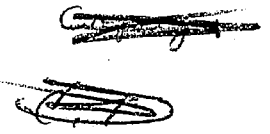


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No. 327

L A T E C O E R E   A I R   L I N E S .

Prepared for U. S. Army Air Service,  
by Lieut. J. Parker Van Zandt.

FILE COPY

To be returned to  
the office of the Langley  
Memorial Aeronautical  
Laboratory

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TECHNICAL MEMORANDUM NO. 327.

## L A T É C O È R E   A I R   L I N E S . \*

By Lieut. J. Parker Van Zandt, Air Service, U.S.A.

One of the least advertised but most interesting air lines in Europe is that of the "Compagnie Générale d'Entreprises Aéronautiques," better known as the "Lignes Aériennes Latécoère," which connects Southern France with Morocco and Algéria, North Africa. In conjunction with the 5:00 p.m. train from Paris, arriving Toulouse at 4:30 a.m. the following morning, an airplane takes off daily, including Sundays, at 5:30 a.m., for Perpignan, 110 miles southwest, at the foot of the Pyrénées and near the shore of the Mediterranean. Here it is met by another airplane bringing mail from Marseilles. From Perpignan the route follows the east coast of Spain, with stops at Barcelona (128 miles), Alicante (300 miles) and Malaga (315 miles). At both Barcelona and Alicante, a transfer is made to a fresh airplane and pilot. At the latter port, the mail for Algeria is transferred to a flying boat which crosses the Mediterranean, 190 miles, to Oran. At Malaga, the mail and passengers for Morocco are transferred to a fourth airplane which crosses over Gibraltar, landing at Tangier (115 miles), Rabat (130 miles) and Casablanca (56 miles), all in Morocco. Where the route passes, the straits are about 11 miles wide.

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There are thus four airplanes (generally modified Breguets No. 14, with 300 HP. Renault engine) and four pilots involved daily in each direction for a route 1160 miles (1850 kilometers) in length which, during at least four months of the year, is covered in one day (about 15 hours, including stops). Twice a week a service is available in each direction between Casablanca, Morocco and Oran (Algeria), 470 miles, passing through the interior of Morocco, past the Atlas mountains, with stops at Rabat and Fez. At the latter field a transfer is made to a fresh airplane and pilot.

#### Inspection Trip

The writer was privileged to make a complete circuit of these lines (except for the division from Perpignan to Marseilles), during the period July 25-30, 1924, passing from Toulouse, France, to Casablanca, Morocco, thence to Oran, Algeria, thence by seaplane to Alicante, Spain, and return to Toulouse. It is understood that this is the first time the circuit has been flown, as the seaplane service has only been in operation since March, 1924, and is not yet officially open to passengers. A total of 2360 miles were covered in 29 hours and 15 minutes (average speed, 81 miles per hour) in nine separate airplanes, with no serious delays or technical difficulties. Ten fields were visited in four different countries. Except for the seaplane division (on which Liore and Olivier flying boats are used) and 1 3/4 hours for the Toulouse-Perpignan and Rabat-Casablanca hops,

the entire round trip was made in open cockpits seated on sacks of air mail.

### General Observations

There are several features of particular interest in connection with the Latécoère system:

1. The operating organization and the results obtained probably approach more nearly those of the U. S. Air Mail Service than any other air line in Europe. Single engine modified war airplanes are employed (excluding the seaplane service, which is experimental), not greatly dissimilar to the DH4 Mail airplane; a similar system of airplane and pilot relays is operated; the time for transfer at relay points is limited to a maximum of 20 minutes (as in the U. S. Air Mail Service); a businesslike maintenance and overhaul program is rigorously adhered to; and a regularity of arrival and freedom from accidents is obtained closely paralleling that of the U. S. Air Mail.

Allowing for the inherent differences in the two problems, the Latécoère line is merely the U. S. Air Mail transplanted. The main technical differences are (a) the use of a metal airplane and (b) the method of payment to pilots, chief mechanics and field managers (discussed in paragraphs below).

The three principles that explain the success of the Latécoère lines apply equally to the U. S. Air Mail record, namely: (a) standardized type of operating equipment; (b) rigorous maintenance and overhaul program; and (c) elimination of all but

the best flying and mechanical personnel.

