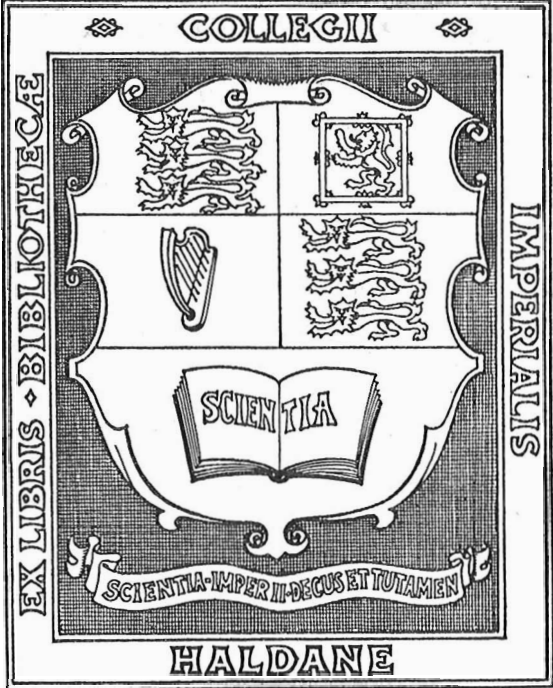


IMPERIAL COLLEGE
OF SCIENCE & TECHNOLOGY

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THE EXPLORATION BOARD



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THE IMPERIAL COLLEGE
AFRICA AND AMERICAS EXPEDITION

March - November, 1960

D. Hyde, M.Sc.(Eng.), D.I.C., A.C.G.I., I.S. Gartshore, M.Sc.(Eng),
D.I.C., B.A.Sc., and W.H. Melbourne, Ph.D., D.I.C., B.E.

The expedition travelled overland through Africa and the Americas,
making a survey of civil light aircraft and their activities.

December, 1960.

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INTRODUCTION

In January 1959 the three members of the expedition, who were at that time all doing post-graduate work in the aeronautics department of Imperial College, decided to investigate the possibility of making a survey of aviation activities in Africa and South America. In March of that year Hyde made application for the John de Havilland Award, a £400 grant which is administered by the Society of British Aircraft Constructors and is in memory of Sir Geoffrey and Lady de Havilland's third son. This money is given annually in support of projects related to the aircraft industry or airline operation and the expedition's proposal to study airline operations in primitive and isolated areas of Africa and South America won for Hyde the 1959 award.

Detailed plans for the expedition were meanwhile being made by all three members. In March 1959, Melbourne purchased a 1952 Land Rover for the journey; the British Council and the Commercial Relation and Exports Department of the Board of Trade were approached to assist in contacting aviation officials in the countries to be visited. Through the latter group United Kingdom Trade Commissioners or Commercial Secretaries connected with British Embassies were contacted in every area of Africa and South America; these officials provided the expedition with invaluable introductions throughout the route.

In November 1959, the proposals for the journey received the authorization and support of the Imperial College Exploration Board, and the final name, the Imperial College Africa and Americas Expedition, was adopted.

Hyde meanwhile had been making an extensive investigation of airfield locations and of the existing literature on aircraft operations in the two continents. In this work he was assisted by the Ministry of Aviation Aeronautical Information Service and by the Market Research Group of the de Havilland Aircraft Company.

As a result of these investigations, it was decided to concentrate on the operations and requirements of light aircraft operators during the survey since documentation of these topics was found in many cases to be incomplete or out of date.

Consular representatives of all the countries to be visited were contacted and visas were obtained for the African territories. Through the Royal Automobile Club, the various automobile clubs were contacted and arrangements were made for the temporary importation of the car into the countries concerned. The Land Rover itself was meanwhile reconditioned and modified for the journey.

The expedition left London on March 16, 1960.

DESCRIPTION OF THE EXPEDITION ACTIVITIES

Gibraltar was reached one week after the expedition's departure from London and the crossing to Tangier from Gibraltar was made without difficulty. Morocco was in a state of emergency at this time, and some 14 police barriers were encountered along the route; at these barriers, a few questions were asked and passports examined before the road was cleared for the vehicle.

At Tlemcen, on the Morocco-Algeria border, security forces thoroughly checked the vehicle and travel documents, a $2\frac{1}{2}$ -hour procedure. Due to the rebel activity in Algeria, guards were stationed in almost every village with orders to enforce a strict curfew on travelling at night; camping was consequently forbidden and the expedition was forced to find hotel accommodation. This curfew extended only through Northern Algeria, and was not enforced at Colomb Bechar, reached three days after entering Algeria. This centre marks the start of the Sahara Desert crossing, although several large oases lie between it and the heart of the desert itself, and it is therefore at Colomb Bechar that papers related to the trans-Sahara journey must be checked.

A long tedious detour between Colomb Bechar and Beni Abbes brought us near Adrar, on the outskirts of the desert sands. Since arriving in Africa, we had seen mostly military aviation activity; these operations were quite extensive, due to the French atomic centre at Reggan as well as to the generally high level of French military action throughout Algeria. This activity was not included in our survey, which was restricted to civilian aviation.

At Adrar, we waited three days to join a convoy of large trucks, thereby avoiding an insurance premium levied on all lone travellers. Our convoy of 4 vehicles had a compulsory escort of two military armoured cars for the part of the journey near Reggan; these left us some 80 kilometers south of the atomic centre.

The track was marked from Reggan to Tessalit, on the southern edge of the desert, by 20-litre drums placed at 5 km. intervals, and the road over which we travelled was seldom soft enough to necessitate the use of 4-wheel drive. Petrol was picked up at Balise, Bidon V, Ponnalit and Anefis, by arrangement with the Mediterranean-Niger Company; water was available only at Tessalit.

The convoy trucks were left at Gao where the Niger River and large spreading fig trees made delightfully cool and pleasant camping conditions. Unfortunately we drank the Niger water without first chlorinating it and thereby contracted dysentery. This ailment did not impede our progress greatly however and we reached Niamey on April 13th, nearly one month after leaving London.

The U.K. Trade Commissioner in Kaduna, the administrative capital of Nigeria, had been contacted by the Board of Trade regarding our expedition, and we spent two busy days there with Mr. J. Quinn, the Acting Trade Commissioner. The aviation picture was completed by a short stay in Kano; here we learned from Nigerian Airways of their reductions in fleet and in domestic flights and of the generally disappointing development of native traffic in Nigeria.

The road through the former French Equatorial Africa, although very rough and rocky, passed through many small interesting native villages. We saw a few of the natives from the "banana" tribe who, unaffected by the approach of civilization, wear no clothes whatsoever. We were fortunate to meet and spend a night with an American Baptist missionary and his family at their mission station near Fort Archambault, and learned much from them about the natives of the district. Ferry barges, sometimes crudely constructed, often act as substitutes for expensive bridges in the Congo and carry trucks and people from bank to bank. While crossing on one of these barges at Bondo, we were suddenly lashed by the wind-driven rain of a violent tropical storm with its brilliant sheets of lightning and loud thunder. To our amazement and consternation,

all the natives manning the ferry left their posts and crowded excitedly into the small engine room out of the rain. The barge meanwhile drifted rapidly downstream and finally ran aground on a mud bank. Soon the rain and wind ceased as abruptly as they had begun, and the natives, quite unabashed by their frightening desertion of a few minutes before, chattered happily amongst themselves as they began the job of re-floating the barge. A short time later we thankfully drove ashore and started cutting our way through the bamboo which had been blown over the road.

At Ndu, on the Congo border, we had been met by a friendly intelligent Congolese Customs official, who gave us a large juicy pineapple. However the elections which preceded the independence of the Congo were only a few weeks away, and anti-white political broadcasts and reports of general unrest combined to give us an uneasy feeling about the conditions which we would find in the large northern centre of Stanleyville. On the road, near the city, a tree presumably blown down by a recent storm, blocked our path and a large group of blacks surrounded our car as we stopped to investigate. The tree had been cut into sections, but had not been removed from the road, and we realized that the natives were stopping all vehicles by this simple road block. Our lack of fluent French, our vigorous removal of the tree from the road, our right-hand drive vehicle or our gift of a few coins may have surprised them however, for they let us pass through without difficulty after a few minutes discussion.

In Stanleyville we heard, but did not witness, a political demonstration which followed a visit to the town by M. Lumumba. In the city we camped for one night behind a Roman Catholic school and learned of the tense situation in the Congo from one of the teachers there. We left the city the following morning and safely crossed the border into Uganda some three days later. While in Stanleyville however we spoke with several airport officials and

were amazed at the numbers of whites leaving the country by air in the face of the forthcoming independence. All Sabena's flights out of the Congo were, so we were told, completely booked up for the next five months.

In East Africa we found a great deal of light aircraft activity, and were particularly interested in the extensive charter operations based on Lake Victoria and at Nairobi. We stayed for three nights at Lake Naivasha in the beautiful home of Captain B.L. Maclaren. Here we installed a complete new rear spring on the Rover in an effort to avoid further rear suspension trouble - at that point we had broken and replaced a total of ten rear spring leaves. Interviews in Nairobi were quickly and efficiently arranged by the U.K. Trade Commissioner Mr. C.E. Dymond. In Tanganyika we stopped briefly at Mboya to watch an interesting operation of Wwela, the Witwatersrand Native Labour Association, who transport native labour by air from centres in Tanganyika and the Federation to the Johannesburg district for 18-month terms in the mines.

Shortly after entering the Central African Federation, we took the opportunity of visiting two of Africa's most famous sights: Kariba dam and Victoria Falls. Both these attractions left us with unforgettable impressions, and we felt that the reputations which each enjoy are quite justified.

Between Victoria Falls and Bulawayo, we drove for some 80 miles through the Nankie Game Reserve and saw a large variety of wild game including giraffe, elephant, buffalo, impala, kudu and wildebeest.

In Salisbury, we camped in a Municipal camp site; here hot showers were a welcome change from our usual less elaborate washing arrangements, and were well worth the five shilling fee for our site. Shell officials in Salisbury who had been contacted by the London office regarding our arrival, gave the

Land Rover a complete oil change and took us to lunch.

Interviews were arranged through U.K. Trade Commissioners at Pretoria, Johannesburg, Durban and Cape Town in South Africa; in both Johannesburg and Cape Town we stayed in university residences with little or no charge, as guests of the university. The arrangements for this accommodation were made on arrival, and were possible only through the kindness of the South Africans whom we met. Press interviews were arranged by the U.K. Information Service in all of these centres except Pretoria, and we were the recipients of a great deal of hospitality from the Trade Commissioners and their associates. Highlights in the aviation field were a demonstration flight in a series J2 Bell 47 at Pretoria and an absorbing day touring South African Airways' main base at Johannesburg with the General Manager, Col. J. Louw. The "garden route", as the road along the coast between Durban and Cape Town is called, provided us with a particularly enjoyable few days.

In light aircraft operations in South Africa, as in East Africa and the Federation, Cessna and Piper machines are preferred to other makes, although operators would buy a British model if a suitable one was available. Extensive executive flying by the large mining houses and crop-spraying add diversity to the usual charter operations.

Since the ship on which we were to sail to South America was five days late in arriving at Cape Town, we had some free time in that beautiful city and spent it in writing reports and letters and in sightseeing and climbing on Table Mountain. **We sailed from Africa** aboard the Royal Inter-Ocean Lines' ship M.V. Tjisadane on July 5th, 1960.

On board the Tjisadane were 200 Japanese immigrants travelling to Brazil, and the Dutch ship's officers and Chinese galley crew, together with the multi-racial group of passengers (there were even a few White Russians) gave a really international flavour to the

voyage. Our second class quarters were comfortable and our meals were good; deck games, reading and writing were pleasant changes from the overland travelling and interviewing to which we had become accustomed in the previous three months. On one occasion we gave a colour-slide/^{show}to the Japanese passengers and were astonished by the way that the interpreter amplified our simple comments about the African pictures into lengthy floods of Japanese!

Hyde and Gartshore disembarked at Rio de Janeiro, leaving Molhorne and the Land Rover on board to continue to Buenos Aires. This division of the expedition was necessary in order that Brazil be covered in the aircraft survey even though the vehicle was prohibited by customs regulations from entering the country. In Rio interviews at the Directorate of Civil Aviation and with several operators were arranged through the British Embassy.

A division of the Brazilian Air Force flies some free scheduled services for such people as missionaries and students, in addition to their routes in the jungle areas. Gartshore and Hyde managed to obtain places on one of these flights in a 36-seat Air Force DC-3 from Rio to Porto Alegre, a distance of 700 miles.

Montevideo was reached after a 20-hour bus journey from Porto Alegre, during which the bus on one occasion was unloaded to cross a very primitive bridge submerged by swirling muddy water; the passengers crossed on a new structure nearby whose approaches had been washed out by the swollen stream. In the Uruguayan capital time was efficiently organised by Mr. J. Taylor and Mr. R. Lacroze of the Commercial Section of the British Embassy.

Discussions with several British aircraft company representatives were held on aircraft sales and on the potential market in South America for British products. As these people travel widely throughout the continent, they were able to clarify the economies and tax structures in the various republics as well as suggesting

further contacts in the aeronautical field. Again in Montevideo, the two members of the crew were shown a great deal of hospitality and were given two free tickets by the C.A.U.S.A. company for their flying boat service from Colonia, in Uruguay, across the mouth of the River Plate to Buenos Aires, in Argentina.

Unfortunately, on the day for which the tickets were issued, the aircraft on the crossing were grounded by a thick fog which blanketed Buenos Aires. So thick was this fog that the radar-equipped ferry on which Hyde and Gartshore travelled from Colonia to Buenos Aires, rammed a barge in the shallow channel between the two ports; the ferry was not damaged in the collision but her emotional captain had an exciting few minutes and seemed greatly disturbed by the incident.

Melbourne meanwhile had continued on the Tjisadane from Rio de Janeiro and after brief stops at Santos and Montevideo, docked in Buenos Aires of July 23rd. To everyone's surprise, the Land Rover was pushed through the complicated customs formalities in the record time of 26 working hours (the previous record, held by a diplomat, was just over 48 hours) and Melbourne, again working through the British Embassy, organised and held many of the interviews which were to keep us all busy for several days in this immense capital of Argentina. Although Hyde and Gartshore arrived from Uruguay on the 27th of July, it was not until 3 days later that the team were all able to leave Buenos Aires, travelling now in the Land Rover over the rich cattle-covered pampas of the Argentine.

Our first obstacle, the snow clad Andes soon glistened in the distance. We were impressed to realize that ahead of us in this range, the highest in the world outside the Himalayas, was Mt. Aconcagua, America's highest point at 23,100 ft. As we expected, the Mendoza pass was blocked with snow and rock slides when we arrived; even the railway had only just been re-opened after a two-week closure and the backlog of freight,

particularly cattle would, we were told, take some time to clear.

With the help of the local Ford agent, Mr. R.I. Walker, together with a bottle of cognac and some cigarettes, we persuaded the station-master at Mendoza to put the Land Rover on a flat car leaving for Los Andes, in Chile, on the next train. We boarded the guards' van, a sooty windowless box-car with a smoky wood stove, for the journey over the pass. The crossing of about 200 miles took our cog-driven steam train more than 36 hours; snow, rock and soaring peaks often lifted our attention above the soot and smoke of our temporary home and the friendly Argentine engine driver with whom we rode for some time stopped the train on several occasions for us to take pictures or to see more clearly some particularly spectacular sight on his Andean route. Our only setback on the crossing came at the Argentine-Chilean border where we discovered that the freight charges which we had paid in Mendoza covered only the Argentine section of the journey. New and heavy charges had to be paid, and the total, some £57, was more than we had expected for such a short journey.

In Santiago we stayed with Michael Westcott, a Cambridge graduate and a member of a recent Cambridge Pan-American expedition from New York to Santiago. From him we learned more about the impassable stretches of the Central American highway, some of which he had driven through the previous year. His descriptions of these roads, together with his cine pictures of his journey convinced us that, if we were to get through in reasonable time, we would have to ship ourselves and the vehicle around the Panama where two of the worst pieces of road could be severely flooded by the time we would be there.

Although Chile itself is a poor country, particularly since the decline of the northern nitrate fields, the internal light aircraft activity is suprisingly great. From the Directorate of Aeronautics we learned of the 55 aero clubs operating in the country with 260 aircraft.

Two days after leaving Santiago, we started through the Atacama desert, a high rolling plain covered with velvety-fine dust. It was in the south of the desert that we came dangerously close to running out of petrol, and in this hot desolate region, where trucks may pass only once a day, a three-day wait for fresh supplies could be very uncomfortable. The map which we were using, given to us by a large oil company, indicated that petrol was available on the main road at a certain village. Finding no sign of the place mentioned on the map, we had the choice of going on in the hope that the centre was just ahead, or of going back to a mine some 30 miles off the main road where petrol might be sold. After a short discussion, we went back, arriving at the mine with petrol for only a few miles left in our tank, our normal reserve having been already used. Had we continued into the desert, we certainly would have run completely out of petrol, for supplies were not available for many miles. The mine to which we had come, where dusty mud-brick walls and unpainted wooden buildings were covered with communist signs and symbols, sold us a full supply of "gasolino" and the men watched curiously as we drove back between the piles of brilliant white slag. Tourists, we were sure, seldom come that way!

Flat tyres too, were common in this area. Deserted wooden houses, rotting beside the road reflect the inability of the countryside to support the people, and also leave nails to be picked up by the tyres of passing motorists. Here too we passed over some of the dustiest roads we had ever seen, the Land Rover stirring up fine particles which streamed into the cab and surrounded the car in clouds so dense that it often became impossible to see anything in any direction. Even after the car was thoroughly washed, inside and out, we retained dusty souvenirs of those few miles.

Antofagasta, whose few modern buildings are surrounded by

hundreds of squalid wooden shacks, marked the beginning of a transition from the rolling desert to vast areas of broken and parched clay, the famous intrate fields. For hundreds of miles, the road wound between disordered piles of top soil, left in chaotic heaps often twenty feet high after the nitrate had been removed. No vegetation relieves the desolation of these fields and the sun, as it climbs overhead, bakes the earth into hardened chunks and causes the eerie sound of clay cracking in the heat.

Bolivia does not recognize the international motor vehicle carnet which we had obtained from the Royal Automobile Club for customs clearance of the Land Rover, and so we had to obtain special documents before our entry into the country. Arica, where we were to organize these papers, was on holiday on the Monday when we arrived, and it was only by great perseverance and about £2. 10. in outright bribes that we managed to complete our business in the town. From Northern Chile we crossed the border into Peru, and after a protracted visit with the police and the customs officers in Tacna, turned inland and upward toward Bolivia's capital, La Paz.

