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## ESTIMATES AND ACTUALITY: COMPARATIVE COSTS OF BRITISH CROSS-CHANNEL AIRLINES, 1918-1924

ROBIN HIGHAM†

The two articles that follow are published as an illustration of the tremendous strides that have been made in air transportation in the past forty-odd years. Contrast, if you will, the absence of concrete data and the extent of speculation detailed in Dr. Higham's article on the problems of the fledgling British airlines' cross-channel operations, with the statistical detail available to air carriers engaged in international operations today as they plan for supersonic operations.

IT IS not possible to be definitive about the costs of establishing British overseas airlines for the simple reason that most of the early statistics simply do not exist. Many were allowed to go by default, some companies' accounts are not available or have been lost, and at least one company's records were destroyed during World War II air raids. Only those belonging to the Daimler Airway have been accessible. At the outset secrecy was regarded as essential. However, political reaction against Imperial Airways, Ltd., in the latter nineteen thirties resulted in a clause in the British Overseas Airways (Corporation) Act of 1939 compelling the publication of a full financial statement each year.

British overseas airline development was a natural outcome of the pre-war enthusiasm of a devoted band of semi-professionals and of the immense technological advances made during the course of World War I. Except for the stunt Hendon-Windsor Coronation air mail service of 1911, which made an operating profit of £1,460, there was no practical airline in England until after the war. However, schemes, including a pre-war one for a service to India via Constantinople, did appear.

The greatest difficulty faced by early companies was to find some data upon which to base their estimates and some patrons who were willing to loan risk capital. This was fully recognized by the distinguished company who sat on, or were co-opted to help with, the Civil Aerial Transport Committee appointed in 1917. This Report (*Cd. 9218*) was full of sound advice, based in part upon maritime experience, but none of the experts ventured any concrete financial proposals. However, the Committee did recognize that the fate of civil aviation was intimately concerned with that of the aircraft industry and almost as vitally with the

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R.A.F. Unfortunately, no precise advice could be given since so much depended upon the naval, military and financial plans and commitments of the government. The government, even more ignorant of aviation than the Committee, did nothing. After civil flying had started, a committee under Lord Weir of Eastwood reported on Imperial Air Routes (*Cmd.* 449). They proposed a charter company be established to operate a service from Cairo to Karachi. Considerable government support in the way of free gifts of war surplus materials and the establishment of aerodromes where the R.A.F. felt they were needed, was to be given with additional monies for civil facilities as necessary. But again, no concrete financial details were suggested. However, these were beginning to be available during 1920.

One of the more enterprising of the early enthusiasts for aviation was George Holt Thomas of THE GRAPHIC. Unlike so many other pioneers, he had sufficient capital. Before the First World War he had acquired the license to produce the French Farman aeroplanes in England. During the conflict he manufactured non-rigid airships at one plant and aeroplanes designed by Geoffrey de Havilland (DH) at his Aircraft Manufacturing Company. In 1916 he moved a step further and founded a subsidiary, Aircraft Transport and Travel, Ltd., commonly known as A.T. & T. Because of the war, this company was unable to start operations until late 1918, when it began a service to Belgium with R.A.F. aircraft flown by service pilots. Along the side of the cockpit was painted, "Aircraft Transport and Travel, Ltd., Folkestone-Ghent parcels service;" otherwise the machines bore normal R.A.F. markings. This unusual situation, the details of which have never been made public, was regularized in the summer of 1919 when international flying was allowed after the Allies had agreed to the International Convention for Aerial Navigation.

On 25 August 1919 Handley Page Transport joined A.T. & T. to inaugurate British civil air services to the Continent. It, too, was an offshoot of an aircraft manufacturing concern. (In addition, H.P.T. was involved with the Aircraft Disposals Company's war-surplus activities.) Both companies operated to Paris and the Lowlands and were staffed with enthusiastic personnel and a large and uncommercial collection of aircraft. Both soon found themselves in severe financial difficulties. Since the Handley Page records are not available and A.T. & T.'s were burned in a World War II German raid on Birmingham, we know little of their finances. This is not to say we know nothing at all.