2. The terrain and weather difficulties are much greater than generally imagined:

Practically the entire east coast of Spain is rough and mountainous, the Sierra Nevadas, near Malaga, rising to a height of 11,000 feet, with some snow the entire year. Occasional sandy beaches furnish the best emergency fields, but several rocky promontories jut out into the Mediterranean and offer serious obstacles in case of bad weather. South of Barcelona the country becomes dry and arid, there are long stretches with little sign of habitation, and on the few level plains, the Spanish method of cultivation ruins otherwise possible landing fields. (The day following my flight, the airplane flying between Alicante and Malaga, broke a connecting rod and crashed in attempting to land on a small beach near Mutril, with minor casualties to pilot and both passengers.)

Once across the straits, the Moroccan shore south to Casablanca is practically level, though with little habitation save wandering native cattle and sheep herders for the first 100 miles. Heavy sea fogs are not uncommon in the early morning, but often may be circumvented by flying 20 or 30 miles inland.

The heat at Alicante and Malaga, Spain and at all Moroccan fields is often intense in summer, particularly at Fez, in the heart of Morocco. The pilots on these divisions wear toques, or white casaques and occasionally face masks.

The entire line is in a region of strong winds. Of the 15

landings made, all were in moderate to very strong winds. For this reason alone none of the bi-motored airplanes in use between London and Paris could be employed here. The sirocco, a dry hot wind from the south, is much dreaded. Conditions at Perpignan, where the Pyrenees are crossed, are particularly unusual. This is probably the windiest city in all France, the valleys forming a kind of Venturi; during the equinoxial seasons especially, winds as high as 80 miles per hour have been encountered, and it is claimed that airplanes have taken three hours to cover 40 miles past this point. The wind is very rough, extreme bumps occurring and only maneuverable airplanes of robust construction could be employed. (The violence of these winds seemed to me at first exaggerated, but after flying the route I am inclined to accept them; the return from Perpignan to Toulouse, 110 miles, took 2 hours, against 1 hour outbound. The cruising speed of the airplanes is 85 miles per hour.)

The one great advantage of the route is that ground fogs are rare, although pilots are occasionally obliged to fly at 100 meters (328 feet) over the water, below the level of the cliffs.

The fields in general are rather small and uneven. At Alicante, we blew out a tire while taxiing at a very conservative speed. (The delay due to this was less than 10 minutes.) At Fez, an airplane has broken a wheel and overturned in taking off. Contrary to the general practice in Europe, the Latécoère owns or rents all of its fields with the exception of those in

French Morocco and Algeria, which belong to the government.

3. In common with all European air lines, political difficulties present a serious handicap. Packages and mail cannot be brought in or taken out of Spain by air. The company is even obliged to send its own field supplies in by train! There is no direct inter-field communication the entire length of Spain, as permission cannot be obtained to install wireless stations. A pilot who recently had a forced landing some 45 miles north of Alicante, tells me he spent practically all day trying to reach the field by telephone, finally sending a telegram to advise them at what hour communication would be attempted.

Curiously enough the best organized portion is through the interior of Morocco: Rabat-Fez-Oran. Upper air soundings are available from four stations en route and the fields are connected by wireless and telegraph. In the region between Fez and Taza the route passes within 10 miles of heavy fighting between the Moors and the French and the French Air Service is very much in evidence. On taking off at Fez, a French ambulance airplane passed, returning with wounded.

4. Without question the Latéccère system is giving a public service of economic value, which distinguishes it at once from the majority of European air lines. When I arrived at Casablanca the evening of July 25th, every place for the return trip was reserved through August 6th; this in spite of the fact that no ef-

fort is made to cater to passengers, who are obliged to sit in an open cockpit, often on top of air mail sacks for 14 to 15 hours (for the Casablanca-Toulouse run) and are crowded two in a cockpit not much larger than that of the pilot. The great majority of passengers are French. My companion southward was a military clothing merchant from Perpignan, going to Rabat for three days; from Casablanca to Oran, an Algerian wine merchant returning to his place of business. Several "season" tickets have been sold. Commercial travelers from Algeria and Tunis often come to Oran by train to connect with the air line to Morocco. Many of the southbound air parcels originate in Manchester, England, in Belgium, Italy and elsewhere.