The road upward into the Andes from Tacna is one of the most picturesque in the world. It winds from sea level through cobbled village squares, around terraced slopes and past scattered herds of llamas and alpacas, to a height of more than 14,000 feet. Here the air is clear and crisp and the snow peaks seem close and picture-like. Dropping onto the vast altiplano near La Paz, we skirted the edge of Lake Titicaca, the highest navigable body of water in the world and an important centre of the great Inca civilization. Just beyond the lake, impressively glaciated and frequently rising above 20,000 feet, lay the mountains of the Cordillera Real and driving towards the southernmost peak of Illimani, we suddenly reached the rim of a huge basin hollowed from the altiplano and saw the city of La Paz nestled beneath us

in the bottom.

The commercial secretary in the British Embassy at La Paz, Mr. D. Allen, greeted us warmly, for only a year before Melbourne had climbed in Bolivia with the Imperial College Apolobamba Expedition, and had left many friends in and around the capital city. We spent three days with the Allens, and learned much from them, and from the people that we interviewed there, about this socialistic country's faltering economy. We saw too many of the colourful Bolivian Aymara Indians, the women with their bright costumes and inevitable bowler hats, and we visited their unique market particularly to see the curious foods, herbs and tools of witchcraft on sale there.

Leaving Bolivia by way of the ferry across Lake Titicaca near Copacabana, we travelled slowly northward into Peru, stopping every few miles for police control posts. These posts, manned by very unintelligent officials who required irrelevant scraps of information about the car or its occupants, were ignored wherever possible, without unpleasant repercussions.

Our faithful Land Rover, with little left at this altitude of its normal power, carried us over the Great Divide at La Roya, a height of 14,300 feet, then down a narrow valley into Cuzco. This ancient city, once the capital of the Inca civilization, still holds many relics of its former greatness. Precisely hand-hewn stones were fitted together by the Incas into solid foundations for their massive buildings; many of these gigantic stone jig-saws still remain, now desecrated by upper storeys of mud brick which were added by later Spanish builders.

Winding up and down, westward from Cuzco through the Andes, we often travelled near one of the old Inca roads. These trails, built for the runners which held the empire together, are still used in many places, and their narrow, beautifully constructed stone bridges are common sights in the Peruvian highlands around Cuzco.

In contrast with this historically famous area, Lima, the capital of Peru, is a rapidly expanding city with obvious signs of modern North American influence. Much of the flying in Peru is the transport of freight to the little interior jungle communities not served by roads or railways, as well as carrying passengers along the more conventional coast routes. Faucett airlines, one of the few airlines in the world to have ever built their own aircraft, are mainly engaged in the latter of these activities, while charter companies operate in the eastern jungle regions.

The coastal road through Peru is wide and paved, and we made good time until we neared the Ecuador border. Arriving late in the afternoon at the Peruvian customs post, we forded a river about 40 yards wide and two feet deep which marked the border. We were unable to complete the Ecuador formalities on the same day, and in any case were forbidden to continue by the local border police with conflicting but emphatic stories of robbery and highway construction on the road ahead. By special arrangement with an English-speaking officer in the local army we were allowed to sleep that night in the army jail, a dimly lit concrete room with iron bars in the windows and a heavy wooden door. Pleased with any accommodation, we spread our sleeping bags on the floor and slept soundly.

The road from the border to Loja in Ecuador was classed as "impassable" by an American Automobile Association handbook which we were using, and certainly it was as bad a track as we had seen anywhere else. Creek beds, some with water rushing through them, formed the track in many places, and the very steep and twisting dirt road was often deeply rutted by water. Bananas, bought from roadside vendors, were cheap and delicious however and the lush valleys above which we travelled were often filled with cloud, leaving the hills around clear and beautiful.

Passing Cotapaxi, the world's highest volcano which was covered

with snow despite its proximity to the equator, we arrived in Quito, the sleepy picturesque capital of Ecuador. One of the most interesting interviews in this city was with the "Voice of the Andes" radio station. The transmitters of this station, 70 kilowatts in all, send our religious and musical broadcasts in many languages, and are heard in Europe and N. America quite clearly. From the people on the station we learned of flights into interior missions and of the savage tribes of natives with whom contact is being established.

Throughout Ecuador we encountered some of the worst roads on the journey, but the patchwork of colours on the precipitous sides of the narrow valleys, which characterize the country, helped to compensate for the difficulties which the same valleys have created for the road-builder and the motorist. We could sometimes see the road winding for miles ahead; our path might be only a few hundred yards away, but on the other side of a valley - 25 miles distant by road!

Wider, smoother roads in Colombia brought us to Cali and a tarmac surface, and the journey over a pass to Bogota was a pleasant change after the dust and corrugations of the previous thousand miles. In the capital we spent a profitable and enjoyable few days, sleeping and cooking our meals in a room above the garage of Mr. H. Franks, the Commercial Secretary of the British Embassy. Here too we replaced our last broken rear spring, the thirteenth, and added an extra leaf to the set to provide extra strength for the remaining distance ahead.

On Friday September 16th, we reached Cartagena, a Colombian port on the Caribbean, and camped on a wide clean beach. The sea was warm and salty and the sun, now passing almost directly overhead, encouraged us to spend a great deal of our spare time in the water. Our Rover was loaded onto the Degero, a Finnish ship on charter to the Royal Mail Lines, for the trip through the Panama to Puntarenos

- Punta Mona. We took a bus to Barranguilla and after two days of report and letter writing in a cheap hotel there, flew by K.L.M. to San Jose, the capital of Costa Rica. Although we had officially finished our aeronautical investigation in South America, we were well received by Mr. Mill-Irving, the British ambassador, and by his assistant Mr. Atkinson who introduced us to local aviation officials and entertained us for the two days that we were in San Jose.

Once our car had been unloaded off the ship, and had been through the customs formalities, we drove from Puntarenas northwards through Central America. By experience we learned that it was economical to arrive at border points between 9 a.m. and 12 noon, or between 3 p.m. and 5 p.m., on Monday to Friday; outside of those hours the service was good, but heavy charges were levied for "special service out of hours".

Passing many volcanos in the picturesque countries of El Salvador and Guatemala, we crossed into Mexico. Here another train journey awaited us, for the highway was blocked by rock slides in a short stretch called "the plug" just south of the border. The 120 mile, 10 hour ride aboard a flat car with the Land Rover was a hot, uncomfortable but very interesting experience. The train jolted and swayed through verdant swampy country and past little mud and thatch huts surrounded by tall beautiful coconut palms and dark excited children. The Mexican roads to Mexico City are excellent and we lost no time in motoring north to the Gulf of Mexico, then west to the capital.

Mexico City, where we stayed for two days, is a large attractive metropolis. Its many tall modern buildings contrast sharply with the older National Palace and Fine Arts Centre, both located in the centre of the city; wide tree-lined streets carry streams of cars past the impressive statues and fountains located in the roundabouts at major intersections. It is no wonder that Mexico can derive

so much income from its American visitors, most of whom visit the capital city.

Travelling steadily over straight, wide roads, we drove north to Ciudad Juarez on the American border opposite El Paso in Texas. It was pleasant to hear the customs officer greet us in a slow drawl, and to know that we were back in an English-speaking area. In the United States, we visited California Institute of Technology and U.C.L.A., the University of California at Los Angeles, as well as two aircraft plants, Hillers and Boeings.

Since our departure from London, we had been through more than 30 countries in Africa and the Americas, some of which had already changed name or status since our visit to them. We arrived in Vancouver, Canada, on Friday October 21st, a little more than seven months after leaving London. From Vancouver we travelled across Canada giving a lecture tour arranged by the United Kingdom Information Service. In the east, the team separated, Hyde flying directly back to U.K., Melbourne accompanying the Land Rover by sea, and Gartshore remaining in Canada.

PART I. AERONAUTICAL INVESTIGATION.

This investigation was made in order to establish the present situation and future requirements in the civil light aircraft field in Africa and South America.

In general "light aircraft" was interpreted as meaning aircraft up to DC-3 size. However, in some cases domestic and even international airlines are discussed so as to indicate the relative size of the light aircraft activity.

Each country is considered under three sections. The first is a general review of the aviation picture, based on the interviews held in that territory; the second is a list of the personnel consulted; and the third, which should be of most value to market research organisations, contains as much reliable statistical data as could be obtained.

Overall conclusions on Africa and South America are given separately in sections 7 and 17 respectively.

AFRICA

1. Introduction.

In Africa today a total population of some 200 million people is concentrated into three main areas; Nigeria; East Africa around Lake Victoria; and the environs of the gold reef of Johannesburg. Within and surrounding these regions the development of an adequate surface communication system would be an extremely costly scheme. Thus aviation facilities will play an increasing part in the maintenance of communications within Africa and in the development of the continent's resources.

In the areas investigated in this survey - Nigeria, the Congo, the East African Territories, the Central African Federation and the Union of South Africa - some 45 charter firms, communication flights, crop spraying units and mining houses were contacted; these organizations represent a majority of the civil light

aircraft operators in Africa south of the Sahara.

2. Nigeria

2.1. General Summary (Nigeria)

Nigeria, the most populous territory in Africa, has an area over seven times that of England, but the average annual income of approximately £20 per head reflects the relative poverty of the people and indicates the major barrier to the establishment of an extensive airline network in the country. Apparently the development of native traffic has been disappointing; in general, the black Nigerian, although a frequent traveller, often likes to carry a vast quantity of luggage and is rarely in a hurry.

This situation is reflected by the withdrawal of the W.A.A.C. - Nigerian ^{Airways}/fleet of eight Herons at the end of March this year in an attempt to decrease the loss on domestic routes. A standardised fleet reduced to seven 28-seat DC-3s now offer less frequent services. In the consideration of a DC-3 replacement for this area it must be remembered that one of the main traffic generators is the northern resort of Jos; here the main runway is a 5,100 ft. laterite strip located at an altitude of 4,250 ft. which, combined with a mean maximum temperature of 90°F, necessitates large power reserves in aircraft which are to carry a full payload.

On the charter front, Fison-Airwork at Port Harcourt are operating Twin Pioneers (on behalf of Shell-Mex & BP) and Whirlwinds and Hillers, mainly for survey and agricultural work. In addition, Aero Contractors use an Apache for general charter duties, and Crop Culture are spraying the banana plantations in the Southern Cameroons with four Austers; the latter company, together with the banana exporters Elders & Fyffes, also have an Apache for communication and charter work. There are very few

privately owned aircraft in Nigeria, and the aerial activities of missions attain a similar scale. The Sudan Interior Mission has five Piper Comanche 180s based at Jos, and a Cessna 170 is used by a Catholic mission from Gusau.

The present aviation picture is completed by the Northern Region Communication Flight, based at Kaduna the capital of the North. Norflight started operations in mid-1955 with two Auster Autocars. One of these crashed due to pilot error, and the other was sold when two Apaches were bought in 1956. The Apaches are used mainly by regional government officials and fly approximately 700 hours per year. Some 21 Norflight laterite strips, varying in length from 600 to 800 yards, supplement a similar number of D.C.A. airfields in the region.

With the recent reduction in Nigerian Airways services, Norflight are particularly busy and are looking for an additional aircraft. Their ideal specification is for a machine with six or seven places capable of operating at full load from a 600 yard strip at 2,000 ft. altitude; a strong twin-engine preference exists due to the Autocar accident. The Piaggio P.166 is considered to be most suitable, the Twin Pioneer being too large.

Future developments may include the freighting of beef by air from the north-east corner of the country to Lagos and Accra, with DC-4s. A large new abattoir was recently opened at Maidugri, the centre of the disease-free area where first class cattle are bred; a 2,000 yard runway is available at Maidugri, Northern Developments (Nigeria) Ltd. have an interest in this project.

The vast flat Northern Region, with its dearth of surface communications, is thought to be very suitable for hovercraft operations; such vehicles would be ideal for the evacuation of produce from the upper reaches of the Niger and Benue rivers.

2.2. Personnel Interviewed (Nigeria)

R. Murphy - Northern Developments (Nigeria) Ltd., Kaduna.

I.S. Treverton and S. Leicaster - Chief Pilot and Chief Engineer,
Northern Region Communications Flight, Kaduna.

G. Willey - Survey Division of Ministry of Land and Survey,
Kaduna.

I. Simpson - Airport Commandant, Kano.

A. Strong - W.A.A.C. Station Manager, Kano.

2.3. Statistical Information (Nigeria)

W.A.A.C. (Nigerian Airways), Lagos: 7 DC-3, 1 Dove.

Northern Region Communications Flight, Kaduna: 2 Apache.

Fison-Airwork Ltd., Port Harcourt: 4 Whirlwind, 2 Twin
Pioneer and ? Hiller 12.

Aero Contractors Ltd.: 1 Apache.

Crop Culture Ltd., Tiko, Southern Cameroons: 1 Apache,
4 Auster.

Catholic Mission, Gusau: 1 Cossna 170B.

Sudan Interior Mission, Jos: 1 Cossna, 5 Comanche 180.

1. Belgian Congo.

1.1. General Summary (Belgian Congo)

Internal aviation is predominated by Sabena's DC-3 network. In addition, Sobelair, a Sabena subsidiary, use three Cessna 410 aircraft working local services from Elizabethville, Kwanloyville and Usumbura, whilst Air Brousse have a fleet of Jupidos, Pacers and Tri-Pacers on similar work around Leopoldville. These two companies also undertake charter work, but this has been at a low ebb recently due to political disturbances.*

Aero Clubs operate most of the other aircraft that are registered in the Congo.

3.2. Personnel Interviewed (Belgian Congo)

P. Jacques -- Airport Commandant, Stanleyville.

3.3. Statistical Information (Belgian Congo)

Total number of civil aircraft registered: 91 (including 15 aircraft owned by Sabena).

Sobelair at Elizabethville, Stanleyville and Usumbura: 3 Cessna 310.
Air Brousse at Leopoldville and Luluabourg: 5 Repide, 3 Pacer, 2 Tripacer, 1 Aiglet, 1 Tiger Moth.

Aircraft registered with Aero Clubs: 31.

The majority of the other aircraft are executive machines or privately owned.

*

The Belgian Congo was visited shortly before it received independence, i.e. prior to the major political riots.

4. East African Territories

4.1. General Summary (East African Territories)

A total of 148 civil aircraft were registered in the East African Territories on February 1st, 1960. There were 115 single-engined aircraft and of this number 42 were Piper machines, whilst Cessna singles accounted for another 34; such is the predominance of American aircraft in this class.

The development of aviation in Kenya has been assisted by the construction of more than half of the 135 strips in the territory by the Kenya Police Air Wing. Most of these strips are about 600 yards long at altitudes up to 8,000 ft; on the coastal belt the average length is only 350-400 yards.

In 1949 the predecessor of the Wing, the Kenya Police Reserve, was started with volunteers. Three years later the Air Wing was formed with the purchase of one Auster; during the emergency of the same year the fleet was increased to 12 Tripacers and 3 Cessnas. Now the Cessnas with conventional undercarriages have replaced the Tripacers due to their superior performance and ability to land on rougher airstrips. Under the command of Wg. Cdr. A.N. Frankel, the eight Cessna 180s of the Wing last year logged over 5,000 hours and $\frac{3}{4}$ million passenger-miles of communications flying. Operations flying can vary from free-dropping supplies to rescue teams on Mount Kenya at 16,000 ft. to poaching and anti-smuggling patrols along the coast. Eight special V.H.F. frequencies enable direct contact to be maintained between the aircraft and police stations and vehicles.

Nairobi is the main base of Campling Brothers & Vanderwal, the largest of the East African non-scheduled companies. Subsidiary bases are located at Dar-es-Salaam and Mombasa. Instructional work is carried out using five aircraft and is increasing steadily (during 1957 the average number of instruction hours per month was 88.3 and this figure will be nearly doubled

during the present year). The charter fleet consists of two Cessna MB.320s, two Bonanzas, one Comanche and a fleet of Cessnas. In U.B.V. are Cessna agents their fleet is constantly changing. Maintenance forms an important source of revenue to the company as they do all Cessna and Bonanza "majors" as well as most Piper overhauls. However, in March of this year Wilken Air Services was registered and, as Piper sub-agents, this new and enthusiastic organisation hopes to capture a share of the sales and maintenance market.

Caspair, a subsidiary of C.B.V., still operate a regular service around Lake Victoria with three Series 4 Rapides based at Entebbe. Meanwhile, East African Airways Corporation are to retire their four standard Rapides from the Uganda internal routes and the coastal services. Their Rapides have been limited on very hot days to four passengers on the longer stage-lengths, and the uncertainty of seats has discouraged regular passengers. The airfields have now been improved to DC-3 standard and the introduction of Dakotas on these services should generate both regular freight and passenger traffic. It is rumoured that, after the E.A.A.C. Rapides are withdrawn at the end of July, an associate company will continue to operate the aircraft on the coastal routes.

Typical of the small charter companies is Pharazyn Air Charters, with one Bonanza based at Kitale (a centre for European settlers in the Kenya Highlands). **Manager and pilot** is ex-R.A.F. Dennis Pharazyn, who registered his own company four-and-a half years ago; most of his charters are between Nairobi and Kitale, and Pharazyn has now flown this route over 1,500 times.

An interesting operation with headquarters at Nairobi is that of Desert Locust Survey, a department of the East African High Commission. Three Beavers equipped with Britton-Norman

spray gear are used, together with a reconnaissance Cossna 182. The pilots like the power provided by the Beaver's Pratt & Whitney unit since they have to fly just above the locust swarms when spraying and frequently in hilly country, with its associated downdraughts. In July the locusts enter Africa from Arabia: D.L.S. spray the swarms in Ethiopia and Somalia, later following them into East Africa.

4.2. Personnel Interviewed (East African Territories)

- A. Mackenzie - E.A.A.C. Senior Station Manager at Entebbe.
- G. Parks - Chief Engineer, Caspair Ltd., Entebbe.
- D. Pharazyn - Manager and Pilot, Pharazyn Air Charters, Kitale.
- Gp. Capt. Soden - Private owner, Kitale.
- K. Boskovic - Aviation Manager and Chief Pilot, Campling Brothers and Vanderwal Ltd., Nairobi.
- Wg. Cmdr. A.N. Frankel - Head of Kenya Police Air Wing, Nairobi.
- L.A. Martel - Chief Pilot, Desert Locust Survey, Nairobi.
- J.M. Williams - Director, Wilken Air Services, Nairobi.
- T.O. Lockhart-Muir - Aviation Services Ltd. (de Havilland agents in East Africa), Nairobi.
- Capt. E.E. Morris and A.E. Robinson - Operations Manager and Chief Engineer, E.A.A.C., Nairobi.
- J.J. Furniss and G.M. Dickson - Director and Chief of Air Navigational Services, Department of Civil Aviation, Nairobi.
- (Mrs) J. Montgomery - E.A.A.C. Station Manager at Mbeya.
- V. Turner - Officer in Charge, Mbeya Aerodrome.
- Capt. B.J. Keyter - C.A.A.C. Beaver Captain, Mbeya.
- Capt. B. de Swardt - Wenela Air Services, Mbeya.
- B.E. Stocker - Pilot in Air Survey Division, Tanganyika Government.