In April 1920 General W. Sefton Brancker, who with General Festing ran A.T. & T., lectured before the Royal Aeronautical Society in London.<sup>1</sup> Though he did not reveal what his company's operating figures were, he did indicate that their ground costs, excluding insurance but including costs on the French side, amounted to about £45,000 per year. An exami-

<sup>1</sup> Brancker, *Aerial Transport from a Business Point of View*, XXIV, No. 114 J. of the Royal Aeronautical Soc'y, 294-312 (1920). Table A is a paraphrase of Brancker's presentation with my notes and percentages indicated by editorial brackets.

Some idea of the increased capital cost of running an airline today may be gathered from the fact that a used Douglas DC-3, a 1936 design, cost £19,000 (c. \$54,000 in 1959), while a new Fokker-Fairchild Friendship as supplied to Piedmont Airlines as a replacement for the DC-3 costs about \$735,000. The DH 34 cost £10,000, the Armstrong-Whitworth Argosy of 1926-35 £33,000, and the Short Empire flying-boats of 1936-45 £59,000 plus. These increased costs had a direct effect on the capital necessary. Brancker proposed £140,000 in 1920. By 1939 this had risen to £10,000,000, for B.O.A.C. with its world-wide commitments and need for more than 50 four-engined aircraft.

nation of the following table (Table A) indicates that his figures for a hypothetical company were probably about what A.T. & T. was actually operating on, but without having fourteen identical aircraft, which for these figures were to have been DH 18's. In other words, the proposals Brancker presented were probably the ones upon which the future of A.T. & T. was based.

TABLE A

Brancker  
June 1920

Cost of London-Paris Air Service

14 aeroplanes, including reserves & spares at £6,500 each	£91,000
Spare engines	£10,000
Other spares	£20,000
Transport, tools, etc.	£9,000
Working capital	£10,000
Total	£140,000
Each of the 14 aeroplanes utilized 300 hours per year with six trips each way daily scheduled between London and Paris. With an average of 280 flying days per year, this equals 1,680 trips or 4,200 hours.	
Fuel for 4,200 hours at £5 per hour	£21,000 [14%]
Depreciation at 50% including obsolescence	£45,500 [31%]
Insurance at 20% [of value of the aircraft]	£18,200 [12%]
Pilots' bonus at 10/—per hour	£2,100
Total	£86,800
Total Charges (admittedly on high side)	
without interest on capital, per year	£131,800
with 10% interest on capital, per year	£145,800 [100%]
Cost per trip with one ton of freight at 100 m.p.h. over 250 miles	£78.10.0d
At £15.15.0d each for a full load of passengers, per year revenue	£211,680
At 2/—per pound of freight at full load of one ton, per year revenue	£376,320
For a mixed load, say, per year, or £175 per trip with full load.	£300,000

The above revenue figures presume a full load, or 6,720 passengers per year and 840 tons of goods. Admittedly impossible. Breakeven point per trip is 2.8 passengers and 784 pounds of freight, or 9 passengers and 2,500 pounds of freight a day.

[N.B. In 1924 Imperial Airways estimated a London-Paris service of 1,484 trips with 8,122 passengers on a load factor of 4 persons in the 8 passenger DH 34. This was then expected to produce a revenue of £39,049. In 1922/23 Handley Page Transport had a revenue on this route of £33,971 for only two-thirds the mileage, subsidy excluded.] [The above table is a paraphrase from the materials presented to the Royal Aeronautical Society.]

Brancker's figures when compared on a percentage basis with those of Imperial Airways for its world-wide operations in the period 1932-37 (for which see Table F below), show that his fuel estimates were lower, but he was operating single-engined aircraft. His depreciation figure is

extremely high at 31%, but he was amortizing the aircraft in two years, whereas later custom was to take four or five. Brancker's practice however was not out of line with war-time experience where the erosion of aircraft was 60% per month due to enemy action, lack of training, and flying accidents. In addition the "crates" A.T. & T. was using were not as durable as later machines specially built for commercial use. Moreover, insurance costs were very high in the early days owing to lack of actuarial materials and the inexperience with air transport of all concerned.