The statistics for the first six months of 1924, recently published in the Moroccan press, are as follows:

From Morocco to France,	778,800	letters	
" France " Morocco,	791,000	"	"
" Morocco " Algeria,	62,700	"	"
" Algeria " Morocco,	50,700	"	"
Between Moroccan cities (on above routes)	<u>23,100</u>	"	"
Total	1,706,400	"	"

as compared with a total of 1,321,500 for the same period in 1923, i.e., an increase of almost 33%. There are probably about 25 letter-packets per pound. The total weight carried during this period, including merchandise, amounted to 37,700 kilograms (83,000 pounds).



The number of passengers has also increased. The figures for the first half of 1924 show a total of 561, divided as follows:

From Morocco to France,	240
" France " Morocco,	189
" Morocco " Algeria,	64
" Algeria " Morocco,	<u>68</u>
Total	561

The distance flown (not including the seaplane service) amounted to about 530,000 miles.

To make the journey from Morocco to France other than by air, one leaves Casablanca at 5:00 a.m. by auto-bus for a 200-mile hot, dusty drive to Tangier. There is one boat a day across the straits (3 hours) to the Spanish port of Algesiras and the bus generally is too late to make connections. From Algesiras it is roughly 24 hours by train across Spain, via Madrid. There is also a bi-weekly boat service between Marseilles and Morocco, which takes about three days. Via the air line, one may leave Paris (by night train to Toulouse) at 5:00 p.m., and be in Casablanca between 7:00 and 9:00 p.m. the following evening.

The same general relations hold true between Morocco and Algeria: One takes a train from Oran to Oudjda in the afternoon; the following morning at 5:00 a.m. by auto-bus across a semi-desert to Fez by 2 p.m., for connection with a second car which

reaches Casablanca about 10:00 p.m. Via airplane, the journey is made in comparative comfort in 5½ hours.

The Government subsidy allows two days for the France-Morocco route and practically 99% of the scheduled trips are completed within this period.

Of the passengers who fly, well under 10% take out insurance (the rate is 125 francs for 50,000 francs indemnity in case of death or permanent disability).

The following sample load is taken from the customs sheets at Toulouse:

July 11, 1924,  
Toulouse, France.

Airplane No. 401, A.F.F.P.

<u>Mail</u>	<u>No. of sacks</u>	<u>Weight (in lb.)</u>	<u>Destination</u>
	2	8.7	To:Tangier
	3	81.5	Rabat
	4	136.0	Casablanca
	2	35.0	Fez
	2	11.5	Oran (by
Total Mail . . . . .		272.7	connection with seaplane)

<u>Merchandise</u>	<u>No. of pkgs.</u>	<u>Weight (in lb.)</u>	<u>Value in Fcs.</u>	<u>Destination</u>
Auto parts	1	9.0	250	To:Fez
" "	1	134.0	2446	Casablanca
Models	1	9.0	500	"
Feathers	1	2.6	429	"
Auto parts	1	8.1	167	"
Photo apparatus	1	4.2	500	"
Films	1	3.5	100	"
Clothing	1	3.7	150	"
Total	8	174.1		

Total load (272.7 + 174.1) = 446.8 lb. (1 passenger in addition with 20 lb. allowance for baggage).

The standard maximum load is 660 lb. (300 kg) with 5½ hours gasoline. My impression is that the airplanes not infrequently fly overloaded.

During the Christmas season (November and December) there is a marked increase in mail and merchandise loads, perhaps 30%.

The Latécoère line demonstrates incontestably that, given fairly regular and safe transportation with a pronounced saving in time, mail merchandise and passengers will not hesitate to make generous use of the service.

5. The Seaplane Service: The Latécoère system furnishes a striking comparison between the difficulties of over-water and over-land commercial air operations. At Oran, Algeria, there are, roughly, 50 employees: seven (including 2 pilots) are employed in operating the bi-weekly landplane service to Fez (300 miles) and return; three are purely clerical; the remainder (40) are engaged in maintaining four round-trips weekly by seaplane (190 miles) to Alicante, Spain.