4.3. Statistical Information (East African Territories)

Total number of civil aircraft registered on	
February 1st, 1960	148
Privately owned aircraft	70
Aircraft engaged in charter and instruction work	22
Aircraft registered with Aero Clubs	10
Aircraft on scheduled services	18
Aircraft used for special services (government flying, executive work, etc.)	28

Distribution of single-engined aircraft (total 115):

Piper	42
Cessna	34
de Havilland (including 3 Beavers and 5 Tiger Moths)	16
Auster	11
Beechcraft	5
Others	7

E.A.A.C., Nairobi: 3 DC-4M, 9 DC-3, 4 Rapide

Caspair Ltd., Nairobi: 3 Rapide, 1 Cub, 1 Cessna 182.

Pharazyn Air Charters, Kitale: 1 Bonanza.

Campling Brothers & Vanderwal Ltd., Nairobi: 2 Cub, 1 Chipmunk, 1 Cessna 150, 1 Pacer (instruction fleet); 2 Macchi MB.320, 2 Bonanza, 1 Comanche, 8 Cessna (charter and demonstration fleet: currently being augmented by another 5 Cessna).

Kenya Police Air Wing, Nairobi: 8 Cessna 180.

Wilken Air Service Ltd., Nairobi: 2 Comanche, 2 Caribbean, 1 Cessna 180 (charter and demonstration fleet); 1 Cruiser, 1 Cub (instruction fleet).

Desert Locust Survey, Nairobi: 3 Beaver, 1 Cessna 182.

5. Federation of Rhodesia and Nyasaland

5.1. General Summary (Federation of Rhodesia and Nyasaland)

In the Central African Federation, as in East Africa, the development of aviation has been accelerated by the lack of good surface communications. This factor is particularly significant in Northern Rhodesia.

From Lusaka Sqn. Ldr. W.G. Redding commands the Communications Flight of the Northern Region Government. The Flight operates 3 Apaches, 1 Autocar and 1 Caribbean and undertakes emergency duties as well as the transportation of government personnel. Although the airfield altitudes average some 4,000 ft. here, density altitudes up to 7,000 ft. are common. The Apaches have a single-engined ceiling of approximately 6,500 ft. at full load, so the Flight are considering replacing them by the more powerful Aztecs in the near future.

Charter companies in the Federation are located at Kitwe, Lusaka, Kariba, Victoria Falls and Bulawayo as well as at the Federal capital, Salisbury. The tourist trade provides most of the business for Victoria Falls Airways' three Rapides and one Tripacer, which operate from an 800 yard tarmac strip near the Falls. Sight-seeing flights also supplement the business charters for Rhodesia Nyasaland Air Charters at Lusaka and Zambesi Airways at Kariba.

Commercial Air Services (Rhodesia) (Private) ran a network called the Southern Rhodesia Internal Service with Cessna 180s from Bulawayo, but ceased flights in March as it became uneconomical. Most revenue is now derived from up-country business charters, but Comair, who are Cessna sub-agents, do some maintenance work in addition to contract photographic flying. The company has excellent workshop facilities, but appears to be having a marginal existence at present. It is rumoured that Air Carriers, Salisbury, may become their parent

company. Apaches of Air Carriers run a weekly service for the Bechuanaland government from Bulawayo to Ghanzi via Francistown and Maun.

Salisbury is the headquarters of two young companies using only rotating wing equipment. Autair Helicopters (Africa) have three Bell 47-G2s, two of which are used for transporting surveyors and geologists of Rhodesian Selection Trust around the Kitwe district, and Helicopter Services (Rhodesia) (Private) started operations with a Hiller 12E early this year. Both concerns are enthusiastically anticipating increasing business in the future.

Skywork at Salisbury, Cessna dealers since January this year, are hoping to build up their sales and maintenance revenue, encouraged by the abolition of the 10% import tax on aircraft and spares in June 1960. Most of Skywork's charter flying is executive work, of which three-quarters is flown on twins; the company claims that most business men's insurance does not cover flights in single-engine aircraft, and encourage twin charters as they have two Cessna 310s. Apparently, government personnel account for most of the single-engine flights, as their travel allowance is severely limited.

Northern Rhodesian Aviation Services, with 2 Doves and 1 Cessna 310, are also based at Salisbury, and do solely business communication flying for their holding companies (Anglo American Corporation, Costains, Rhodesian Selection Trust and British South African Company).

Particularly interesting at the new Bulawayo Airport are the activities of Africair (Rhodesia), a subsidiary of the General Mining and Finance Company. The overhaul and maintenance of the Wenela fleet is being transferred to Bulawayo from Africair, Johannesburg. Wenela, the Witwatersrand Native Labour Association, use eight 40-seat DC-3s and two 98-seat DC-4s in the movement of

African labour from centres in the Federation and Tanganyika to Francistown, in Bechuanaland; from here the natives travel by rail to Johannesburg to work in the mines. The passenger turnover on this operation is reputedly 100,000 per year and the Wenela fleet flies between 800 and 900 hours per month. The DC-3 fleet is being 'maximised' and the conversion, costing some £6,500 installed, consists of redesigned engine cowlings and exhaust systems, as well as fairings on the main undercarriage wheels and the tailwheel.

Africair(Rhodesia) are purely an overhaul and maintenance organisation and the transfer mentioned above should be completed by the end of the year, giving complete DC-3 and DC-4 facilities at Bulawayo. It is hoped that an R.R.A.F. contract on DC-3 airframes will then be extended to cover engines and also Argonaut work.

The success of Central African Airways' "Skybus" operations is outstanding. Started last January, this third-class service provides a convenient link to enable Nyasaland labour to reach the industrial areas of Southern Rhodesia. C.A.A. are at present flying one return Salisbury-Biantyre service per week using 40-seat DC-3s and it is planned to increase frequencies and possibly make route extensions to Lilongwe, Fort Jameson and Ndola. The single fare for this existing 300-mile flight is £4. 10s., in contrast to a cost of over £12 for the comparable Viscount flight. Load factors of virtually 100% have been obtained, the distribution of races being 65% African, 20% Asiatic and 15% European (although Europeans are not encouraged to use this service). One factor that assists in minimising the fare is the "Skybus Booking Van" which tours the African townships; a down payment of £4. 10s. cash, non-returnable, made to the van conductor is the only way of securing a seat on the aircraft.

The Nyasaland and Barotseland internal services, operated by

C.A.A.'s five Beavers, continue to make life liveable in remote
country near these routes.

U.P. Personnel Interviewed (Federation of Rhodesia and Nyasaland)

G.D.I. Foursie - Airport Manager, Lusaka.

M.S. Pike - Pilot, Rhodesia Nyasaland Air Charters, Lusaka.

Sqdn. Ldr. W.G. Redding - Officer Commanding and Chief Pilot,
Communications Flight of Northern Rhodesia Government, Lusaka.

W.W. Bonecke - Manager and Pilot, Zambosi Airways Ltd., Kariba.

C. Myers and D. Bekker - Managing Director and Chief Engineer,
Victoria Falls Airways Ltd., Victoria Falls.

F.J. Haddon - Airport Manager, Bulawayo.

Wg. Cdr. B.H. Gibbon - Managing Director, Africair (Rhodesia) Ltd.,
Bulawayo.

D. Eardley, D. Gardyne and E. Witchell - Managing Director,
Chief Engineer and Pilot, Commercial Air Services (Rhodesia)(Pvt.)
Ltd., Bulawayo. (Cessna Agents).

P. Pennant-Roa - Deputy Director, Department of Civil Aviation,
Salisbury.

L.R. Lord - Director, Autair Helicopters (Africa) Ltd., Salisbury.

V.K. Rhodes - Acting Chief Engineer, Northern Rhodesian Aviation
Services Ltd., Salisbury.

D. Beattie and C. Miller - Director and Pilot, Air Carriers Ltd.,
Salisbury.

Capt. M. O'Donovan and B. Botting - Operations Manager and
Assistant Operations Manager, C.A.A.C., Salisbury.

W.G. Carter - Chief Engineer, Helicopter Services (Rhodesia)
(Pvt.) Ltd., Salisbury.

R. Wallis - Engineering Manager, Skywork (Pvt.) Ltd., Salisbury.

5.3. Statistical Information (Federation of Rhodesia and Nyasaland)

Total number of civil aircraft registered	
on April 1st, 1960	136
Privately owned aircraft	41
Aircraft engaged in charter and	
instruction work	28
Aircraft registered with Aero Clubs	19
Aircraft on scheduled services	15
Aircraft used for special services	
(government flying, executive work etc.)	33

Distribution of single-engined aircraft (total 93):

Piper	30
de Havilland (including 7 Beavers and	
19 Tiger Moths).....	30
Cessna	13
Auster	12
Beechcraft	4
Others (including 3 Bell 47s)	15

C.A.A.C. Salisbury: 4 Viscount, 6 DC-3, 5 Beaver.

Rhodesia Nyasaland Air Charters Ltd., Lusaka: 1 Tripacer.

Communications Flight of Northern Rhodesia Government, Lusaka:

3 Apache, 1 Autocar, 1 Caribbean.

Zambesi Airways Ltd., Kariba: 1 Tripacer.

Victoria Falls Airways Ltd., Victoria Falls: 3 Rapide, 1 Tripacer.

Commercial Air Services (Rhodesia) (Pvt.) Ltd., Bulawayo: 2 Cessna 180,
1 Cessna 310 and 2 Cessna 195 for sale.

Autair Helicopters (Africa) Ltd., Salisbury: 3 Bell 47 G-2.

Northern Rhodesian Aviation Services Ltd., Salisbury: 2 Dove,
1 Cessna 310.

Air Carriers Ltd., Salisbury: 4 Apache, 1 Cessna 180.

Helicopter Services (Rhodesia) (Pvt.) Ltd., Salisbury: 1 Hiller 12E.

Rhodesian Air Services (Pvt.) Ltd., Salisbury: 1 DC-3.

Skywork (Pvt.) Ltd., Salisbury: 2 Cessna 310, 1 Cessna 175, 1 Cessna
210 (current).

9. Union of South Africa.

6.1. General Summary (Union of South Africa)

In the Union of South Africa and South West Africa, but excluding the Protectorates, there are some 315 licensed aerodromes, over half of which are privately owned, and probably a similar number of unlicensed strips. The private airfields are owned mainly by farmers and the mining houses.

Placo Aircraft Sales, at Wonderboom Airport near Pretoria, are the main Piper representatives and they sell about 30 units per year. Associated companies are Placo Stores (Piper parts), Placo Workshops (Piper maintenance and overhauls) and Pretoria Flying Services. Commercial Air Services at Johannesburg are the Cessna agents.

Amongst the smaller companies in the charter business the general feeling is that this field of activity is well saturated and competition is very keen. New licences are extremely difficult to obtain.

The larger concerns usually do maintenance or instruction work in order to supplement their air-taxi flying. For instance, Commercial Air Services (Natal) at Durban are Cessna sub-agents and obtain 50% of their revenue from charters and 50% from sales and maintenance; Natal Aviation, also at Durban, concentrate on instructional work in addition to their charter business. At Cape Town, Owenair have a fleet of 13 aircraft on crop-spraying, instruction and photographic work as well as routine charter flights. Maintenance and overhauls are carried out (including a Department of Defence contract on Harvards) and imported aircraft are assembled at the rate of about one per month.

Three years ago Oryx Aviation was started with Owenair's assistance, and in 1959 this company merged with South West Air Transport to form South West Airways. Flying from Windhoek, S.W.A.'s fleet of 16 aircraft now logs approximately 800 hours per month.

A large proportion of the executive flying is associated with the wealthy mining houses, many of whom own their own aircraft. The Anglo American Corporation have used aircraft since the second world war and recently a Grumman Gulfstream was added to their fleet of 2 Beavers, 1 Heron and 1 Dove. Consolidated Diamond Mines, a company within the A.A.C. group, use a Dove and a Beech 50 in South West Africa, whilst an associate concern, Williamson Diamond Mines, have two DC-3s and a Cessna 182 working in Tanganyika.

An eight-seat executive Percival Prince is owned by the S.A. Iron and Steel Corporation at Pretoria, and during the last eight years this machine has had no fewer than nine engine failures. Due to high airfield pressure altitudes the Prince is often limited to six passengers and only four on the Pretoria-Windhoeck stage. (The Air Survey Division of the Tanganyika Government also reported engine troubles with their three Princes. These aircraft are now up for sale and two Apaches have been purchased).

Light aircraft are extensively used for agricultural purposes in South Africa: cotton is sprayed in Basutoland, wheat in the Western and Cape Provinces, maize in the High Veldt and wattle and sugar in Natal. Recently flocks of finches have also been sprayed and, during the off-season, locusts in the Congo and Northern Rhodesia are treated. Small companies (frequently one-man concerns) have created fierce competition and prices as low as 4s or 5s per acre for spraying are sometimes charged under favourable conditions. This price war has caused the collapse of several organisations and has caused concern amongst the old-established firms, such as African Airsprayers at Pretoria, who realise that these "pirate" companies are often in the business because the pilots enjoy flying and inevitably use incorrect insecticide concentrations and cut corners when spraying.

However, now that the resultant economic advantage have been well proven, there seems no possibility of a large reduction of flying in this field.

Lush Products at Durban, who started agricultural flying in 1958, report that their Prospector aircraft is very under-powered for use in the Union. Apparently the after sales service from the English company has been atrocious and a plan to re-engine the machine with a 450 h.p. Pratt & Whitney unit has met neither enthusiasm or criticism from the manufacturer.

At Durban, General Aircraft are producing the Aerial, a redesigned version of the French Emerald. Genair are reducing costs by manufacturing their own perspex and fibreglass components, as well as brakes and wheels. The Mark Two Aerial with a sliding canopy and 90 h.p. Continental engine is being produced for under £2,000 at the rate of one every ten days. A 4/5-seater powered by two 95 h.p. engines and selling at £4,500 should fly later this year.

6.2. Personnel Interviewed (Union of South Africa)

D. Struwig, J. Krige and J.J. Granzier - Chief Inspector of Flying, Head of Airports Department and Head of Aircraft Department, Division of Civil Aviation in the Department of Transport, Pretoria.

Flt. Lt. J.W. Kilburn - Service Liaison Staff, Pretoria.

J. Van der Woude and J.H. Chappell - Chairman and Assistant Sales Manager, Placo Aircraft Sales Ltd., Pretoria (Piper agents).

R.H. Preller and C. Reck - Chief Pilot and Co-Pilot, S.A. Iron and Steel Corporation, Pretoria.

J.K. Graham - Export Sales Administrator (Europe and Africa), Bell Helicopter Corporation.

J.E. Popham - Director, African Airsprayers (Pty.) Ltd., Pretoria.

M.B. Williams - Acting Chief Pilot, Anglo American Corporation, Johannesburg.

D. Dunn - Chairman, National Air Charters (Pty.) Ltd., Johannesburg.

G. Naylor - Chief Inspector, Trekair (Pty.) Ltd., Johannesburg.

T. Ward - Technical Director, Africair Ltd., Johannesburg.

A.J.C. Mering - Manager, Transvaal Air Charters (Pty.) Ltd., Johannesburg.

J. Davison and F.G. Weston - Managing Director and Engine Division Sales, de Havilland Aircraft Company of South Africa (Pty.) Ltd., Johannesburg.

Col. J. Louw and Scott - General Manager and Chief Engineer, S.A.A., Johannesburg.

G. Jaaback - Director, Lush Products (Pty.) Ltd., Durban.

N. Batstone and I. Cribbins - Director and Pilot, Commercial Air Services (Natal) (Pty.) Ltd., Durban.

A.G. Morris - Pilot, Natal Aviation (Pty.) Ltd., Durban.

A.J. Oppenheim - Managing Director, General Aircraft (Pty.) Ltd., Durban.

E.E. Schmidt - Technical Director, Owenair (Pty.) Ltd., Cape Town.

6.3. Statistical Information (Union of South Africa)

Total number of civil aircraft

registered on April 1st, 1960 643

(This analysis does not include 54 Gliders, 11 Rotocraft and 3 Ultra Light Aircraft that are also currently registered).

Privately owned aircraft 311

Aircraft engaged in charter and instruction work 86

Aircraft registered with Aero Clubs	67
Aircraft on scheduled services	33
Aircraft used for special services (Government flying, executive work etc.)	146

Distribution of single-engined aircraft (total 546)

Piper	234
Cessna	101
de Havilland (including 5 Beavers and 54 Tiger Moths)	72
Beechcraft	24
Auster	12
Others	103

South African Airways, Johannesburg: 4 DC-7B, 4 L.749 Constellation, 7 DC-4, 6 DC-3, 7 Viscount, 3 Boeing 707-320 (current)

Aircraft Operating Co. (Aerial Surveys) Ltd., Johannesburg: 1 DC-3, 2 Lodestar, 1 Cessna 180, 1 Apache.

Commercial Air Services (Pty.) Ltd., Johannesburg: 2 Lodestar, 3 Skylano; 1 Cessna 175. Also: 5 Cessna 210, 2 Cessna 172, 1 Cessna 182 (current).

Pretoria Flying Services Ltd., Pretoria: 1 Bonanza, 1 Tripacer, 1 Cub.

S.A. Iron and Steel Corporation, Pretoria: 1 Prince.

African Airsprayers (Pty.) Ltd., Pretoria: 5 Super Cub, 1 Taylorcraft Toppen.

Anglo American Corporation, Johannesburg: 1 Heron, 1 Dove, 2 Beaver, 1 Gulfstream (current)

National Air Charters (Pty.) Ltd., Johannesburg: 2 Cessna 310, 2 Bonanza, 1 Beaver, 1 Cessna 182.

Trekair (Pty.) Ltd., Johannesburg: 2 DC-4, 1 Viking.

Africair Ltd., Johannesburg: 1 Beech D185, 1 DC-3.

Transvaal Air Charters (Pty.) Ltd., Johannesburg: 1 Comanche, 1 Tripacer.

Lush Products (Pty.) Ltd: 1 Super Cub, 1 Pawnee, 1 Prospector.

Commercial Air Services (Natal) (Pty.) Ltd., Durban: 1 Cessna 210,
1 Skylane, 1 Cessna 175, 1 Cessna 182.