Some interesting comments on Brancker's operational ideas appeared two years later when Col. Frank Searle also spoke to the Royal Aeronautical Society. Searle had been the guiding hand of the London General Omnibus Company and then of Daimler Hire, the *deluxe* English car rental agency. When the Birmingham Small Arms (B.S.A.) group, which owned the Daimler motor car company, bought Holt Thomas's Aircraft Manufacturing Company, it sent Searle to investigate and then to manage A.T. & T. He told the Society that in the Fall of 1920 he found the airline had some twenty-five aircraft, of which scarcely two were identical, valued at £50,000.<sup>2</sup> In addition an order had been placed for £60,000 worth of DH 18's. The latter was a brand-new type properly conceived as a civil airliner and intended as a replacement for all the old war-surplus material. Brancker was outraged when Searle cancelled the order for these machines, which were, after all, necessary. But, as Searle quite properly noted, Brancker could if he wanted junk the twenty-five relics (and certainly do away with some of the miniature Air Ministry running them), but he could not as cavalierly erase the £50,000 from the books.<sup>3</sup>

The Instone Airline was almost an accidental creation. The firm of S. Instone and Company ran collieries and owned and chartered ships to take their coal to France. In 1918-1919 they found that the mails were

<sup>2</sup> *Types of Aircraft in Use by British Air Transport Companies, 1919-1924.*

Type	Aircraft Transport and Travel	Handley Page Transport	The Instone Air Line	Daimler Airway	Grand Total
DH 4	4	2	1		7
DH 9	9	8			17
DH 16	8				8
DH 18	3 (to Instone)	1	5	1	6
DH 34			4 (one to-)	6	9
HP 0/400		10			10
HP 0/10		8			8
HP 0/11		5			5
HP W8		1			1
HP W8b		3			3
Bristol Fighter		2			2
Bristol 10-seater		1			1
Bristol Tourer			1		1
Vickers Vimy Commercial			1		1
Vickers Vulcan			3 (2 returned to V's)		3
B.A.T. FK26			1		1
Westland Limousine			2		2
Supermarine Sea Eagle		2 (British Marine Air Navigation Co.)			2
18 types	24/4 types	41/10 types	18/8 types	7/2 types	87

N.B. Not all of the aircraft registered by Handley Page Transport were used for airline service.

The DH 18's were owned by the Air Ministry and shuffled around amongst the lines, which is why the right-hand totals do not agree with some horizontal totals.

Source: Lists compiled by L. T. Mason of the Air Registration Board of London for use in my book *Britain's Imperial Air Routes, 1918-1939*, (Hamden, Conn., 1961).

<sup>3</sup> Searle, *The Requirements and Difficulties of Air Transport*, XXVI, No. 133 J. of the Royal Aeronautical Soc'y, 3-22 (1922).

so slow that they were paying excessive demurrage charges because their colliers arrived in France before the necessary papers. To rectify this situation they obtained a DH 4a and pilot from the Air Ministry. Soon they expanded their service and began to carry passengers and freight. It was only in the last year of operations that the airline side of the business was registered as a private company. No records have so far come to light, so no financial figures are available except those reported for subsidiary purposes. According to these, despite a government subsidy of £44,100 for the year 9 March 1921-31 March 1922, the Instone Air Line lost £5,398.<sup>4</sup> But what Sir Samuel Instone pointed out at one of the Air Conferences was no doubt true, that not one of the companies would have shown a profit if proper allowances for depreciation, etc., were made.<sup>5</sup>

In the fall of 1920 the first of three Air Conferences was held in London.<sup>6</sup> The initial meeting is of particular interest because its Report contains the estimates of H. White-Smith, who had been on the 1918 C.A.T. Committee, for a London-Paris air service with six identical aircraft of each of the twelve types then available for civil use. These figures (given in Table B below) were not applicable to the airlines of that moment for not one of them operated a matched set of planes. But White-Smith's prognostications may be compared with the actual operational accounts of the Daimler Airway (see Tables C and D below) which did own six identical aircraft for the two years 1922-1924. Though the original table contained twelve types, for simplicity only those types which went into regular airline operation are included here. Of these, the DH 9 was converted from a two-seat day-bomber, the Handley Page 0/400 was a late model heavy bomber, the Vickers Vimy Commercial was the basic heavy bomber with a large plywood monocoque fuselage. Only the DH 18 and the Handley Page W8 were initiated as commercial designs.

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<sup>4</sup> Sykes, *From Many Angles* 294, (London, 1943).

<sup>5</sup> *Cmd. 1157*, 21-23.