The equipment consists of 6 or more Lioré and Olivier flying boats, equipped with two 180 HP. Hispano-Suiza and three small subchasers, type "Canada," 250 HP., purchased from surplus war stock. These boats have radio which receives the airplane signals, sent out regularly during flight. The intention is to transmit to the airplane, merely informing it if it is off the direct route, but during my trip no reception on the place was attempted. There is also a motor boat for use in the port; a large crane for lifting airplanes out of the water at Oran (at

Alicante there is a boat slip). Extensive pigeon lofts at each port, eight pigeons are carried on each trip, four from either port. At Oran there are a large steel hangar and shops, property of the French marine authorities. At Alicante Port, there is very little, negotiations with the Spanish Government being still in progress.

A crew of three is carried: pilot, radio operator, and mechanic. The pilot is paid more for this run than for any other (150 francs per trip) and both operator and mechanic receive flying pay, the latter 60 francs per trip.

Passengers are not yet accepted.

Both ports are restricted in size for take-off, which is usually accomplished outside. On my trip a half hour was spent trying to get off, in moderate waves: we only succeeded in thoroughly drenching one engine, taxied back and changed to another airplane, finally getting off in the harbor with a side wind, 1 1/4 hours late. The landplanes, on the other hand, got away on time in every instance, even at Casablanca, where the engine was missing when warmed up and a reserve airplane had to be wheeled out.

Fairly good regularity is being maintained by overhauling the Hispano-Suiza every 20 flying hours. This means that both engines are changed after every three round trips. There have been three forced landings at sea so far in four months of operations. Lots of maintenance trouble has been experienced with the plywood hulls, with rusting due to the action of salt water, etc.

The cruising speed is about 75 miles per hour (It took us 3 hours and 20 minutes to make the 190 miles in a moderately strong side wind); the pay load is less per horsepower than the landplanes.

The first airplane was equipped as an amphibian, the intention being to use the landing fields already existing at Oran and Alicante. But the rough fields wrecked the boat hull and the reduction in speed and pay load made this impracticable.

As an object lesson in the respective merits of seaplanes versus landplanes for commercial air transportation, the Oran-Alicante, Oran-Fez routes would be hard to excel.

#### Technical Features

For the carriage of mail, two streamlined containers are built on the lower wings, one on either side of the fuselage, underslung under the first bay. They will each carry about 220 lb. of mail, in roughly 1 cubic meter of volume (35 cubic feet) and reduce the airplane speed by 6 to 7 miles per hour. Without this provision, it would be impossible to carry passengers.

Engines receive a general overhaul on an average every 80 flying hours. In addition, however, they are "dégrouvés" (that is, bearings inspected, valves ground, etc.) every 20 and 60 flying hours. All complete overhauls are carried out in the shops at Toulouse (even most of the Hispano-Suiza engines on

the seaplane service are shipped to Toulouse for complete overhaul). Forced landings have been reduced to less than 0.45%, that is, 1 out of 220 flights, or more.

The type of workman everywhere is rather inferior in appearance, - at least, inefficient. Boys of 16 to 18 years of age as shop mechanics, and old men puttering about at carpentry and odd jobs. The wage scale, however, is not high. A former pilot now a clerk in the office gets 900 francs a month (at the present rate of exchange, less than \$300 a year); the chief mechanic gets 1400 francs a month. Over 300 are employed at Toulouse. The shop output is 18 to 20 Renaults and 5 to 6 Hisos overhauled, per month. It is said to take a month to put an airplane through a complete overhaul.

Rubber hose gasoline connections, porcelain spark plugs, and generally all the standard war stock is used. Commercial gasoline is employed, and castor oil. Between Marseilles and Perpignan a 50% alcohol and gasoline mixture known as "Carburant National" is being used with success.

The shops at Toulouse also do manufacturing, 20 Breguets now being under construction for the French Government. Almost all of the work (except the seaplane) is in metal. Three attempts have been made recently at a new type of airplane: last year the Lat. No. 6, a metal multi-engine biplane, was built. This year a thick tapered wing metal monoplane with a Lorraine 400 HP. engine, has been constructed and is being sold to the government

(the LAT 16). I was told it did not represent a sufficient improvement over the Breguet-Renault to warrant adoption on their own service. A bi-engined metal monoplane is now under construction, using two Lorraine 260 HP. The experiment work, however, appears very tentative and disorganized.