Natal Aviation (Pty.) (Ltd.), Durban: 1 Apache, 2 Bonanza (charter
fleet), 2 Vagabond (instruction fleet).

Air Survey Company of Africa (Pty.) Ltd., Durban: 1 Cessna 170.

Owenair (Pty.) Ltd., Cape Town: 4 Cub, 2 Chipmunk (instruction fleet),
2 Super Cub (crop-spraying), 2 Cruiser, 1 Rapide, 1 Skylane,
1 Cessna 170 (charter fleet).

South West Airways, Windhoek: 8 Navion, 2 Apache, 6 Cessna.

7. Conclusions (Africa)

One outstanding generalisation is common to light aircraft operations in the entire African continent: the predominance of high airfield pressure altitudes resulting from high basic airfield locations and elevated ambient temperatures. A large power-reserve is essential if light aircraft are to be operated without severe limitations under these conditions, and this requirement alone accounts for the striking monopoly held by American products in this field.

The inadequate power of the earlier helicopters was the most important factor in retarding their introduction into the Federation and East Africa. Now, however, the Hiller 12E and the Bell 47 series G2 and J2 with more powerful engines are operating successfully in areas where pressure altitudes up to 8,000 ft. are found.

A preference for British products seems to exist, but until a prime mover with a high power/weight ratio is combined with an all-metal airframe, there is no possibility of a radical change from the American light aircraft monopoly. The majority of the single-engined requirements could be met by the following two specifications:

(a) a simple and robust 2-seat aircraft, suitable for instructional work, powered by a 100-150 h.p. engine. Low cost is critical and the machine should sell at about £2,500; an agricultural version, slightly higher priced should be made.

(b) a 4-seat machine for use as a tourer and for air-taxi work, costing approximately £3,500 to £4,000, and powered by a 180-200 h.p. piston engine. It is important that this aircraft is made attractive to buy i.e. the customer should have a choice of colour schemes to suit a well-furnished interior, and the product must be backed by impressive 'glossy' brochures.

Both aircraft should have an efficient after sales follow-up;

this point cannot be over-emphasised as it is traditionally quoted abroad as a disadvantage of buying a British light aircraft. Many aviation people in Africa will be closely watching the development of the recently announced British Executive and General Aviation Ltd. (BEAGLE), and of the acquisition by Rolls Royce Ltd. of a licence to produce Continental engines in the U.K.

A substantial market exists, mainly in the East African Territories, the Federation of Rhodesia and Nyasaland and the Union of South Africa. Of the 927 civil aircraft currently registered in these three areas, no fewer than 754 are single-engined machines. Piper and Cessna 'singles', in the ratio of 2 to 1 respectively, account for 454 of these units. It is interesting to note that more than half of the 153 de Havilland and Auster single-engined models are Tiger Moths.

Throughout Africa the twin-engined requirements most frequently expressed by operators could be classified into two categories, as follows: (a) there is a need for an economical 8/10-seat aircraft needing minimum maintenance, including a fixed undercarriage and fixed-pitch propellers, yet still capable of unlimited operations from airfields where pressure altitudes reach 8,000 ft. Such an aircraft would fill the gap between the light twin and the DC-3, and would also replace the Rapide, some 35 of which are still in service with charter companies and airlines alone in Africa south of the Sahara.

For this application the Scottish Aviation Twin-Pioneer is underpowered and potential operators do not favour the comparatively low overall life of the Leonides units. The proposed 15-seat Short SC.7 Skyvan is somewhat larger than the present requirement, but the emphasis on "simplicity with ruggedness" and the special consideration given to airfield performance under "hot and high conditions" will be particularly appreciated by the African operators.

(b) a demand exists for a 10/12-seat executive transport capable of cruising at 300 miles per hour or more, and able to maintain an altitude of 12,000 ft. on one engine when fully loaded. Although the market for such a vehicle is limited, it must be remembered that the potential customers, mainly mining houses and large industrial concerns, have extensive capital resources. Conversions of ex-U.S.A.F. equipment, such as the Douglas A-26 with two Pratt and Whitney CB-17 power plants, have roused considerable interest in South Africa (the converted aircraft are known as the Howard 500, Tempo 1 and 2, Marketoer and Super 26).

A large amount of executive flying is done on the twin-engined Apaches, Aztecs and Cessna 310s. As the main criticisms of this type of aircraft are that the Apache is slightly underpowered and that the Cessna 310 is too expensive, it would appear that the best way to break into this market would be to produce a 4/5-seat twin, powered by 250-300 h.p. engines, and costing approximately £20,000.

Unfortunately the present political chaos will undoubtedly influence the future requirements for light aircraft in Africa and must, therefore, be taken into consideration.

SOUTH AMERICA

8. Introduction

The topography of South America is made up of jungles, swamps and vast plains in the east, cut off from the narrow western coastal strip by the Andean chain of mountains stretching 4,400 miles from the Caribbean sea to the far south at an average height of 13,000 ft. Such natural barriers, combined with surface communications that are inadequate and primitive (or in many areas non-existent), present ideal opportunities for the successful operation of aircraft.

In the republics investigated - namely, Brazil, Uruguay, Argentina, Chile, Bolivia, Peru, Ecuador and Colombia - over 70 people were consulted, representing directorates of civil aviation, air-taxi and non-scheduled companies, domestic airlines, agricultural organizations, and private interests.

2. Brazil

2.1. General Summary (Brazil)

Brazil, whose area is greater than that of the continental United States, contains approximately half the population of South America. Aero Clubs and private aviation are thriving, over 2,500 aircraft being currently registered in the latter category alone.

Operators of air-taxis, or taxi-aereos as they are known, are classed as those having equipment with not more than six seats or 600 kg. capacity; they are free to fly scheduled services and to fix their own tariffs, but flying is limited to V.F.R. conditions. Where more than two aircraft are operated, a registered company must be formed: some 300 aircraft are used as taxi-aereos, 78 of which are owned by 15 companies.

Non-scheduled operations using equipment larger than that in the air-taxi class are discouraged in order to protect the interests of the regular airlines, which are subsidized both directly and indirectly by the government. Only two minor airlines are not members of one of the six major consortia into which the scheduled airlines are grouped. The non-scheduled companies must use multi-engined aircraft and have good maintenance facilities, and cannot "fly repeatedly between points served by the regular airlines" or "charge so that competition is made with regular airlines". Consequently only three organizations have non-scheduled licences and only one of these is operational.

N.A.B. - Navegacao Aerea Brasileira, S.A. - are typical of the smaller airlines with their 32-seat DC-3 fleet operating coach services and three C-46s on freight work. This company is rumoured to be interested in buying the bare hulls of Dart-Heralds and then furnishing and equipping the aircraft themselves for high density work. However, N.A.B. complain that the current import restrictions make any expansion plans difficult to fulfill.

For the same reason Cruzeiro do Sul find that they can only maintain five of their seven C-82s in the air. First and second preference is given to Convair and DC-3 spares, and their quota only enables a limited quantity of C-82 parts to be imported. Nevertheless an average yearly traffic growth of 12% during the last 15 years reported by Cruzeiro do Sul seems to be typical for the Brazilian domestic operators.

On their government subsidised Amazon service, Panair do Brasil use five Catalinas; this operation covers points between Belem and Manaus and then spreads fanwise eastwards from Manaus. A year ago the DC-3 fleet was sold and Panair are obtaining three C-46 aircraft to link the Amazon service with industrial areas in the south and also to connect main centres in the Amazon basin. An attempt to organise a helicopter subsidiary, Helibras, has not met with government approval and an independent organisation under the auspices of World Helicopters is now being planned.

The work of Correio Aereo Nacional, the transport branch of the Brazilian Armed Forces, is important. C.A.N. are mainly responsible for air services in areas where commercial operations would not be justified and new routes which are opened up are handed over to commercial airlines if they become economic to run. This military airline also "shows the flag" on international communications flights. No charge is made on any of C.A.N.'s routes.

It is interesting to note that of the 292 aircraft in service with the scheduled companies, no fewer than 173 are C-46s, C-47s and DC-3s; these provide almost half of the total seating capacity available. Re-equipment is a major problem to these airlines, whose domestic fare structures are falsely low. Extended-credit terms of up to eight years, which British manufacturers have great difficulty in offering are necessary if new aircraft are to be bought.

9.2. Personnel Interviewed (Brazil)

J. Mendos da Silva, Trajana F. Rois and Eloy Teixeira - Director, Head of Legal Division and Head of Personnel & Aircraft Division, Directorate of Civil Aviation, Rio de Janeiro.

Gp. Cpt. J.A. Crockett - Air Attache, Rio de Janeiro.

Capt. Caldas - Brazilian Air Force.

Murillo de Sampaio Pacheco - Director of Maintenance Cruzeiro do Sul, Rio de Janeiro.

Lt. Col. Diderot - Correio Aereo Nacional, Rio de Janeiro.

Helio Costa - Operations Manager, Panair do Brasil, Rio de Janeiro.

Aloysio Alvim - Director of Traffic, N.A.B., Rio de Janeiro.

Commandante Aldemar and Rudolf Nageli - Operations Manager and Flight Instructor, Loide Aereo Nacional, Rio de Janeiro.

9.3. Statistical Information (Brazil)

Civil aircraft registered privately or with
aero clubs: 2,334(1958) 2,500+ (1960).

Civil aircraft registered with scheduled,
non-scheduled and air-taxi companies: 613(1958) 590 (1960).

(a) Scheduled and non-scheduled airlines. **The six major consortia**
are:

- i) CRVZEIRO DO SUL, S.A.V.A.G., T.A.C. (CATARINENSE)
- ii) LOIDE AEREO NACIONAL, T.A.B.A.
- iii) PANAIR DO BRASIL
- iv) V.A.R.I.G.
- v) V.A.S.P.
- vi) REAL-AEROVIAS-NACIONAL, AERONORTE, S.A.D.I.A., T.A.S.
(SALVADOR).

T.A.S. are believed to have recently separated from the REAL consortium, but their position is unsettled as the company is

having serious financial difficulties. The two minor airlines are:

- i) N.A.B.
- ii) T.A.P. (PARAENSE)

T.A.P. are also the only company who are operating under a non-scheduled licence.

In July the scheduled airlines had 292 aircraft offering 10,918 seats (cargo aircraft are considered to have zero seats). Of this total, 130 DC-3s offered 3,683 seats and 43 C-46s offered 1,595 seats.

Cruzeiro do Sul, Rio de Janeiro: 10 Convair 240, 4 Convair 340, 4 Convair 440, 7 C-82, 29 DC-3 (2 owned by S.A.V.A.G. and 2 by T.A.C.).

Servicos Aerofotogrametricos, Rio de Janeiro: 4 Beech AT-11, 1 C-39.

Correio Aereo Nacional: 30 C-47, 3 C-82, 12 C-54, 14 C-810 Catalina (approximate fleet).

T.A.P., Belem: 4 C-46.

Panair do Brasil, Rio de Janeiro: 4 DC-7C, 12 Constellation, 5 Catalina, 4 DC-6C (on loan from Loide Aereo Nacional), 2 DC-8 (on order), 3 C-46 (current).

N.A.B., Rio de Janeiro: 8 DC-3, 3 C-46.

Loide Aereo Nacional, Rio de Janeiro: 8 DC-4, 8 C-46, 4 DC-6C (on lease to Panair do Brasil).

(b) Air Taxi Companies. In July a total of 298 aircraft were licensed in this class, of which 78 were owned by 15 companies (26 company authorisations were valid).

Aero Transporte Vitoria Ltda. (VITORIA), Rio de Janeiro: 1 Lockheed 12A.

Atlanta Taxi-Aereo Ltda (ATLANTA), Salvador: 2 Bonanza.

"Boa" Brasil Organizacao Aerea Ltd. (BOA), Curitiba: 14 Cessna.

Companhia Mariliense de Taxi-Aereo "Comtax" (MARILIENSE),
Marilia: 1 Cessna 170, 6 Bonanza.

Imperial Transportes Aereos Ltda (IMPERIAL), Belo Horizonte:
8 Bonanza, 1 Beechcraft D-18.

Org. Mineira de Transportes Aereos Ltda. (OMTA), Belo Horizonte:
1 Bonanza, 1 Nord-1203, 1 Auster J-5, 1 Rapide.

Rede Estadual de Taxi-Aereo Ltd. (RETA), Londrina: 2 Cessna 170,
9 Bonanza.

Servicos Aereos Continental Ltda (CONTINENTAL), Belo Horizonte:
2 Cessna 170, 1 Bonanza.

Servicos Interestaduais de Transportes Aereos S.A. (SITA), Belo
Horizonte: 6 Bonanza.

Soc. de Transportes Aereos Regionais S.A. (STAR), Sao Paulo:
7 Bonanza, 5 Stinson-108, 1 Heron.

Transportes Aereos Alianca S.A. (ALIANCA), Sao Luiz: 1 Cessna 170,
3 Cessna 172, 1 Aeronca.

Transportes Aereos Centro Oeste Ltda. (TACO), Cuiaba: 1 Bonanza.

Transportes Aereos Delta Ltda. (DELTA), Camp Grande: 5 Bonanza,
1 Cessna 180, 1 Super Aero 45.

Transportes Aereos Tapuio S.A. (TAPUIO), Sao Luiz: 1 Bonanza.

Viacao Aerea Sao Paulo S.A. (VASP), Sao Paulo: 1 Beechcraft AT-7.

10. Uruguay

10.1. General Summary (Uruguay)

Uruguay is the smallest of the South American republics, and here light aircraft and aviation fuel could be obtained at preferential rates of exchange until early this year; thus aircraft effectively cost one-fifth of their real price and fuel was reduced to one-third of its actual cost. Combined with the inadequate surface communication system, the preferential rate of exchange assisted the development of aviation enormously. Even today, with a free rate of exchange but with high automobile taxes, \$12,000 buys a Cessna 180 or a new American car. This very high taxation on motor vehicles makes the light aeroplane particularly attractive to many of the 'estancia' or ranch owners - the note that "an airstrip is available" often appears in advertisements for cattle sales.

A government grant to the aero clubs was increased two years ago to nearly £6,000 and is distributed in proportion to the number of pilots trained in the previous year. (in this system PPLs account for one point and commercial licences for two points). Of the total of 330 civil aircraft with current Cs of A in Uruguay, 63 belong to the clubs.

Although only 28 machines are at present licensed to carry out air-taxi work, many others enter this market illegally. Even the subsidized clubs do unofficial charter work, providing unfair competition for the established taxi firms.

The government-owned airline P.L.U.N.A. are using a fleet of DC-3s at an average utilisation of $6\frac{1}{2}$ hours per day per aircraft, mainly on domestic routes. Three Viscounts fly an average total of 12 hours per day connecting Montevideo with Buenos Aires and Rio de Janeiro. The Montevideo-Buenos Aires service is treated as an excellent prestige route and P.L.U.N.A. lose money even at 100% load factor due to the very short stage length and the high class of service offered.

C.A.U.S.A. also operate the Montevideo-B.A. and Colonia - B.A. routes with two 47-seat Sandringham flying boats. After 1953 this company's government subsidy was stopped and, although the flight time is longer and the service inferior to that offered by P.L.U.N.A., the Sandringhams have the advantage of flying directly from waterfront to waterfront which is very near the city centre in both cases. At the end of July Aerolineas Argentinas are retiring their Sandringham fleet from this service and C.A.U.S.A. hope to fly more of the 600,000 people who travel between the two capital cities each year (Of this total 87,000 travelled by air in 1957 and this number increased to approximately 140,000 in the first six months of 1960).

Aerolines Colonia S.A. own 92% of C.A.U.S.A.'s stock, and they also have permission to operate from Colonia to B.A. Each year half a million people travel between these two points by all means of transport. Plans to capture more of the traffic on these routes by using very high-density DC-4s or Constellations are being considered, and application to the government for European flights to supplement the short stage-length ferry services has been made.

10.2. Personnel Interviewed (Uruguay)

Ismael Vigil and Victor Garin - Chief of Operations Department and Director of Montevideo International Airport, Directorate of Civil Aviation, Montevideo.

J.F. Lyford-Pike - Managing Director, Pike & Co. S.A., (Beechcraft distributions) Montevideo.

B.W.F. Tull - Technical Sales Manager for de Havilland Holdings in South America.

J.N. Miller - Private owner.

H.P. Willis - Regional Executive for Hawker Siddeley Group in South and Central America.

Mario Artygavetia and I.C. Svotogorsky - Inspector General and Foreign Affairs Officer, P.L.U.N.A., Montevideo.

Dr. Conrado Hughes - President of C.A.U.S.A. and Aerolineas Colonia S.A., Montevideo.

10.3. Statistical Information (Uruguay)

Total number of civil aircraft with current Cs of A	330
Aircraft certified for air-taxi work	28
Aircraft registered with Aero Clubs	63
Aircraft used exclusively for ambulance work	7

P.L.U.N.A., Montevideo: 6 DC-3, 3 Viscount, 1 Navion (instructional purposes only)

C.A.U.S.A., Montevideo: 2 Sandringham.

Charles Chalkling Airways, Paysandu: 1 Cessna 180, 1 Debonair.

1.1. Argentina

1.1.1. General Summary (Argentina)

Argentina, second largest in size and population of the South American countries, is made up of four distinctive regions: the Andos, the North, the Pampas and Patagonia. For many years plagues of grasshoppers attacked the rich pastures of the Pampas; now as many as 250 aircraft are used for agricultural work, mainly to counter this menace. Of the 800 private aircraft in the country, a large number are based on the ranches. The Harriet family, owners of the largest estancia in Argentina, operate 22 single-engined machines over their two million acres of property.

In the Argentine, as in Brazil, the aero clubs are strong with some 130 clubs owning 500 aircraft. At present a heavy import tax is levied on light aircraft and to avoid this some owners are retaining American registrations.

Siro Comi S.R.L. are the Cessna distributors for the Argentine and Paraguay. A fleet of 21 Cessnas is maintained for charter work and 85% of the business comes from the ranches. **Sales vary** with the changing import taxes, but in the first seven months of this year over 100 units were sold. The 182 stands out as the most popular model in the Cessna range, whilst the majority of the Piper products are Super Cubs, owing to this model's suitability for agricultural work.

Attempts are being made in Argentina to construct light aircraft suited to the vast potential market that exists; the immediate advantage of such projects is the avoidance of the heavy taxes on imported aircraft. The Institute Aerotecnico at Cordoba is producing the IA-46, a three-seat high-wing aircraft particularly useful for agricultural work; power is provided by a 150 h.p. Lycoming unit. In addition, the IA-35, a general purpose military twin, is still in production at Cordoba, where the Morane-Saulnier MS-760 Paris and the Beechcraft T-34 Mentor

are under licence production.