<sup>6</sup> Reported verbatim in *Cmd. 1157*. The other two Conferences are covered by *Cmd. 1619* and *Cmd. 1848*.

TABLE B

Mr. H. White-Smith's estimates for operation of a London-Paris Air Service with six machines of known makes, October 1920. [Percentages added by author.]

<i>Item</i>	<i>DH 9</i>	<i>DH 18</i>	<i>HP 0/400</i>	<i>Vimy</i>	<i>HP W8</i>
Horsepower	240 h.p. £	450 h.p. £	2/350 h.p. £	2/350 h.p. £	2/450 h.p. £
Cost of airframe	500s	4,500	2,800s	6,800	9,000
Cost of engines	350s	2,000	3,200s	3,200s	4,000
Total per a/c	850s	6,500	6,000s	10,000	13,000
Total for 6 a/c	5,100	39,000	36,000	60,000	78,000
Spare engines	700	4,000	6,400	6,400	8,000
Spares at 25% value of a/c	1,275	9,750	9,000	15,000	19,500
Aerodrome transport	2,000	2,000	2,000	2,000	2,000
Machinery & plant at terminal	2,000	2,000	3,000	3,000	3,000
Working capital (two months' running costs)	8,940	15,540	21,165	24,635	27,820
Total capital outlay	£20,015	£72,290	£77,565	£111,035	£138,320
General Charges	18,160	18,160	20,500	20,500	20,500
Maintenance labour	6,680	6,680	12,750	12,750	12,750
Spares at 25% (also above)	1,275	9,750	9,000	15,000	19,500
Pilots at £1 per hour plus retainer	6,800	6,800	6,800	6,800	6,800
Co-pilot at 10/—plus retainer	-----	-----	3,800	3,800	3,800
Petrol and oil at 4/—a gallon	17,500	28,500	54,120	54,120	57,000
Insurance at 15%	765	5,850	5,400	9,000	11,700
Depreciation: 3000 hours for engines, 2000 hours for airframes	2,200	17,500	14,800	26,000	35,000
Interest on capital, 10%	2,001	7,229	7,756	11,103	13,832
Total operating costs	£55,381	£100,469	£134,746	£158,893	£180,702
A/c capacity					
passengers or freight (lbs)	2 500	8 2,000	10 1,800	12 2,240	14 3,600

Source: *Cmd. 1157* s denotes war surplus price. a/c denotes *aircraft* (aeroplanes).

It is British practice to quote price without engines and, often, without radio equipment.

All percentages rounded to one decimal place.

TABLE B

*Cmd. 1157 (cont.)*

General Charges explained.

<i>Item</i>	<i>Single-engine</i>	<i>Twin-engine</i>
Chief Pilot or Traffic Manager	£600	same
Navigation Controller	500	"
Business Manager & Accountant	500	"
Foreign aerodrome manager	500	"
2 Customs clerks	400	"
2 Typists (home)	300	"
2 Typists (abroad)	200	"
2 Accounting clerks	450	"
1 General Clerk	150	"
	£3,600	£3,600
Advertising	5,000	5,000
Rent at Terminal	1,500	2,500
Transport for maintenance works	1,000	1,000
Insurance of buildings and men	100	180
Insurance of 8 pilots	160	320
Depreciation of plant at 10%	200	300
Office expenses	600	600
Contingencies, including salvage of aircraft, etc.	2,000	3,000
Administrative expenses	1,000	4,000
Grand Total	£18,160	£20,500

In the *Table B* the most significant percentage figures are those which show the contrast between war-surplus aeroplanes and those designed for commercial service. Thus it is seen that the operating costs for the DH 18 are considerably better than for the DH 9 with but one quarter the capacity. There is a steady progressive improvement from the bober-conversion HP 0/400 to the HP W8 commercial design with the commercialized Vimy bomber a fairly good runner up. Insurance and depreciation both increase more rapidly for the commercial designs owing to greater initial cost, but this is compensated for by the greater efficiency and longevity of these designs. Such a comparative study as this was not readily available in the interwar years owing to natural business secrecy and reluctance to see what might be detrimental comparisons, but is today becoming increasingly common.