### Metal Construction

While admitting that duralumin is very expensive to work, Mr. Daurat, the operating director, is a strong partisan of steel alloy construction. Operations in a hot and humid climate, he states, have disclosed numerous difficulties with wood construction. Their program of study is toward an all-metal airplane (including wing covering) with a reliable single engine, rather than multi-engined. Except for the admitted differences in climate, however, operations here constitute a strong argument for the "stick-and-wire" type of airplane. The life of the Breguet airplanes is not over 300 hours between complete overhauls, and a comparison between the complicated shop installation here and that at Croydon, England, or for the Air Union at Le Bourget, presents a striking financial argument in favor of wood construction.

Where weather will at all permit and until aircraft are far more standardized than at present, the use of metal airplanes would appear to be doubtful economy from a strictly business point of view.

### Method of Payment

Salaries here are on a rather unusual basis: field managers, pilots and chief mechanics are made financially responsible for the regularity of the service. A pilot is paid a fixed amount for each trip; if he fails to complete it in six hours for any reason whatsoever, this amount is seriously reduced. If he leaves on time, he receives a bonus; if he completes the trip, another bonus; and a third bonus for not breaking anything. The field manager and chief mechanic also receive bonuses if the stage is commenced on time and completed satisfactorily. If not, all three are penalized. All field managers are pilots and under obligation to undertake the flight if the regular pilot is sick or not available. Pilots and mechanics who, even though with apparently excellent explanations, have had more than the average number of forced landings or interruptions, have been rigorously eliminated. The method appears as if it might not infrequently involve some injustice, but from the dispatch and energy displayed at all fields visited, it is apparently well suited to the French temperament.

### Government Relations

As in the case of all French air lines, the Latécoère system is little more than a ward of the government, financially speaking. The company receives all of the surtax on air mail, at a rate of 50 centimes per 20 grams or less; this is a minimum



of 25 francs per kilogram (about \$0.60 per pound at present rate of exchange). The actual average France-Morocco mail load is about 250 lb. per airplane for a route of over 1100 miles. The passenger fare is 924 francs - Toulouse-Casablanca - with 20 lb. free baggage, or an equivalent of about \$0.25 per lb. Were the airplane filled to capacity with mail, the total maximum revenue would be  $(300 \times 2.2 \times \$0.60)$  about \$400, while the expense is probably more than twice this amount. The revenue on the Casablanca-Oran line is much less and for the seaplane service, practically negligible.

The subsidy relations are covered by quite a complicated convention, involving a number of direct and indirect payments and will be considered in a separate report.