A three-place Macchi MB-308, which uses a 90 h.p. Continental engine, is being built under licence by German Bianco S.A. at Buenos Aires, but the wooden construction in this aircraft is not popular. Aero Talleres Boero S.R.L. have designed and built two Aero Boero 95s at Morteros in Cordoba provinces. Also powered by a 90 h.p. Continental unit, this high-wing monoplane has a wide speed range and is said to be ideal for taxi, training and agricultural work as well as for aerobatic flying. It remains to be seen whether a licence for quantity production for this model will be granted, as the Aero Boero 95 would be in direct competition with the government sponsored IA-46.

Among taxi operations, those of Aerochaco AND T.A.A.S.A. are particularly interesting. Aerochaco's two Beavers operate a "radial" system of routes mainly within 200 miles of Resistencia in the Chaco, a great lowland in the north-east of Argentina covered with scrub forest and grassy savannah. The highest summer temperatures in South America have been recorded in the Argentine Chaco, and this combined with the rugged terrain, poor airstrips and heavy winter rains, makes the area ideal Beaver country.

T.A.A.S.A. - Taxis Aereos Argentines S.A. - are operating two scheduled services, with intermediate stops, from Buenos Aires north to Concordia and Diamante in the rough Entre Rios Province. The company has six Rapides, only three of which are in service at present; it is hoped that an increase in the same region to seven routes will employ all six aircraft. In the last year three pilots flew 4,500 passengers on T.A.A.S.A.'s services. The eight-seat series 3 Rapides have been extensively modified by the company, the most obvious point being the absence of the undercarriage cowlings. This modification, combined with the metal fuselage bottom, minimizes possible damage from stones

on primitive airstrips. The replacement of the standard 40 ampere-hour battery by one 180 ampere-hours' capacity facilitates continued operations from strips without any ground equipment. The venturi has been located on the undercarriage strut, in the propeller slipstream, V.H.F. radio has been fitted and v.p. propellers are manually operated.

Air taxi companies constitute most of the members of Camara Argentina del Comercio de Aviacion, the "aviation chamber of commerce". The Asociacion Argentina de Transportadores Aereo represents the independent airlines and are hoping to obtain a government subsidy for distribution to their members on a capacity-kilometre basis.

L.A.D.E., Lineas Aereas del Estado, is operated with aircraft of the Argentine Air Force (Transport Command) to serve routes which would be uneconomical for a commercial company; at the same time the Air Force uses these services to train their aircrew.

11.2. Personnel Interviewed (Argentina)

Juan Francisco Fabri - President, Asociacion Argentina de Transportadores Aereo, Buenos Aires.

Gil Giron - Secretary, Camara Argentina del Comercio de Aviacion, Buenos Aires.

C.A. Rogers and Luis Gonzalez Moreno - Aviation Manager and Assistant, Shell Argentina Ltd., Buenos Aires.

J. Ravogo - Director, Taxis Aereos Argentinas S.A., Buenos Aires.

J.J. Glenny - Vice-President, Aircom S.A. (Bristol agents), Buenos Aires.

Siro A. Comi - Director, Siro Comi S.R.L. (Cessna distributors in Argentina and Paraguay), Buenos Aires.

Juan F. Albarenque - Director, Servicios Aeos Albarenque Aeroexploracion S.A., Buenos Aires.

D.J.E. Harriet - Director of largest ranch in Argentina.
 Gp. Cpt. D.J. Devitt - British Air Attache, Buenos Aires.
 J. Bridger - Waldron Aviation S.R.L. (de Havilland agents in Argentina), Buenos Aires.

11.3. Statistical Information (Argentina)

The following are approximate figures:

Total number of civil aircraft registered	2,000
Privately owned aircraft	800
Aircraft registered with 130 Aero Clubs	500
Aircraft engaged on agricultural flying (during season)	250

Aerolineas Argentinas, Buenos Aires: 4 Comet 4, 5 DC-6, 6 DC-4,
 3 Convair 240, 11 DC-3, 3 C-47, 6 Sandringham.

✕ Transcontinental S.A., Buenos Aires: 2 Britannia, 6 CW-20 Commuter,
 1 Super CW-20.

✕ Aerolineas Ini, Buenos Aires: 1 DC-4, 1 DC-6.

✕ Austral S.A., Buenos Aires: 5 C-46, 1 DC-4 freighter.

✕ A.L.A., Rosario: 6 DC-3.

✕ Norsur - P.L.A.S. (Primera Linea Aerea Santafesina) - L.A.C.
 (Lineas Aereas de Cuyo S.A.) combine: 7 Lodestar, 1 C-46.

✕ T.A.A.S.A. (Taxis Aereos Argentinos S.A.), Buenos Aires: 6 Rapide.
 Aerochaco, Resistencia: 2 Beaver.

Transamerican S.A., Buenos Aires: 1 C-46 freighter.

T.A.B.A. (Transportes Aereos Buenos Aires), Buenos Aires: 4
 Expeditor.

✕ Transaereo: 3 C-39.

Transcarga: 1 C-82.

Platamar: 1 DC-2 freighter.

Aerolineas Carreras: 2 C-46.

Aerolineas Halcon: 1 C-46 freighter.

L.A.D.E. (Lineas Aereas del Estado), Buenos Aires: ? DC-3,
? DC-4, 2 Bristol 170.

Aircom S.A., Buenos Aires: 2 Piper Cub (instruction fleet):
1 Bonanza, 2 Navion, 1 Cessna 175 (charter fleet).

Siro Comi S.R.L., Buenos Aires: 2 Cessna 310, 1 Cessna 210,
10 Cessna 182, 3 Cessna 180, 4 Cessna 172, 1 Cessna 175.

Servicios Aereos Albargonque Acroexploracion S.A., Buenos Aires:
4 Piper, 1 Cessna 170, 16 Aeronca (insect control fleet); 2 Bonanza
(communication fleet); 1 B-25, 1 Cessna 182, 1 Anson, 1 Beech AT-11
(geophysical and photographic fleet).

Harriet family: 3 Bonanza, 2 Cessna 182, 1 Stinson L-5 (communication
fleet); 3 Piper Super Cruiser, 2 Cessna 140, 1 Cessna 165, 2 Super
Cub, 8 1A-11 (agricultural fleet).

T.A.Y.R. (Trabajos Aereos y Representaciones S.A.), Buenos Aires:
Not operational - previously a leading charter helicopter organisation

⌘

Member of A.A.T.A. (Asociacion Argentina de Transportadores
Aereo).

12. Chile

12.1. General Summary (Chile)

Chile is a 2,800-mile ribbon of land lying between the Andes and the Pacific, and for this reason efficient transportation has always been important. The air-mindedness of Chile, whose total population is only seven millions, is reflected by the existence of 55 clubs using 260 aircraft and of 132 privately owned aircraft. A substantial government subsidy is distributed to the clubs each year by the Federacion Aerea de Chile and is based, as in Uruguay, on the number of PPLs obtained in the previous twelve months.

A total of 90 aircraft are engaged in all types of commercial activities in Chile. With the bankruptcy of C.I.N.T.A./A.L.A. and Transa de Chile, only the government airline L.A.N. and L.A.D.E.C.O. operate scheduled services. L.A.N. will probably buy pure jet equipment soon to modernize their fleet, the Comet 4C or Boeing 720 being the most likely choice for this application.

L.A.D.E.C.O., Linea Aerea del Cobre, was formed in 1958 to take over some domestic operations from C.I.N.T.A. A scheduled service is flown between Santiago, Potrerillos, Antofagasta and Calama using two DC-3 "Super 94s" and is subsidised by the copper mines that are served. **The Pratt and Whitney 1830-94 engines** enable the aircraft to maintain height at 12,000 ft. on one engine when fully loaded, and the gross take-off weight is increased to 26,900 lb. Nevertheless, substantial payload restrictions still have to be imposed at Potrerillos; located at 8,300 ft. this is the highest airfield in Chile and the 5,250 ft. runway has a $3\frac{1}{2}\%$ slope combined with difficult approaches (maximum take-off weight is 25,750 lb. and maximum landing weight is 25,250 lb). Many slow deflations of tyres on the DC-3s were experienced during the initial operations into Potrerillos. This is now being avoided by using lower tyre pressures, so it would appear that the

increased differential pressure on the tyres at high altitude, combined with the severe braking necessary on a limited airstrip, gave rise to a deterioration in the material which eventually caused the slow deflations.

Several companies do non-scheduled and air-taxi work whilst agricultural operations are carried out by four units using twelve Piper Super Cubs. Fumagro y Agral, who started in 1954 as Linea Area Fumagro, was the first organisation to do crop-spraying on a commercial basis in Chile. In 1959 the company amalgamated with Agral. Asociacion Pairoa Epple, who do a combination of taxi and agricultural flying, are believed to be organising a helicopter subsidiary.

L.A.S.A. are a typical non-scheduled company with three C-46 aircraft doing all-cargo work. Founded last year the company operates mainly from Santiago to the port of Arica in the north and to Osoruo, the earthquake region in the south. With the extensive use of aircraft during the recent earthquake emergency their potential is being appreciated more and more in the south.

12.2. Personnel Interviewed (Chile)

General Renato Gonzalez, Carlos Arroyo and James Robinson - Director, Head of Commercial Aviation Department and Head of Air Traffic Control Service, Directorate of Aeronautics, Santiago.
A.N. Beven - Director, Gibbs and Co. S.A.C. (de Havilland, Vickers and Westland agents), Santiago.

Jorge Salvatierra C. - Aviation Manager, Shell Chile Limited, Santiago.

Ortega - Manager, Federacion Aerea de Chile, Santiago.

Luis Riquelme and Fernando Villarroel - General Manager and Technical Manager, Fumagro y Agral Limitada, Santiago.

Renato Sepulveda Rojas - General Manager, L.A.S.A., Santiago.

Juan Costabal, George Figueroa and George Nordenflycht -
General Manager, Assistant to General Manager and Operations
Manager, L.A.D.E.C.O., Santiago.

12.3. Statistical Information (Chile)

Privately owned aircraft	132
Aircraft engaged in commercial work of all natures, including executive aircraft	90
Aircraft registered with the 55 Aero Clubs	260
Number of gliders affiliated with the 2 Gliding Clubs	10

Scheduled airlines:-

Linea Aerea Nacional (L.A.N.), Santiago: 7 DC-6B, 4 Martin 202,
17 DC-3.

Linea Aerea del Cobre, Ltda (L.A.D.E.C.O.), Santiago: 2 DC-3 Super
94.

Non-scheduled and cargo airlines:-

Linea Aerea Sud Americana (L.A.S.A.), Santiago: 3 C-46 (leased).

Transportes Roberto Parrague: 1 Catalina.

Transportes Delano Sepulveda: 1 C-46 (loaned to L.A.S.A.).

Ricardo de Varennes: 1 C-82 with auxiliary jet.

Air-taxi companies:-

Roth y Cia. Ltda.: 1 Grumman G-21-A.

Sociedad Transportes Gidema: 1 Cessna 180.

Linea Aerea Cruz del Sur, Ltda.: 1 Apache, 1 Bonanza.

Taxpa Ltda.: 2 Stinson Voyager.

Asociacion Pairoa Epple: 3 Super Cub.

Agricultural companies:-

Fumagro y Agral Ltda, Santiago: 1 Champion (communications), 5
Super Cub.

Linea Aero-Servicios Ltda.: 1 Super Cub.

Alao Agricolas Ltda. (Asociacion Pairoa Epple): 3 Super Cub.

Aerosan Ltda.: 3 Super Cub.

13. Bolivia.

13.1. General Summary (Bolivia)

Bolivia, where the vast Altiplans at 12,000 ft. contrasts with the eastern semi-tropical lowland is relatively backward in its aviation. A total of only 86 civil aircraft are currently registered. However, the Directorate of Civil Aviation formed a flying training school in 1956 and 27 pilots have been issued with licenses. At Cochabamba 15 students are currently undergoing instruction on six single-engined aircraft. **La Paz** airfield, at 13,358 ft., is unsuitable for training purposes since it is in fact the highest commercial airfield in the world.

Air-taxi operations are concentrated at Santa Cruz, Trinidad and Caramavi in the east, where surface communications are extremely bad or non-existent. A lot of charter work emanates from the oil companies prospecting in the eastern lowlands; here Bristow Helicopters, Bermuda, have eight rotating-wing aircraft on permanent charter. In June two C-82 aircraft were introduced into the country for the movement of drilling rigs and allied equipment from Santa Cruz.

Most of the airline-operated machines are obsolete ex-U.S.A.F. aircraft, B-17s and B-24s being common sights in Bolivia as well as the inevitable C-46s and C-47s. The state airline Lloyd Aereo Boliviano have reduced their services recently and are suffering from a lack of confidence expressed by the travelling public, mainly attributed to their DC-4 crash in February and their inefficient organisation. They have been showing a strong interest in the Dart-Herald but are now considering the purchase of DC-6 equipment. However, it would seem illogical for L.A.B. to attempt competition with Braniff and L.A.N. on international routes with DC-6s before they are able to organise an efficient domestic network.

Competition with L.A.B. is made on the basis of a lower fare structure by Aerovias Condor and Transportes Aereos Militares, the commercial airline staffed and organized by military personnel. The government protect the interests of their state airline and Aerovias Condor complain that many of the smaller airfields are staffed by L.A.B. staff who only remain on duty when L.A.B. flights are due!

C.B.F., the Bolivian Development Corporation, use C-46s and B-17s for a wide variety of work, including the air freighting of beef from the Beni Province up to the Altiplano. Frigorificos Ballivian, who have their own ranches, abattoirs and refrigerating plants, started this operation in 1949 with a C-46 and then changed to converted B-24 Liberator aircraft. Due to government restrictions the company intends to sell its two remaining B-24s in the near future.

The Institute of Linguistics, based at Riberalta, on the River Beni, use a Piper Cruiser, an Aeronca float plane and a Helio Courier. The Institute is a large international organization equipping and maintaining several hundred linguistic missionaries in isolated jungle areas. With headquarters at Glendale in California, this institution has South American operations in Peru and Ecuador as well as in Bolivia.

13.2. Personnel Interviewed (Bolivia)

Alfredo Fernandez, Rene Antesala and Federicko Tejerina - Director, Deputy Director and Chief of Operations Department, Directorate of Civil Aviation, La Paz.

W. Weener - Director, Cia. Petrolera Boliviana Shell Ltd., La Paz.
Charles Schonstrom - Managing Director, Frigorificos Ballivian, La Paz.

Jorge Saenz - President, Aerovias Condor, La Paz.

R. Clark - Director, Martin & Co. Ltd. (Vickers, Handley Page, Rolls Royce, Auster, Scottish Aviation and Westland agents), La Paz.

13.3. Statistical Information (Bolivia)

Total number of civil aircraft registered	86
Privately owned aircraft	22
Aircraft licensed for air-taxi work	16

Lloyd Aereo Boliviano, S.A., Cochabamba: 2 DC-4 (on loan), 2 B-17,
3 DC-3, 6 C-47.

Corporacion Boliviano de Fomento (CBF), La Paz: 2 C-46, 3 B-17.

Frigorificos Ballivian Ltda., La Paz: 1 Convair L-13A, 5 B-24
(only 2 in use).

Aerovias Condor Ltda., Cocha bamba: 1 Cessna 182, 2 C-47, 2 C-82.

Yacimientos Petroliferos F.B. (Government gasoline monopoly): 1 C-47,
1 Cessna 180, 1 Cessna 310.

Institute of Linguistics, Riberalta: 1 Piper Cruiser, 1 Aeronca,
1 Helio Cruiser.

Transportes Aereos Militares, La Paz: ? C-46, ? C-47, ? B-17.

1.4. Peru

1.4.1. General Summary (Peru)

Peru has relatively little light aviation. A total of 60 aircraft are either privately owned or affiliated with one of the five aero clubs. However, the importance of cotton to Peru has accelerated the development of agricultural flying and cotton is now sprayed in the northern coastal regions and in the middle jungle belt. As many as 90 machines do this work during the season.

Only 22 aircraft are licensed to do taxi on non-scheduled charter work in Peru. One of the oldest-established firms is Aero Taxi S.A., which was formed in 1953 by two Americans (the same two partners manage Jamison and Reich S.A., the Cessna distributors for Peru since last year). Seven war-surplus Cessna UC-78s were purchased for Aero Taxi in the United States and flown to Peru; now only two are flying, but a Cessna 180 was recently added to the fleet. Lima is used as a maintenance centre and the aircraft are based in the jungle at San Ramon, north-east of Lima. A network of seven H.F. radio stations is operated by the company, most of whose work has been the transportation of freight to isolated settlements in the central jungle region. With the completion of new roads in the area resulting in a decrease in traffic, and with the added complication of government restrictions on charter operators, Aero Taxi is being kept in existence only by the profits made on the Cessna sales and service of the sister company (nine aircraft were sold in the first eight months of the year).

The Faucett company, noted for its reliability and operational economy, has the distinction of being one of the few airlines to operate aircraft of its own manufacture. Thirty Faucett-Stinsons were produced around 1945, and four of these robust aircraft still remain in service. Each of the seven-passenger

Stinson monoplanes is powered by a 600 h.p. Pratt and Whitney radial engine. The Talara-Tumbes and the Aroquipa-Mollendo-Ilo routes are now flown by these four extraordinary machines.

An average increase in traffic of some 12% annually is reported by Faucett, the greatest growth being on the freight side. Because of this cargo boom and the prevalence of poor airstrips the company are showing a very keen interest in the civil version of the Lockheed Hercules S.T.O.L. aircraft. Two of the present C-47 fleet are converted to "Hi-Per" standards with Pratt and Whitney R-2000 engines giving a single-engine ceiling of 16,000 ft. at full load. This extra performance is particularly desirable on trans-Andean routes.

At Lima Faucett have a modern maintenance base which is one of the few in South America that has F.A.A. approval to carry out overhauls and modifications. The company hopes to extend its field of activity from purely domestic work to include a flight to Panama and Miami in the near future.

Early this year T.A.P.S.A. Transportes Aereos Peruanas S.A., terminated operations when both their C-46 aircraft crashed within a few days of each other. A.P.S.A., Aerolineas Peruanas S.A., have two DC-6Cs on international routes and have recently applied for a license to cover domestic work.

Servicis Aereos Transportes Comerciales (S.A.T.C.O.) is the new name for the branch of the Peruvian Air Force which organises commercial scheduled services. S.A.T.C.O., who are contemplating the purchase of DC-6s, has a fleet of 10 C-46s and C-47s which is often supplemented by Air Force Beavers, PBVs, Stinson L-5s and Piaggio P136s in the jungle areas.

