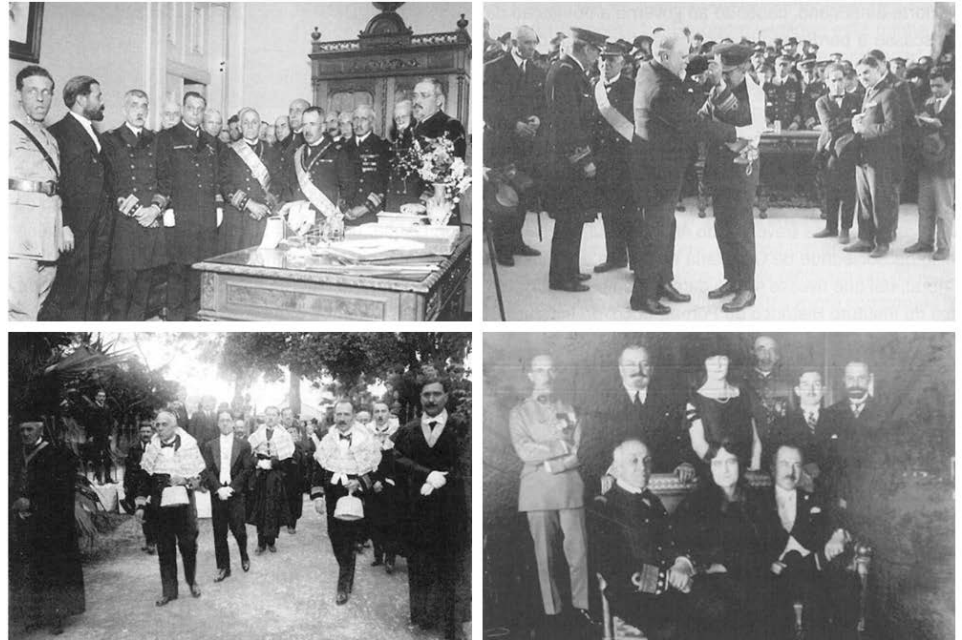


Figure 13. Gago Coutinho and Sacadura Cabral receiving the *Grand Cross of the Ordem Militar da Torre, Espada, Valor, Lealdade e Mérito*; (above, left): the “*Grand Cross of the Ordem Militar de Santiago da Espada*”; (above, right): the “*Commander Cross of the Legion d’Honneur*” at France, (bottom, right); and the Honoris Causa of both airmen, at Faculty of Engineering of Oporto (bottom, left).

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