In the above table the contrast between the cost of operating the DH 9 and the DH 18 is noteworthy. Despite the fact that the price of the DH 18 was six times the DH 9 and the capital outlay three-and-a-half times as much, the operating cost was slightly less than doubled while the capacity was quadrupled. The DH 34 cost about £10,000 maximum. The Daimler Airway was able to hire-purchase these machines, it is true, but nevertheless it operated with only four to six of them and made a good showing with an original capital of only £30,000.

Before comparing White-Smith's estimates with our control, the Daimler Airway, whose monthly accounts survive, something must be said about government aid to the airlines.

Despite stress laid by advisory bodies on the importance of governmental assistance to both the airline and the aircraft industry, in the first two post-war years the British government took the attitude that



the airlines must fly by themselves.<sup>7</sup> The French, however, heavily subsidized their operators in the interests of national defense. The result was that French fare-cutting forced the virtual cessation of all British airline operations, while the British government maintained facilities for French operators! The crisis was reached in February-March 1921. Winston Churchill, then Secretary of State for Colonies and Air, appointed the emergency Cross-Channel Subsidies Committee. This body immediately recommended a "temporary scheme" to aid Handley Page Transport and the Instone Air Line (A.T. & T. was then being liquidated.) to get back in the air. Each company was to be granted £25,000 for operations from March through October. The scheme was subsequently extended to the end of March 1922<sup>8</sup> with an additional grant of £19,100 for each company. In other words, the government was forced to do virtually what the Weir Committee (*Cmd. 770*) had recommended in April 1920. While the "temporary scheme" was in force, the Air Ministry asked for other operators' proposals. In September 1921 the Ministry approved those submitted by the Daimler Airway. Thus the "permanent scheme" provided for operations by three British companies.

Under the "permanent scheme" the Air Ministry not only paid a subsidy on the basis of 25% of gross revenues for carriage of passengers, freight and mails, but also supplied 50% of the total fleet on a hire-purchase basis and paid half of the premiums for insurance up to 10% of the value of the material. If net profits, including subsidies, exceeded 15% of the total subscribed cash capital, then the balance in excess was to be refunded to the Air Ministry until the whole of the subsidy was repaid. In practice, of course, this latter provision proved utterly unreal. It should also be noted that the Air Ministry made at this time no attempt to divide up the routes, but allowed all three companies to compete on the lucrative London-Paris run. This, as the Hambling Committee of 1923 (*Cmd. 1811*) so correctly pointed out, meant that the Air Ministry was competing against itself as well as against the French.

Since the above arrangement did not prove satisfactory, in the fall of 1922 a "revised scheme" came into operation. This required the lines to fulfill certain minimum operating conditions, introducing fines for nonfulfillment. It also provided for the free gift to the companies of all the material purchased for them by the Air Ministry up to 31 March 1923. In addition, the routes were redistributed so that Handley Page monopolized London-Paris, Instone's London-Brussels-Cologne, and Daimler Manchester-London-Amsterdam-Berlin. But before the companies were allowed to gain full experience with this arrangement, the Hambling Committee met and the government decided on a new program.

The final cost of the subsidies' schemes to the cessation of competitive operations on 31 March 1924, including financial aid to the De Havilland Air Taxi service for experimental air mail operations in the United

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<sup>7</sup> Winston Churchill in introducing the Air Estimates on 3 March 1920 referred briefly to the civil airlines in this respect and the sentence became one of the key dictums of British aviation policy. (See 126 *H. C. Debs.*, 5 s., 1622, (11 March 1920).)

<sup>8</sup> The original agreement was *Cmd. 1521*; the scheme is summarized in *Cmd. 1811*, one of the essential documents of British aeronautical history.

Kingdom, was £313,824.<sup>9</sup> Thus, despite the Churchillian dictum that the airlines would have to fly by themselves, the government did have to boost the airlines into the black.