14.2. Personnel Interviewed (Peru)

Col. Jorge Chamot - Sub-Director, Directorate of Civil Aviation, Lima.

J.K. Blair - Director, Gibbs & Co. S.A. (de Havilland agents), Lima.

J. Regan - Station Freight Manager, Panagra, Lima.

General Armando Revoredo - Operations Manager, Cia. Aviacion 'Faucett' S.A., Lima.

Col. Jose Heighes and Commandante C. Podesta - Director of Operations and Chief of Operations, Peruvian Air Force, Lima.

Norman Jamison and Lawrence Reich - Directors of Aero Taxi S.A. and Jamison & Reich S.A. (Cessna distributors), Lima.

14.3. Statistical Information (Peru)

Total number of civil aircraft registered	280
Privately owned aircraft	40
Aircraft registered with the 5 Aero Clubs	20
Air-taxi and non-scheduled charter aircraft	22
Maximum number of aircraft used by the 6 agricultural companies	90

Compania de Aviacion 'Faucett' S.A., Lima: 1 DC-6B, 4 DC-4, 4 Faucett-Stinson, 11 C-47 and DC-3 (including 2 Hi-Per DC-3) Aerolineas Peruanas S.A. (A.P.S.A.), Lima; 2 DC-6C. Letter of intent signed for 2 Comot 4C.

Servicio Aereas Transportes Comerciales (S.A.T.C.O.), Lima: 3 C-47, 4 DC-3. 3 C-46.

Aero-Taxi S.A., Lima: 2 Cessna UC-78, 1 Cessna 180.

Jamison and Reich S.A., Lima: 1 Skylane (current).

Aerovias del Solar: 1 Cessna 180.

15. Ecuador

15.1. General Summary (Ecuador)

Ecuador is the second smallest South American republic and, like Peru, has distinctive coastal, Andean and forested regions. Light aircraft activity is concentrated along the coastal strip, where most of Ecuador's resources are located. In this area nine agricultural companies use some 50 aircraft, mainly to spray the banana plantations. Eight Hiller UH-12s are now being used, in addition to a large number of the more common Piper Super Cubs. The one aero club in Ecuador is based on Guayaquil, on the coast, which is also the headquarters of the four air-taxi companies.

Scheduled services to the west of the Andes are run by Aerovias Ecuatorianas, S.A., (AREA) with three 28-seat DC-3s and one 40-seat F-27A. The DC-3s fly between 3,500 and 4,000 hours per year per aircraft, at an average load factor of 87%, and the F-27A logged 1,050 hours during its first year in service, recently completed. At present the jet-prop makes two round trips per day on the Quito-Guayaquil service, but this should be increased to three trips before the end of the year. In 1959 nearly 35,000 passengers flew each way between these cities, the great majority on AREA services.

As they intend to extend jet-prop services to Esmeraldas AREA hope to obtain another F-27 type of aircraft; the directors consider that the cost of the F-27 has now increased too much and are looking for a cheaper twin-turboprop machine. Interest in the Avro 748 seems to be keen, but the general attitude towards the Dart-Herald was one of scepticism as all the information available was discouraging. Apparently the airline has not been officially approached on the subject.

Regular services in the east are maintained by Transportes Aereos Orientales, who started operations in 1958; Quito is the maintenance depot and Shell-Mera, east of the Andes, is the jungle

base. Twenty-two centres in the Oriente are served by T.A.O., eleven by a Junkers Ju 52/3m; the remainder, whose airstrips are only about 400 metres long, are fed by a Cessna 180 and a Norseman. A C-47 is to be bought late in 1959.

Also based at Shell-Mera are the activities of the Missionary Aviation Fellowship, whose function is to serve protestant missions in otherwise inaccessible areas. M.A.F. have programmes in Brazil, British Guiana, New Guinea and Africa as well as in Ecuador, where their work has extended over the past 14 years. At present, twelve locations in the central jungle region are served by a Piper Cub and a Cessna 180.

Most of the international traffic originating in Ecuador is carried on C.E.A.'s routes. They recently obtained a second DC-6 aircraft from American Airlines and are interested in buying a Caravelle if their traffic continues to increase. Linea Internacional Aerea (L.I.A.) operate schedule to Guayaquil and Tulcan from Quito and also do non-scheduled international work. They have applied for a scheduled international route license.

15.2. Personnel Interviewed (Ecuador)

Guido Bucheli Cadona, Jaime Ordenez Pallares, Enrique Munoz de Larrea and Rodrigo J. Ruiz B. - Director, Sub-Director, Head of Operations Department and Airport Manager, Directorate of Civil Aviation, Quito.

Dr. Marco Julio Gonzalez - President, Cia Ecuatoriana de Aviacion, Quito.

Capitan Agustin Arias G. - General Manager, ARRA, Quito.

Capitan Jacinto Ruales - Manager, T.A.O., Quito.

(Mrs.) E.M. Wiebe - Hostess for 'Voice of the Andes', Quito.

15.3. Statistical Information (Ecuador)

Privately owned aircraft	6
Aircraft owned by the 4 air-taxi companies	26
Aircraft operated by the 9 agricultural companies	50

Aerovias Ecuatorianas, S.A., (AREA), Quito: 3 DC-3, 1 F-27A.

Transportes Aereos Orientales, (T.A.O.), Quito: 1 Cessna 180,
1 Norseman, 1 Junkers Ju52, 1 C-47 (current).

Cia. Ecuatoriana de Aviacion, (C.E.A.), Quito: 1 DC-6. 1 DC-6B.

Linea Internacional Aerea (L.I.A.), Quito: 2 C-46, 1 Constellation
(current).

Viao Internas Orientales SA (V.I.O.S.A.), Quito: Ceased operations.

CEDTA, Guayaquil: 6 Tripacor, 3 Beech UC-18S, 1 UC-45F, 1 Cessna T50,
1 Stinson V-77.

SAN, Guayaquil: 5 Cessna 170B, 2 Beech JRB-4.

VIANSA, Guayaquil: 2 Cessna 180, 1 Cessna 170A.

ECUAVIA N.S., Guayaquil: 2 Super Cub, 1 Apache, 1 Cessna 172.

Aero Club, Guayaquil: 1 Cessna 140, 1 Cessna 140A, 2 Super Cub.

Missionary Aviation Fellowship, Shell-Mera: 1 Cessna 180, 1 Piper Cub.

Agricultural companies:-

ATOMEK: 9 Super Cub.

Aero-Fumigadora del Litorel: 1 Apache, 3 Super Cub, 2 Cessna 170B.

CADASA: 14 Super Cub.

FALASA: 3 Super Cub.

Industrial Agricola, Guayaquil: 2 Hiller UH-12, 1 Navion.

Comercio y Transportes: 5 Hiller UH-12, 1 Navion.

FASQ, Esmeraldas: 2 Pawnee, 1 Beech C-185, 1 Norseman, 3 Stearman
PT-17.

Pan-American Fruit Company: 1 Super Cub.

Agra Aereo: 1 Hiller UH-12.

Frutera Sudamericana: Ceased operations.

New companies:-

Aerolineas Amazonicas S.A. (A.A.S.A.): To operate one Comanche on routes from Shell-Mera in direct competition with T.A.O.

ANTENA N.S., Esmeraldas: To operate taxi services with 2 Cessna 170 on floats.

AEROTAXI: To do non-scheduled work with 1 Cessna 190.

LAPZA: No information.

16. Colombia

16.1. General Summary (Colombia)

In contrast to most of the other South American republics, Colombia has recently divorced all control of civil aviation from military personnel. This new administration is a refreshing example of the go-ahead nature of aviation in a country where mountain ranges and jungles have prevented the development of a good road or rail system.

The early enterprises of the German S.C.A.D.T.A. in 1919 gave Colombia the distinction of having the oldest airline in the Americas, and since then the country has retained a leading position in South American aviation. Now S.C.A.D.T.A.'s successor AVIANCA operates an extensive domestic and international system of services with 50 aircraft.

A wholly owned AVIANCA subsidiary, Aerotaxi, serves areas which are inaccessible to the larger aircraft. Regular services from Cali, Villavicencio, Bucaramanga, Medellin and Barranquille are flown, in addition to charter work undertaken throughout the country. Last year approximately 100,000 passengers were carried by Aerotaxi's 15 Beavers and 4 Cessna 195s.

AVIANCA also hold 51% of Helicol's stock, the Keystone Helicopter corporation owning the remaining 49%. The main use for the fleet of 23 Bell 47s has been the support of the oil companies seismic crews, but last year the fumigation of cotton was started and has developed rapidly. Now 12 of the Bells can be equipped for spraying, and they are competing favourably with conventional fixed-wing aircraft. Helicol's claim of an average utilization of 1,200 hours per year on their helicopters gives an idea of the opportunities available for this type of aircraft in Colombia. (Another large helicopter flight is used by Petroleum Helicopters de Colombia, whose 12 Bell 47s are engaged on survey work).

Many farmers have their own aircraft or use the facilities of the numerous air-taxi companies, and the seven aero clubs in Colombia have 76 aircraft affiliated to them. In addition there are four schools which train pilots to commercial standards. The largest of these schools is the government subsidized E.N.A.C.C. (The National School of Civil and Commercial Aviation), where 21 pupils are currently undergoing training on 17 aircraft, most of which are Piper Super Cubs.

Both E.N.A.C.C. and Aeroclub Colombia, the largest club, are based at Guaymaral Airport, near Bogota, where the Colombian Piper distributors, Aero-Mercantil Limitada also have their headquarters. Piper sales are still averaging 40 units per year despite the cancellation in 1955 of a preferential rate of exchange for light aircraft, and severe import restrictions introduced two years ago which limit imported aircraft to those used for agricultural or instructional purposes. Aero-Mercantil are doing an increasing amount of maintenance and overhaul work on aircraft up to Aero Commander size.

In Colombia, as in any country where competition in agricultural flying is keen, a price war has developed. Despite a government standard minimum charge, equivalent to 18s. per hectare, prices as low as 5s. are sometimes charged. Cotton and, more recently, banana plantations are sprayed. There are two seasons for cotton spraying, March to August in the interior and September to January on the coast. Reasonable utilization can therefore be obtained from aircraft used solely for fumigation work, and the Piper Pawnee has been introduced successfully. The Pawnee is slowly dispelling the prejudice that undoubtedly exists among pilots accustomed to flying Super Cubs and other high-wing aircraft. For the spraying of bananas, the rotary atomizer type of spray gear is becoming more popular, since the smaller droplet size available with this equipment minimizes leaf-burning.

16.2. Personnel Interviewed (Colombia)

Rene Van Meerbeke R - Head of Administrative Department of Civil Aviation, Bogota.

James G. Leaver - Manager, Aero-Mercantil Ltda. (Handley Page and Piper agents), Bogota.

H. Wild - Commercial Vice-President of AVIANCA, Manager of Aerotaxi and Director of Helicol, Bogota.

J. Bahamon - Assistant to Commercial Vice-President of AVIANCA, Bogota.

16.3. Statistical Information (Colombia)

Total number of civil aircraft registered on July 1, 1960	528
Privately owned aircraft	59
Aircraft operated by the 18 air-taxi companies	88
Aircraft operated by the 11 scheduled and non-scheduled airlines	90
Aircraft operated by the 18 agricultural companies	97
Aircraft registered with the 7 Aero Clubs	76
Aircraft operated by the 4 Schools	39
Executive aircraft owned by 6 companies	10
Aircraft operated by government departments	16
Aircraft operated by Petroleum Helicopters de Colombia	12
Aircraft registered with 3 companies that are not operational	6
Aircraft provisionally registered (mostly for agricultural work)	35

Scheduled and non-scheduled airlines:-

AVIANCA, Bogota: 3 Super-Constellation, 4 Constellation, 8 DC-4, 4 DC-4 freighter, 9 C-47, 2 DC-3, 20 Hi-Per DC-3.

Aerovias Condor de Colombia Ltda. (AEROCCONDOR), Barranquilla:

4 C-46, 1 Cessna 180.

ARCA: 2 C-47, 1 Douglas B-18.

ARCO: 1 Tripacer, 1 Cessna 140.

LAICA: 1 Catalina, 1 Cessna 180.

Lineas Interamericanas Aereos Ltda. (LIA), Bogota: 3 C-46.

Lineas Aereas del Caribe Ltda (LIDCA), Barranquilla: 2 C-82, 1 C-46.

Lloyd Aero Colombiano (LAC), Bogota: 2 C-46, 1 C-82. Recently liquidated.

Rutas Aereas de Colombia (RAS), Medellin: 3 DC-4, 2 DC-6B, 1 DC-3.

Sociedad Aeronautica Medellin (SAM), Medellin: 4 C-46.

Servicio de Fumigacion Aerea (SEFA), Armero: 4 Super Cub.

Lineas Aereas Taxader (TAXADIER), Bucaramanga: 5 DC-3. 3 C-46,

1 Otter, 1 Beaver.

Air-taxi companios:-

Aerotaxi S.A, Bogota: 15 Beaver, 4 Cessna 195.

Aerotaxi Caldas: 1 Apache, 2 Helio Courier.

Aerovias del Llano (AEROLLANO), Villavicencio: 1 Conestoga C-93.

Aerovias Santadereanas Pilotos Asociados (ASPA), Bucaramanga:

1 Cessna 172, 5 Cessna 180, 2 Cessna 170.

Aerovias Pilotos Asociados (AVISPA), Medellin: 2 Cessna 180.

ESTERA: 1 Cessna 180, 1 Norseman.

Helicol, Bogota: 23 Bell 47.

Lineas Aereas Colombiana Expresa (LACE): 2 C-82.

Lineas Aereas Orientales (LAO), Bogota: 2 Pacer.

Rutas Aereas Chaparralunas (RACHA): 1 Cessna 180, 2 Super Cub.

TACATA: 1 Cessna 170, 1 Cessna 180, 1 Voyager.

Taxi Aereo Colombiano (TACO), Villavicencio: 1 Norsemann, 1 Cessna 170.

TAFERO: 1 Tripacer, 2 Cessna T-50.

Taxi Aereo Sabancero (TASS), Yopal: 2 Cessna 170.

Taxader de Boyaca (TABOY): 2 Beaver, 2 C-47.

Taxi Aereo "El Llanero" (TAXALLANO), Villavicencio: 4 Cessna 170,
1 Cessna 140, 1 Cessna 195.

Taxi Aereo Opita (TAO): 1 C-47, 3 Cessna 180, 1 Beaver.

Taxi Aereo del Meta (TAM): 1 Cessna 180, 1 Cessna 170.

Agricultural companios:-

Colombiana Agricola y Trebajos Aereos (CAYTA), Tolima: 8 Super Cub,
2 Pawnee, 1 Cessna 170, 1 Call-Air 150.

COFA: 2 Super Cub.

Empresa de Fumigacion Aerea (EFA), Bogota: 4 Super Cub.

ESA: 2 Super Cub.

Fumigacion Aerea Opina (FAO): 2 Super Cub.

Fumigacion Aerea y Materiales Agricolas (FAMA), Bogota: 4 Super Cub,
1 Pawnee.

Fumigacion Aerea Colombiana (FARCA), Girardot: 9 Super Cub, 1 Cossna 180.

Fumigacion Aereas del Sinu (FASIL): 3 Super Cub, 7 Champion Sky
Trac 6.

Fumigaciones Aereas Valle: 5 Super Cub.

FUMARCO: 2 Super Cub.

FUMICOL: 2 Super Cub.

MICROFUMAR: 8 Super Cub, 5 Stearman, 1 Tripacer.

MICROFAN: 3 Super Cub.

Operaciones Colombiana Agricolas Ltda. (OCA): 3 Super Cub, 1 Call
Air 150.

SASA: 4 Super Cub.

SEA: 1 C-82.

Servicio de Fumigacion Aerea (SEFA), Armero: 4 Super Cub.

SMARTA: 5 Super Cub.

TAPA: 2 Super Cub.

17. Conclusions (South America)

In the vast market for light aircraft which exists in South America, Piper and Cessna distributors today have no serious competitors. Agricultural, taxi and private flying, already very well developed in many parts of the continent, will continue to provide an increasing market for the sale of suitable machines, particularly as the economies of the South American republics become more stable and as their capital resources expand.

A total of some 7,000 civil aircraft are currently registered in the states that were visited. Of this number, approximately 4,700 are either privately owned or affiliated to aero clubs, whilst some 670 are engaged in air-taxi work and about the same number in agricultural flying. The market for both the 4-seat and 2-seat versions of the single-engined aircraft described in Section 7 (Conclusions: Africa) is evidently vast. Particularly notable is the wide use of aircraft for agricultural purposes, in which field the Piper Super Cub is clearly dominant.

As in Africa, a product of comparable price and quality from England, backed by an excellent after sales follow-up, would be extremely popular. In general the Americans are not liked here as their vast Foreign Aid Programme labels them as the "rich relative" to the Latin Americans who love to be independent.

If competition from the U.K. is to be made in the South American market it must be remembered that the United States has an important geographical advantage. Light aircraft can be flown down from North America at less expense than the crating, transporting and reassembling of units from England. Customs delays on imported goods are also a significant factor, and these are less for aircraft that are flown into the country than for those which are shipped in. Where spares are unobtainable from local agents, Piper and Cessna have built up a good reputation by promptly flying the required parts out from the U.S.; competitive

British manufacturers would have to offer a similar service, backed by efficient on-the-spot sales and service organisations. An important point emphasised greatly in South America was that aircraft must be demonstrated locally before any appreciable orders could be expected as the people are particularly impressionable.

On the domestic airline front the present South American fare structure makes it extremely difficult for the airlines to buy new equipment. Surface transport is maintained at a ridiculously cheap level as it is subsidised by the governments who lose favour if they increase the fares (many riots in recent years have been initiated by increases in transportation charges). Airlines are consequently forced to keep uneconomically low tariffs to attract their traffic. The only solution to the re-equipment problem seems to be a hardening of the currency; meanwhile financial difficulties are preventing the sale of many of the larger aircraft and it is common to hear of extended-credit terms of seven or eight years being discussed.

PART II. GENERAL REPORT.

1. ROAD AND TRAVELLING CONDITIONS.

This section records the details of the overland journey. It is hoped that this will be useful to other people intending to travel over similar territory. However, it must be warned that the interpretation of conditions and incidents which occur to other people is difficult and it is worth quoting two travellers whom we met within the space of several hours just before entering the Congo. One told us that the Congolese roads were hard, well-graded and dry, whilst the second described his traverse of the Congolese roads as somewhat of a nightmare. In other words it is very difficult to evaluate a person's judgement on the condition of a road. Added to this is the fact that in tropical countries, what is a good road before the rains start can become impassable in 24 hours, and until such a road is re-graded, water channels up to 12 inches deep can be expected, not to mention the number of bridges which may get washed away leaving rivers to ford.