#### The Future

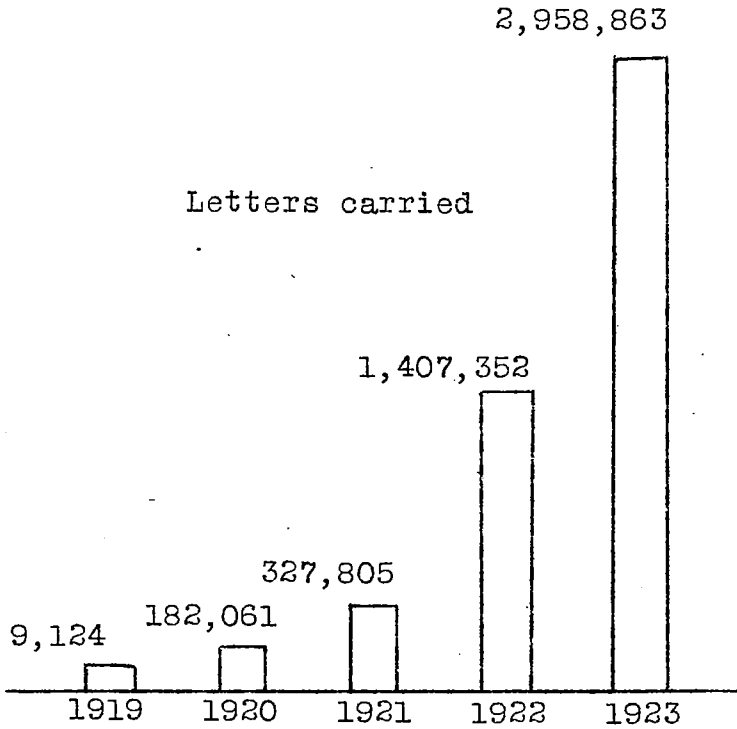
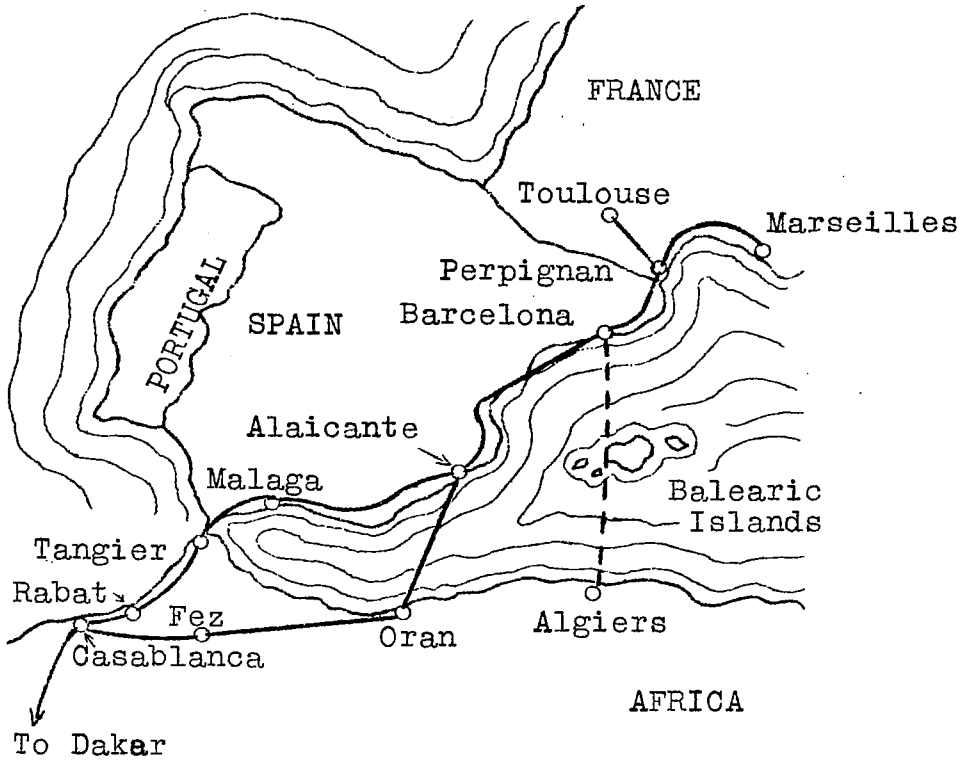
The seaplane service between Oran and Alicante is frankly experimental, to gain experience with seaplane operation. From a commercial point of view, the results are admittedly far from encouraging. Nevertheless, it is planned to inaugurate a line next spring connecting Algiers, the most important city of Algeria, with Barcelona, by way of the Balearic Islands, and thence in liaison with the landplanes, with Toulouse and Marseilles.

The fundamentally weak point of the entire Latécoère system, from a financial point of view, is that Morocco and Algeria

are not of sufficient industrial importance to support an air service of the magnitude required. The chief colonial occupations are agriculture and cattle raising and the market for goods of high intrinsic value is <sup>very</sup> restricted. It was suggested that the air service has already attracted the majority of the "de luxe" traffic that there is available in Morocco.

To circumvent this situation Latécoère is actively promoting an extension of the Moroccan line down the African coast over 1000 miles to Dakar, there to connect with South American mail and passenger steamers. An experimental flight to Dakar was made last year with three airplanes. This will not be an easy route to operate as the country is unsettled and frequented by hostile Moors. However, the flying equipment is on hand to attempt it as soon as the French Government can be persuaded to vote additional subsidies.

I was told that a representative of the company is now in South America attempting to gain aid from the Brazilian Government to inaugurate a line between Rio de Janeiro and Buenos Ayres. Undoubtedly, Latécoère contemplates ultimately an all-French air line from France to Brazil, following in general the route of the two Portuguese Transatlantic fliers. How soon this may become a reality depends principally upon the willingness of the Governments involved to underwrite the venture.



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