The Daimler Airway was established by Col. Frank Searle of Daimler Hire and Maj. George Woods Humphery, who had managed Handley Page Transport in its early days and was by training an engineer and by experience a pilot. Unable to raise the £30,000 capital they considered necessary from private individuals, they persuaded the Daimler Company to advance the necessary funds. It proved to be a good investment, for not only did Daimler get its money back in 1924, but, according to Mr. Woods Humphery, it made in all a 50% return on its investment.<sup>10</sup>

The Daimler Airway was Searle's chance to put into airline practice ideas he had acquired in the adolescent omnibus business. The result was that this company had an influence far beyond its short two-year career. It was assumed that the company could not afford to operate with a large number of idle machines and personnel. Searle stipulated that every aircraft must fly 1,000 hours a year to earn its keep. (Woods Humphery raised this to 2,000 for Imperial Airways.) Every operation was carefully analysed and personnel was cut to the minimum. One of the immediate and most important results of this scrutiny was that Daimler began to fly a round trip with the same aircraft every day on the London-Paris run, and later this was doubled. Heretofore a 'plane was flown over to Paris one day and back to London the next. With this system of intensive usage, Daimler never used more than four aircraft. (When Woods Humphery managed Imperial Airways (1924-1938), he was frequently short of aircraft, but the company just could not afford to keep a number of £30,000-£60,000 machines in hangars around the world in case of emergency. It was not until just before the creation of B.O.A.C. in 1939 that risk capital became available in large enough amounts to allow contemplation of such a luxury.) If Daimler flew its aircraft hard, it also

<sup>9</sup> *Subsidies to British Airlines, 1921-1924, in pounds sterling.*

	1921-22	1922-23	1923-24	1924-25
Daimler	----	39,304	54,936	1,854
Handley Page	37,150	34,169	20,822	2,331
Instone's	38,475	45,818	32,363	2,578
British Marine Air Navigation	----	----	3,846	178
Total of above	75,625	119,291	111,967	6,941
DH. Plymouth-Belfast mail	----	----	1,672	50
Cost of aircraft for above except DeHavilland (DH).		62,461	2,566	

These figures include the final payments made in settlement after audit of the books in 1924.

In the first five years of operations, the five British companies received a total of £378,851 in subsidies and gifts of which £65,027 was in equipment. Not included in these figures are those applicable to the De Havilland Taxi service amounting to £1,722. Although there were five major companies from 1919 to 1924, Aircraft Transport and Travel died before receiving any Government aid.

The total subsidies to each of the four remaining companies amounted to:

Daimler Airway	£ 96,094
Handley Page Transport	£ 94,472
The Instone Air Line	£119,234
British Marine Air Navigation Co.	£ 4,024
Total	£313,824

Source: 204 *H. C. Deb. 5 s.*, 1429 (31 March 1927).

<sup>10</sup> Conversations and correspondence with Mr. Woods-Humphrey, who has hyphenated his name since becoming a resident of the United States.

employed its pilots with equal vigor, but paid them well, too. A typical Daimler day would show this sort of distribution of its DH 34's: G-EBBX London-Amsterdam, G-EBBY Amsterdam-London, G-EBBS Manchester-London, G-EBBQ London-Cologne. The company did not go in for freight on the Berlin route because it claimed that it could not afford to be unable to handle passengers, while the subsidy actually made it a paying proposition to operate without any passengers at all on this long-haul introduced in 1923.

A study of the monthly passengers-carried figures for Daimler indicates that the business was seasonal to such an extent that it varied between a total of 640 passengers in August 1923 down to less than ten in January 1924. The periodic fluctuations are reflected in the reasoning of both Brancker in 1920 and Woods Humphery and Searle in 1924. The causes for this were not only the usual vacation and holiday impulses, but that during the summer months many Americans visiting Europe flew the cross-Channel services for the experience. This held true down to 1929.

This periodic change is not unique with these early British lines. Starting in 1958 Pan-American World Airways and National Airlines made use of varying patterns of seasonal vacation-seekers to economize on the use of jets. National leases Pan-American equipment for its Florida services during the off-season on North Atlantic travel.

Of the seven aircraft which at one time or another carried Daimler registration four crashed and three survived to be turned over to Imperial Airways on 1 April 1924, and one of these crashed the following December. Of the original seven, four were on loan from the Air Council and were part of the free gift of the "revised scheme."

TABLE C  
Daimler Airway monthly profit and loss account in pounds sterling.

<i>Month</i>	<i>1922-23</i>	<i>1923-24</i>
April	-4651-16s	202- 3s
May	-4043-13s	-46-11s
June	-7869-18s	-152-16s
July	-2722-12s	-556- 4s
August	-2073-12s	19
September	-1996- 2s	-149- 5s
October	542- 5s	-555- 7s
November	322-17s	331- 5s
December	939-13s	-1670- 2s
January	610	203-15s
February	45-15s	1363-16s
March	593-15s	3990-18s

Fiscal 1922-23 resulted in a net loss of £20,303-7s for the year.