In an attempt to classify road conditions the following definitions will be a guide. The maximum speeds always refer to conditions of a dry surface.

1. Good paved road. This description indicates that the car can be driven to the extent of its capabilities. A road with a completely hard surface is so superior to any other that no comparison of adjectives will suffice.
2. Bad paved road. It is to be noted that many paved roads are slightly broken, in which case they become dangerous and worse than a good unpaved road.
3. Good unpaved road. This will describe any unpaved road on which speeds of 50 m.p.h. can be

continuously maintained. It will indicate that the road is wide enough to pass trucks going in the opposite direction, without altering course, and that the corners are moderate. This will inevitably refer to the type of road which is badly corrugated on which it is essential to travel at over 45 m.p.h. or shake the vehicle to pieces.

4. Bad unpaved roads.

This will describe a road which, although the surface may be reasonable, allows only a maximum speed of 35 to 40 p.m.h. It mainly applies to narrow roads with sharp corners in hilly country, where the threat of collision is always present. It will also apply to roads which are not curved well and on which the gradients are steep for both ascent and descent.

5. Very bad unpaved roads.

This category is reserved for roads on which the surface, or the precipitous gradients and corners, force one to drive continuously at a speed of less than 25 m.p.h.

This description of the roads will be used in the text and, discounting wet conditions, it is hoped that the future traveller will not find a road in worse condition than those described.

All the touring documents (International Carnet etc.) were prepared for us by the Royal Automobile Club, London. A special commendation is made to the R.A.C. for the way in which the difficult formalities of entering Argentina were successfully carried out. The International Carnet was used for the temporary importation of the vehicle into all countries except where otherwise indicated.

Third-Party insurance is compulsory in African countries and this can be obtained, with difficulty, through the Caledonian Insurance Company or the Royal Insurance Company. We were never asked to produce proof of this insurance anywhere in Africa, although it is definitely compulsory. Third-Party insurance is not necessary in the Americas except in two of the States of the U.S.A., several Canadian Provinces and the Panama Canal Zone. In the Americas if insurance is compulsory then, theoretically, facilities are made available at the border; in practice no one seems to worry although it could be embarrassing in the event of an accident. We carried no insurance in the Americas, the expense being prohibitive.

For reference to the cost of any phase or item see the Financial Report, Section 10.

Comments on the climate will only be made if it was extremely cold or hot at the particular time of transit. For further information see the References, Section 8.

The dates of our journey are given only as a rough guide as they were dictated essentially by the aeronautical investigation.

1.1. EUROPE AND AFRICA (London to Cape Town)

On the whole journey through Africa we found that the theoretically longest petrol stage was about 300 miles, which occurred twice in the North; most stages are less than 200 miles. However it did happen twice that places previously reported as having petrol had just run out. For this reason we carried in cans sufficient fuel for an extra 200 miles in addition to the 220 mile range of the tank. On several occasions this extra fuel was used down to the last few pints and, in retrospect, seems an inadequate reserve because of the unreliability of some of the petrol dumps. Eastern, Central and Southern African supplies were found to be completely reliable and more frequent.

Hotel and good restaurant facilities are non-existent outside the large European-populated cities. This enforces the carrying of complete camping equipment for use on 90% of the journey. The 'Trans-African Highways' book is unreliable in this respect as many of the rest houses are either barns or now a figment of the imagination. There are many so-called hotels run by the local natives which could not be advised for Europeans.

London - Gibraltar. 1,700 miles (approx. by direct route)
16/3/60 to 23/3/60.

Nearly all good paved road, with just a few small sections of good unpaved road in Spain. English Channel crossings can be booked through the Royal Automobile Club.

Gibraltar - Tangier. A daily ferry for cars completes the crossing of the Mediterranean Sea in about four hours.

Tangier - Meknes -
Oujda.

438 miles. 25/3/60 to 27/3/60. Good paved roads. We encountered about 15 police or Army road blocks in Morocco due to a state of civil unrest, but our progress was unhindered.

Oujda - Saida -
Colomb Bechar.

585 miles. 27/3/60 to 29/3/60. Good paved road. No trouble with the customs in Algeria and the French authorities were very helpful. The French Army is in complete control in Algeria and there is a night curfew on travelling; one is forced to sleep in hotels. Weather became hotter as we approached the desert regions.

Colomb Bechar -

Adrar.

391 miles. 1/4/60 to 3/4/60. Very bad unpaved road. This is the approach road to the desert and it is appalling for the first 100 miles during which the French Army is likely to enforce diversions around minofields. The road is corrugated by large trucks which make a corrugation of up to two feet in wavelength. To a small vehicle these are like a ditch, reducing speed, sometimes for hours, to less than 15 m.p.h. After the first 100 miles it is possible in most places to drive beside the road on the desert up to 30 m.p.h. (This is not the real desert and there is a certain amount of vegetation). We were checked out at Colomb Bechar by the French Army. This was the base from where the S.A.T.T. company in previous years had controlled vehicles crossing the desert. The control has now been taken over by the Army and no vehicle inspection is carried out, in fact the procedure is now rather casual. The all-important document is one giving permission by the Prefecture in Paris to enter the desert region. This can be obtained through the French Consulate in London and takes about two months and a good reason to procure. The possession of this document is absolutely essential and it also means that the Army Authorities in Colomb Bechar expect your arrival.

The S.A.T.T. company no longer control any facilities in the desert and the petrol dumps are maintained by another trucking company called Mediteranee-Niger. Fuel arrangements and payments are made at this company's base in Adrar. The route we took is called the Tanzerouft desert. The Hoggar route was temporarily closed during the time we crossed; no particular reason is given, and one is really at the mercy of the Army.

Adrar - Reggan -

Tessalit - Gao.

935 miles. 7/4/60 to 10/4/60. This is the desert crossing. The French Army escorts all vehicles in convoy for the first 150 miles (i.e. about 60 miles past Reggan, the atomic test centre). From Adrar to Tessalit, 570 miles, it is possible to drive on the desert and so avoid the tracks and sand drifts left by the trucks. In places speeds of 50 m.p.h. can be comfortably maintained and in others an occasional reduction to 25 m.p.h. is necessary. It is extremely hot even in the winter season and night driving is much more pleasant. The desert is officially closed from May to September, but the truck drivers told us that for many years now they have operated the same schedule all the year round. Information about the fuel dumps can only be obtained from the Mediteranee-Niger company. The longest petrol stage for us was about 300 miles. Petrol consumption increased in the order of 50% for all the desert driving due to

the softness of the surface. A four wheel drive vehicle will have no trouble with the sand, whereas a two wheel drive vehicle can expect to get bogged down a few times depending on the skill of the driver; in any case it is foolish not to have some six foot planks, or the perforated steel sheets used by the big trucks, and a shovel. No compulsory quantities of water are enforced, although a bare minimum for safety is 4 gallons per man and 4 gallons for the radiator, depending on its condition. One drinks enormous quantities of water and because of this and the discomfort it is best to make the crossing as quickly as possible. If one stays with the convoy after Reggan then the French Touring Club do not extract the insurance fee of about £4 which theoretically guarantees your rescue, but not the vehicle, in the event of a breakdown. As one is forced to start in convoy there is not much point in leaving it as they drive quite fast and do the 1000 miles in 80 hours of virtually continuous driving. The route is beacons with oil drums every 5 kilometers across the desert. Water is available in quantity at Reggan and Tessalit.

Gao - Niamey - Kano. 868 miles. 12/4/60 to 21/4/60. Good unpaved road. Very badly corrugated which enforces a speed of either under 15 m.p.h. or over 40 m.p.h., the latter being nearly always possible. The last 138 miles in to Kano, Nigeria, is a good.

paved road. Very hot and tiring travelling conditions.

Kano - Maidugri.

370 miles. 23/4/60 to 24/4/60. Mostly good paved road, only the last 30 miles being very badly paved, reducing speed to 20 m.p.h. Very hot and becoming more humid.

Maidugri - Fort Lamy -

Fort Archambault.

505 miles. 25/4/60 to 28/4/60. Very bad unpaved road. 90% of this section is over roads reducing speed to between 5 and 20 m.p.h. Previously these roads were not too bad but since the countries have become independent of France the indigenous native does very little work on the roads. This and following sections could well become impassable in a few years if no work is done on them. Charges were made on the ferry at Fort Lamy; the Fort Archambault ferry is free. Very humid.

Fort Archambault -

Fort Crampel - Bambari -

Bangassou.

624 miles. 29/4/60 to 2/5/60. Very bad unpaved roads. Numerous ferries for which no charge is made. Animals in native villages on the roadside make driving difficult.

Bangassou - Buta -

Stanleyville.

454 miles. 2/5/60 to 5/5/60. Bad unpaved roads to Buta then good unpaved road to Stanleyville. May is the start of a wet season and occasionally we were held up for 15 minutes in torrential rain. The area is mostly heavily forested and after a storm the road is littered with fallen bamboos and trees; a machete is useful.

Stanleyville - Mambasa -

Noni - Kasindi. 505 miles. 6/5/60 to 7/5/60. Good unpaved road deteriorating to bad unpaved road near the Congo frontier. Part of this road near Stanleyville was being paved at the time we passed.

Kasindi - Fort Portal -

Kampala. 310 miles. 8/5/60 to 10/5/60. Good unpaved road for 36 miles then 70 miles of good paved road to Fort Portal. Good to bad unpaved road finishing with good paved road into Kampala. Undulating to hilly.

Kampala - Tororo -

Nakuru - Nairobi. 341 miles. 13/5/60 to 15/5/60. Good unpaved road to Nakuru then good paved road to Nairobi. The route is hilly and just before Nakuru an altitude of about 10,000 feet is reached, which was the highest road we travelled on in Africa. From here to Johannesburg the altitude of the road is mostly between 4,000 and 6,000 feet, which increases the petrol consumption.

Nairobi - Arusha -

Iringa - Mbeya. 856 miles. 21/5/60 to 24/5/60. Good (with short stretches of bad) unpaved road except from Narago to just past Arusha which is a good paved road. The unpaved road is very dusty when dry and bad when slightly wet.

Mbeya - Lusaka -

Livingstone (Victoria Falls).

745 miles. 25/5/60 to 30/5/60. Good unpaved road except 157 miles from Kapiri M'poshi to Kafue and the last part into Livingstone which

is good paved road. The direct route from Kafue to Salisbury is all good paved road, 280 miles. We took a much longer route via the Victoria Falls.

Livingstone - Bulawayo

- Salisbury. 566 miles. 2/6/60 to 6/6/60. Very mixed roads, all capable of taking speeds up to 50 m.p.h. and over. Mostly paved surface, but at least 200 miles of this section consists of two 18-inch wide strips of pavement on which great concentration is required to maintain speed. In between there are patches of good unpaved road.

Salisbury - Fort

Victoria - Beit

Bridge.

371 miles. 10/6/60 to 11/6/60. Mostly good paved roads, with still a few miles of "the strips".

Beit Bridge -

Johannesburg - Durban

- Capetown.

1974 miles. 11/6/60 to 26/6/60. Good paved road. This is the middle of winter in June, but the weather is mild and sunny except on the coast where rain can be expected.

1.2. SOUTH AMERICA (Buenos Aires to Cartagena)

Petrol supplies in South America are fairly easily obtained, although it is convenient to be able to do stages up to 300 miles, particularly in the Atacama desert. In the small villages in the Andes of Bolivia and Peru there are no petrol pumps and the fuel is sold by local Indians, usually to be found in the main square.

Hotel and restaurant facilities can be obtained in the cities and the larger towns; however it is still more convenient and almost

essential to be able to cook one's own food and to camp.

The Land Rover entered South America through Buenos Aires in the Argentine and not Rio de Janeiro in Brazil for a very good reason: the Brazilians do not recognise the International Carnet for temporary importation of a vehicle and in fact there does not appear to be any fixed regulations or procedure. However, it was determined that the car could possibly be imported into Brazil upon the payment in cash at the port of arrival of a sum of money five times the value of the vehicle which the local customs official fixes; then there is no guarantee that this money would ever be refunded. As the whole process is unofficial and may still take over a fortnight to complete with associated bribes it seems a very unwise course to take until new agreements have been made. Fortunately for us Argentina has just signed an agreement with Britain to the effect that they will recognise the International Carnet if it is backed by a guarantee of £1,500. This was arranged in London through a Bank and the Royal Automobile Club. The latter made all the necessary preliminary contacts with the Automobile Club de Argentino, which subsequently allowed us to clear the Land Rover of customs almost without delay on arrival. All other South American countries except Bolivia and Ecuador officially recognise the International Carnet. In practice most of the border officials are incredibly uneducated and will accept any good yarn, particularly if you show them how to fill out the Carnet!

Buenos Aires -

Mendoza.

678 miles. 30/7/60 to 2/8/60. Good paved road. Heavy traffic at all times and the road is not very wide. The month of July is mid-winter and it was most essential to

use anti-freeze in the radiator water, even at low altitudes, when inland.

Mendoza - Santiago. 211 miles. 3/8/60 to 7/8/60. This road crosses the Andes over a pass at approximately 12,500 feet and it is closed completely by snow from about May to November (depending on the severity of the season). The road is very bad unpaved over the pass but on the Chilean side after Los Andes there are good paved and unpaved roads to Santiago. During the winter months it is possible to ship a vehicle on a railway flat-car through a tunnel. Even this can be blocked for up to three weeks at a time and hence no reliable crossing can be made during the winter. We were very lucky and got through, after waiting only four days, on the first train to pass in two weeks; bribery is an accepted means of progress with the officials. It is not possible to join the train other than at Mendoza, despite information from the Automobile Club de Argentina to the contrary.

Santiago - Antofogasta

- Arica. 1292 miles. 10/8/60 to 14/8/60. The first 120 miles of this is a mixture of good and bad paved road. This slowly deteriorates to bad unpaved roads as Antofogasta is approached. A petrol stop is advised at Taltal on the coast as there are no more supplies, except at Nitrate mines well off the road, until Antofogasta. About 100 miles north of Antofogasta the road further deteriorates to

very bad unpaved road and then for about 40 miles it becomes a sea of fine dust. This was probably the worst section of road that we encountered on the entire journey. It then improves as Arica is approached.

Arica - Tarata -

Ilave - Desaguadero -

La Paz.

355 miles. 15/8/60 to 17/8/60. Good paved road for 30 miles to Tacna then bad unpaved road to Ilave. This is very mountainous and the climb starts from sea level and finishes at 13,000 feet. The road surface is not too bad but the gradients are steep and steady and, as engine power decreases with altitude, the lower gears are much more frequently used. From Ilave to La Paz it is flat at about 13,000 feet on a bad unpaved road. In Peru there are numerous police, military and civil road blocks and near the frontiers these occur every 10 or 20 miles. No special papers were required to take the vehicle into Bolivia, despite the insistence of the Bolivian Consul in Arica who forced us to waste a lot of money obtaining a manifest.

La Paz - Cuzco -

Nazca - Lima.

1104 miles. 19/8/60 to 25/8/60. Bad unpaved road over very mountainous country, frequently crossing passes at 14,000 feet, until the final descent to the coast near Nazca; then good paved road to Lima. For those not wishing to enter the mountains the good paved road goes direct from Arica to Lima. The mountain

road through Arequipa is probably the best route up to Bolivia or Cuzco.

Lima - Piura -
Macara.

766 miles. 30/8/60 to 31/8/60. Good paved road to Piura then bad unpaved road over hilly country to Macara. There is no bridge at Macara and in the dry season the river is about 40 yards wide and 2 feet deep. Alternative ways of getting to Ecuador are around the coast where it is necessary to take either a train or ferry for a short distance.

Macara - Loja -
Cuenca - Quito,

545 miles. 1/4/60 to 4/9/60. Nothing more than a track leaves Macara, but the new road, which will be bad unpaved, is nearly completed. The rest of the road to Quito is bad to very bad unpaved road with precipitous gradients. From Macara to Cali in Colombia is very mountainous terrain and sometimes the road is visible two miles away on the other side of a valley and it may take two hours to reach there; some descents and ascents are over 4,000 feet at a time, all of which makes driving very fatiguing. Speed is frequently reduced to below 15 m.p.h. for safety as the roads are narrow yet carry many heavy trucks. Roadside graves are numerous.

Quito - Pasto -
Cali - Bogota.

861 miles. 7/9/60 to 9/9/60. Bad to very bad unpaved road to Cali as described in the previous section. Good paved road from Cali

to Bogota with a few bad patches. Climate throughout these last 1,500 miles, during which the equator was crossed, is pleasantly mild as only once, near Cali, was the altitude less than 3,000 feet, the majority being over 7,000 feet.

Bogota - Pereira -

Medollin - Cartagena. 858 miles. 13/9/60 to 15/9/60. Good paved road back to Armenia (i.e. same as to Cali); then bad unpaved road until well past Medellin, mainly on account of the mountainous terrain. The last 200 miles to Cartagena is on good unpaved road, nearly at sea level. Climate here is extremely hot and humid.

1.3. CENTRAL AND NORTHERN AMERICA (Puntarenas to New York)

The customs and immigration officials in Central America probably outdo their southern neighbours in their demand for bribes. The official office hours are in general 9 a.m. to 12 noon and 3 p.m. to 5 p.m. and if you arrive outside of these hours then it can cost up to 30/- a time. The Central American countries, Mexico, U.S.A. and Canada do not recognise the International Carnet, although Costa Rica is a signatory to the International agreement. However, there is no difficulty for the traveller with a vehicle as a temporary permit is typed out at each frontier; this should theoretically cost no money. In the U.S.A. a great variety of unenforced rules exist about registration in the various states, and the best way of coping with the situation is to avoid all contact with the constabulary. Also, in some states, the police have the power to effectively fine without trial for traffic offences; do not assume that they have a friendly disposition towards visitors to the U.S.A.

Putarenas - Managua -

San Salvador.

556 miles. 23/9/60 to 26/9/60. Mostly good paved road over hilly country except through Honduras, which is a bad unpaved road.

We shipped the Land Rover from Cartagena to Putarenas to avoid the two so-called impassable sections of the Pan American Highway. (Actually the Darien Gap, Panama to Colombia, was driven overland for the first time this year in a Land Rover. It took three months to do the 250 mile stretch supported by air drops. The other section between Panama and Costa Rica is traversed regularly in the summer now, but all the bridges are not complete which necessitates the building of rafts in the wet season).

San Salvador -

Guatemala - Mazatamango

- Tapachula.

370 miles. 26/9/60 to 28/9/60. Good paved road to the Guatemala border then bad paved road and bad unpaved road to Guatemala City. Good paved road to Mazatamango then bad to very bad unpaved road to the border of Mexico. Good paved road to Tapachula.

From Tapachula we had to put the Land Rover on to a railway flat - top for 250 miles to Tonalá. This is not always necessary as there is a road from Guatemala to Mexico via Huehuetenango and Comitán. This has been open for many years on the Mexican side and three years ago the Guatemalan side was finished. However the last wet season was extremely bad and, at

the time we arrived, avalanches had closed the road on the Guatemalan section which will be reopened in the dry season.

From Tonalá there are about 15 miles of very bad unpaved road to the main road from Ariaga. From here on throughout Mexico, the U.S.A., and Canada many routes can be chosen, all of them good paved roads with good associated facilities. Our route was Mexico City - EL Paso - Grand Canyon - Las Vegas - Los Angeles - San Francisco - Vancouver - Calgary - Winnipeg - Chicago - Ottawa - New York.

1.4. PETROL LOG.

The following table is drawn up to show how the price of petrol varied and the relative mileage to the gallon which was obtained. The petrol consumption is a function of three main factors: (a) the grade of petrol. (b) the nature of the surface (e.g. in Africa 5% of the mileage was on soft desert sand where the fuel consumption was increased by 50%) and (c) the nature and altitude of the terrain (e.g. in South America we travelled at over 14,000 feet in the Andes).

On leaving London the average fuel consumption on a long run at sea level on a paved surface was between 22 and 24 miles per Imperial gallon when fully loaded. Lean carburettor jets were used throughout the entire journey (i.e. those recommended by the Rover Company for use at between 6,000 and 10,000 feet).

	Distance. (miles)	Fuel consumption (miles/Imperial gallon)	Average price of fuel/Imperial gallon.
London. - Capetown.	14,830	20.9	4s. 7d.
Buenos Aires - Cartagena.	7,170	17.7	2s. 0d.
Puntarenas - New York.	9,300	21.8	2s. 10d.
Total Journey	31,300		

Of the above totals the amount of paved surface in Africa was about 6,400 miles, and that in South America was approximately 2,000 miles. The very high petrol consumption in South America was caused by the long distances travelled at high altitude, and over very bad terrain, in Bolivia, Peru, Ecuador and Colombia.

2. SHIPPING

The short sea crossings of the English Channel and the Mediteranean Sea are straightforward as daily car ferries are in operation all the year round.

The crossing from Capetown to Buenos Aires can be made very easily and comfortably on the Royal Interocean Line ships, which we used. However the immediate reaction to this Line is that it is very expensive. After much research we found that, except for several non-scheduled Japanese freight ships, the Royal Interocean Line is the only company operating this route. Also, further investigation showed that there is, in fact, a second and a third class on these ships, with much cheaper rates, that are not listed in England. The second class is extremely comfortable and English food is served. The third class is usually occupied by Japanese and Chinese imigrants and only Chinese meals are served; Europeans are not allowed to travel in this class, mainly because of the food problem.

The crossing from South America to Central America can be done in many ways. The simplest, without a doubt, is to arrive at Cartagena, put the vehicle on the first ship to Puntarenas in Costa Rica and, as most of these ships do not carry passengers, fly from Baranquilla to San Jose. There are ships running at least every week and as they have no reliable schedule, it is impossible to book more than one or two days ahead; we used the Royal Mail Line.

Unknowingly we tried vainly to book on a ship for at least two months before arriving in Colombia. In this respect we found that the only company willing to book our passages was Graco Lines, operating from Buenaventura to La Libertad in El Salvador. They promptly cancelled two successive ships and are totally unreliable, apart from the fact that their charges are astronomical. We finally made the crossing as described in the

previous paragraph at about half the price quoted by Grace Lines, including the cost of the air flight (see Financial Report, Section 10.).

The crossing from New York to Southampton is routine. It is less expensive to send the vehicle on a freighter than to accompany it on a passenger vessel.

3. LAND ROVER

The Land Rover was a 1952 short wheel base model, which had already done 90,000 miles. It was completely overhauled in London and a factory reconditioned engine was installed. On the entire 30,000 mile journey we were only troubled with one serious failure and that was the rear suspension, on which 13 spring leaves suffered fatigue failures. The newer models of the Land Rover have much heavier and longer rear springs and presumably do not suffer from this defect. By the time we had reached Nairobi we had fitted almost entirely new springs and did not have any more trouble until the Atacama Desert and Ecuador, where we broke a further two new top leaves and a new second leaf. At long last, in Bogota, we had the facilities to put in an extra full-length third leaf and since then have had no further failures. The vehicle was not overloaded as it was carrying only three average weight passengers and a maximum of 500 lbs. of equipment.

Other minor troubles were:-

- (a) Petrol pump failure of several sets of contact points, one set of non-return button valves and one diaphragm and several minor fuel blockages.
- (b) Failure of one front wheel bearing seal.
- (c) Failure of two rear shock absorbers.
- (d) Brake drums always full of sand and dust.
- (e) Ignition failure eventually traced down to a faulty distributor cap.
- (f) Both mudguards and radiator support suffered badly from cracks.
- (g) Slipping clutch due to oil seepage which was repaired at 28,000 miles with a new plate.
- (h) The front wheels developed a shimmy at about 23,000 miles; this was temporarily fixed with new springs on the front swivel cones, the cones and bearings being completely replaced at 28,000 miles.

(i) The engine was given a dochoke and valve grind at 12,000 miles and 28,000 miles.

We obtained about 20 punctures, all from nails on the road. None of these caused a 'blowout', although the tyres were extensively cut on some of the roads that we travelled over. We were given six Dunlop RK3 tyres in England which have given excellent service, each tyre having done over 20,000 road miles; they still have tread to spare to complete 24,000 miles each, which was scheduled for them on a basis of four 6,000 mile rotations.

While on the road we were never held up longer than the two hours that it took us to change a rear spring leaf. We carried a fairly extensive kit of spares, which Rovers will recommend when asked for advice.

For a trip of this nature it is recommended that, if finance permits, a long wheel base Land Rover would be a great improvement because of the more extensive sleeping facilities which would be available in the vehicle.

4. EQUIPMENT.

Our general equipment was of the simplest variety and is listed below:

- 1 Tent (pneumatic Igloo-type, 7 ft. by 7 ft., with a sewn-in groundsheet; this gave excellent service).
- 3 Sleeping bags,
- 2 Small collapsible paraffin stoves,
- 4 Billies and 1 Frying pan,
Plates, knives, forks and spoons,
- 1 Plastic wash bowl (essential),
- 2 $4\frac{1}{2}$ -gallon Jerry cans for water,
- 2 Thermos flasks,
- 3 Small sponge-rubber cushions.

We carried a set of old travelling clothes plus heavy woollen jumpers, and shower-proof jackets. We also carried one suit each with a white shirt and tie which we kept in our only (wardrobe-type) suitcase. All other clothes were packed in canvas kit bags.

On the special equipment side we had a portable typewriter, a Johnson developing tank and chemicals to handle 120-size monochrome negatives, a Remington Rand electric razor working off the car battery and a Murphy portable short-wave radio.

5. VISAS.

Because the requirements for entry into the various countries visited varied from one member of the expedition to another, and because they are continually changed by the countries themselves, no specific list of visa requirements has been made. All the visas necessary for the expedition could have been obtained through consular representatives in London; those for the former French territories in Africa were obtained through M. Amate of the French Consulate in London. However, as the length of time for which most visas are valid is three months, it was necessary to obtain the South American visas and tourist cards en route.

To obtain visas we found that the following documents were necessary:

- a) Passport valid for at least one year after the date of entry into the last foreign country and endorsed for all foreign countries. Melbourne obtained an additional passport before leaving London and Hyde obtained a second passport in Buenos Aires. These were necessary due to shortage of space in the original booklets resulting from the many visas and immigration stamps. Approximately 25 blank pages were filled in the passports of each member during the course of the expedition.
- b) Vaccination certificates, giving proof of vaccination or inoculation against various diseases; see the Medical report, Section 7.
- c) Passport-size photographs; up to five may be necessary for one visa.
- d) Statement of authenticity of the expedition. This document, signed by the Chairman of the Imperial College Exploration Board, mentioned all members by name and stated that our personal insurance had been undertaken by the Board.
- e) Bank statements, signed by the member's Bank Manager, stating that sufficient funds were held to adequately finance the member in any country.

f) Health certificates guarantoeing that the member has been examined and found fit; written on a doctor's headed notepaper. The Brazilians insist upon a special wording or an examination by their doctor.

g) A political statement was required by Peru confirming that we were not communists.

Firearms can be imported into most countries only when proper permits are obtained. This expedition disposed of its one shotgun in North Africa when it became obvious that the customs difficulties arising from the importation of the gun would delay the passage of the group from country to country.

The permits for the entry of the vehicle and its passengers into Algeria were obtained through the French Consulate in London, and gave the exact route to be followed in Algeria. This permit was endorsed by the French Police and military officials at Colomb Bechar and Adrar, as well as at intermediate check points in the Sahara desert (see Section 1.1).

The reasons for landing the vehicle at Buenos Aires and not at Rio de Janeiro have been described in Section 1.2.

Police checks were particularly numerous in Peru and Bolivia. The 'controls', as they are called, were often manned by extremely unintelligent personnel. Whenever possible the expedition drove through the controls without stopping, a procedure which greatly reduced the travelling time and one which had no repercussions.

Customs and Immigration difficulties were encountered in Central America, due to the short official hours that the border posts were open (usually 9 a.m. to 12 noon and 2 p.m. to 5 p.m.). Travellers arriving outside these hours are required to pay fees, or rather bribes, which can be anything up to £2 per group of officials.

Only in one instance, on entering Guatemala, was the expedition required to unload the Land Rover completely for a customs search. It was felt that the route maps painted on the doors of the vehicle allayed the suspicion of officials by arousing their interest in our travels. This also helped to indicate that the Land Rover was definitely in transit through the country concerned.

It could be stated in conclusion that we did not strike trouble at a frontier at any stage of the journey, although we had been told rather frightening stories about the regulations of some countries (o.g. Chile, where the total formalities took about ten minutes and where we were not required to pay any of the deposits that we had been warned about).

7. MEDICAL REPORT.

The general health of the expedition members during the journey was excellent, with only two brief periods of illness. Shortly after crossing the Sahara water was drunk directly from the Niger River, without chlorination, on the advice of the French military people stationed there. As a result all three members caught dysentery which lasted, with varying severity, for about two weeks. During the rest of the journey the chlorination tablets were used despite the protestations of local residents about the purity of their water. Sore throats occurred several times but only once was this severe when Hyde caught a painful throat infection which lasted two days.

The members were vaccinated against the following diseases before leaving London:

- | | | |
|------------------|---|--------------|
| 1. Smallpox. | } | compulsory. |
| 2. Yellow Fever. | | |
| 3. Cholera. | } | recommended. |
| 4. T. A. B. | | |
| 5. Tetanus. | | |
| 6. Typhus. | | |

A large medical kit and a smaller motorists first-aid kit were donated by Boots. Of the usual medical supplies in the former, the following were found particularly useful: mosquito spray and lotion; cough drops and lozenges; caolin type of medicine for dysentery; aspirin, coedine, chloroquinine (anti-malarial) and chlorine tablets (for drinking water).

A snake bite injection kit was purchased in North Africa and was kept in a readily accessible position throughout the journey. Fortunately neither this nor the first aid kit were ever needed, although a few minor cuts were treated.

A flap of mosquito netting was sewn into the door of the tent before leaving London and this was found to be very valuable at night, in combination with the insect spray.

8. REFERENCES.

There are three outstanding references on Africa, South America, and Central America, apart from the endless travel folders that one can obtain at tourist centres for each country and which are always very interesting. These are:

- 1) Trans - African Highways. This is published by the Automobile Association of South Africa, and is available from the A.A. in London. It contains details of road conditions, facilities, petrol and climatic information for the whole of Africa. (the price is about 30/-).
- 2) The South American Handbook. This also includes Mexico and Central America. It has only limited details on roads, but it does provide a goldmine of information about each country, the bigger cities and climatic conditions. It is available at some tourist agencies in London or at the Royal Mail Lines' office in Leadenhall Street, London (the price is about 10/-).
- 3) Two publications produced by the Automobile Association of America on road conditions and facilities in (a) Mexico and (b) Central and South America. The information in these booklets is rather vague to be of great use, but it is a start. They can be obtained by writing to the A.A.A. in either London or America.

The first two books mentioned are invaluable, and are quite sufficient when used in conjunction with the maps made of all these routes by the petroleum companies; these can be obtained by mail.

9. PUBLICITY AND CONCLUDING REMARKS.

To date two technical articles on the expedition's activities have been published. They are:

- a) Flight, 19th August, 1960: Light Aircraft in Africa.
- b) Flight, 28th October, 1960: Light Aircraft in South America.

Most of the publicity was arranged at the request of the United Kingdom Information Service.

London (departure): **Flight**, **Aeroplane**, The Times, The Star,
B.B.C. radio.

Kaduna: N.B.C. radio.

Johannesburg: The Transvaaler, Johannesburg Star, S.A.B.C. radio.

Durban: The Daily News.

Cape Town: Cape Argus.

Buenos Aires: Buenos Aires Herald, La Razon.

La Paz: Ultima Hora, Presencia.

Vancouver: Vancouver Province, C.B.C. radio and TV, Chan TV,
CKLG and CKWX radio stations.

Calgary: Calgary Herald, CFCN TV, CFAC and CKXL radio stations.

Winnipeg: Winnipeg Tribune, Winnipeg Free Press, C.B.C. TV.

Chicago: WCFL radio.

Toronto: Toronto newspapers.

Montreal: La Presse, C.B.C. radio, CFOX and CKVL radio stations.

Ottawa: The Ottawa Journal.

Manchester (return): Evening newspapers.

The United Kingdom Information Service in Canada arranged for the team to lecture on the expedition to the following Universities:

Vancouver: University of British Columbia branch of the A.S.M.E.

University of British Columbia Engineering Dept.

Calgary: Calgary Institute of Technology and Art, Aeronautics Dept.

Winnipeg: University of Manitoba, Engineering Dept.
Toronto: University of Toronto, Exploration Society.
Montreal: McGill University, Engineering Dept.
Ottawa: Carleton University, Engineering Dept.
University of Ottawa, Engineering Dept.
Ontario Institute of Technology.

On completion of the expedition, Hyde returned to the College of Aeronautics, England, as a Research Fellow, Gartshore is taking employment in Canada on aeronautical research and Melbourne, after selling the Land Rover in England, will return to Australia to work in aeronautics.

10. FINANCIAL REPORT

This section will set out the cost of the various items as they actually occurred for the three man expedition to complete the entire 40,200 mile journey from London to London. One departure only has been made for simplification and that is to assume that all three members returned to London, whereas in fact Gartshore remained in Canada.

So as to make this section more useful as a reference there are comments on where reductions were given to the expedition.

PRELIMINARY EXPENSES.

	£	s.	d.	£	s.	d.
Royal Automobile Club fees and international papers for the Land Rover.	5.	12.	0.			
Bank charges for £1500 indemnity to back the international Carnot Compulsory third party insurance in Africa.	2.	2.	0.			
Land Rover spare parts.	22.	10.	0.			
Maps and administration costs.	30.	19.	0.			
Camping gear. (Tents, water & petrol cans, shot gun & shells, misc. items. A majority of this type of gear was previously owned).	6.	2.	6.			
Film.	43.	19.	5.			
Camera insurance.	44.	9.	0.			
	12.	0.	0.			
				<u>167.</u>	<u>13.</u>	<u>11.</u>
VISAS	32.	10.	5.			
				<u>32.</u>	<u>10.</u>	<u>5.</u>

SHIPPING AND TRANSPORT.

English Channel crossing. (Total)	8.	14.	0.
Gibraltar to Tangier (Total)	9.	19.	6.
Capetown to (a) Rio de Janeiro,) 2 passengers.)	220.	0.	0.
(b) Buenos Aires,) 1 passenger.)			
(c) Buenos Aires,) 1 Land Rover.)			
	89.	17.	6.

(The passenger fares were subject to a 25% discount specially given).

	£	s.	d.	£	s.	d.
Mendoza to Puntarenas. 3 passengers.	14.	18.	6.			
1 Land Rover.	42.	10.	0.			
Cartagena to Puntarenas.						
3 Passengers.	70.	6.	0.			
1 Land Rover.	83.	15.	0.			
Tapachula to Ariaga. 3 passengers.	2.	8.	0.			
1 Land Rover.	15.	8.	6.			
New York to London. 3 passengers.	225.	0.	0.			
1 Land Rover.	80.	0.	0.			
Porto Alegre to Buenos Aires.						
2 passengers.	8.	2.	0.			
				<u>870.</u>	<u>19.</u>	<u>0.</u>

(Land Rover costs include loading charges and bribes).

PETROL AND OIL

London to Capetown.						
14,833 miles.	163.	2.	0.			
Buenos Aires to Cartagena.						
7,170 miles.	40.	4.	0.			
Costa Rica to New York.						
9,300 miles.	61.	15.	3.			
Total oil costs (Free Shell lubrication was given, except in N.Africa.	5.	0.	0.			
				<u>270.</u>	<u>1.</u>	<u>3.</u>

FOOD, PARAFFIN & ALL MISCELLANEOUS ITEMS.

(Hospitality received and time spent on ships accounted for 41 of the total of 252 days).	215.	7.	11.			
				<u>215.</u>	<u>7.</u>	<u>11.</u>

GENERAL

Land Rover repairs. (80% for rear suspension).	36.	14.	6.			
Postage.	37.	18.	0.			
Lost wallet.	9.	4.	0.			
Bribes in South & Central America.	9.	7.	0.			
Hotel accommodation (While waiting for Land Rover to clear customs etc.)	16.	4.	0.			
				<u>109.</u>	<u>7.</u>	<u>6.</u>

TOTAL EXPENDITURE

1666. 0. 0.

This financial account has assumed that a vehicle has been purchased and is in final condition for such a journey. For our expedition this took the form of buying a 1952 Land Rover and

thoroughly reconditioning it, including fitting a rebuilt engine; the total cost of this was approximately £440, plus the price of a set of six new tyres and tubes which were donated by Dunlops.

Direct income to the expedition came from three sources, apart from television and radio interviews and writing, which are still in progress.

1. The John de Havilland Award, given to Hyde on behalf of the expedition £400.
2. Support of the Imperial College Exploration Board, carrying with it medical insurance to the value of £48.
3. Shell Mex and B.P. Ltd., donation £50.

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