Fiscal 1923-24 showed a net profit for the year of £2,980-12s.

These figures allowed for depreciation and a ten percent profit, so the net operating loss of £17,322-15s for the two years is not quite a true picture of Daimler finances.

TABLE D

Daimler Airway's annual receipts and expenditures for the company's own fiscal year, 1 November 1922 - 31 October 1923. During this period the company operated no more than six DH 34's and generally only four.

<u>Annual Costs**</u>		<u>Receipts</u>	
Stores consumed	£17,545-12s	Passengers	£8,509- 2s
Wages	6,524-11s	Freight &	
Salaries	4,122	mail	2,078-14s
Pilots' bonuses	2,640-11s	Government	
Advertising	5,007-14s	aid*	60,106- 2s
Car Hire	2,799-12s	Miscellaneous	565- 2s
Insurance	9,354- 9s	Total receipts	£71,539.
Interest to Daimler			
Hire, Ltd.	2,871-19s		
Bad debts	537-17s		
Profit for year	7,171- 3s		
Total of all costs	£71,539.		

\*This item included £651-3s for the repair of engines received from the Air Ministry.

\*\*See Table F for percentages.

Source for Table C and D: Monthly accounts of the Daimler Airway kindly lent by the Secretary, Daimler Hire, Ltd., London. (A microfilm copy is now in the Baker Library, Harvard University.)

Comparison of the Daimler finances with those of earlier companies reveals the difficulties confronting the earlier operators. Not only were they faced with insufficient data, but they were too often militarily-minded in their assessments of what was needed. It is an old Service custom to order considerably in excess of one's needs in order to be sure of obtaining enough. Until the early nineteen thirties, risk capital was just not interested in airlines, let alone willing to squander money on them. Thus the Daimler operation prospered for two reasons apart from its natural efficiency; it was small in concept and it obtained its capital from a large parent corporation, not itself engaged in manufacturing aeroplanes which it expected its subsidiary to purchase. Thus it was free to buy the most suitable machines. Next to Daimler, the Instone Air Line had the soundest base. It was managed by the colliery-shipping company run by the family and obtained its capital from that outfit. Both Handley Page Transport and Aircraft Transport and Travel suffered from being subsidiaries of other aircraft businesses.

The nearest comparable aircraft in the *Cmd. 1157* estimates to Daimler's DH 34's was the DH 18, its elder sister. Both aircraft were designed for commercial service by Geoffrey de Havilland of jet-engined Comet fame. The DH 34 cost £10,000 while the DH 18 was priced at £6,500. The operating budget of the Daimler Airway was £71,539 including an allowed 10% profit for the parent company, while that for the DH 18 was £100,469. The capital costs are not quite comparable for Daimler received three of its aircraft as free gifts from the Air Ministry (one was always owned by the company) after they had only been partially paid for. Nevertheless, the £30,000 capital was considerably less than the £72,290 for the DH 18, though this was probably due to the hire-purchase scheme in force in 1921-22.

Almost as soon as he became Air Minister in the new Conservative government in the Fall of 1922, Sir Samuel Hoare appointed a committee under Sir Herbert Hambling to advise him on an airlines program.

Their Report (*Cmd. 1811*) is one of the landmarks of British air transport history. After carefully reviewing the history of government-airline relations, the Committee recommended drastic changes. Primarily it was concerned that the hand-to-mouth schemes be abandoned in favor of a million-pound monopoly company with a guaranteed subsidy for ten years. The reasoning behind this proposal, which was made by businessmen and not by airmen, was that the only way to attract private capital and at the same time give Britain a proper and stable airline organization was to provide that security of position and subsidy which would allow for planning and development to enable the company to fly by itself at the end of the stipulated period. The committee also made it plain that the proposed monopoly should be operated as a purely commercial enterprise, hoping that the regular payment of dividends would draw in share capital for future development.

The government accepted these proposals and asked for tenders. The Instone family submitted one plan and the other three companies (Handley Page Transport, the Daimler Airway, and the recently-formed British Marine Air Navigation Company) another. In the end the Instones were forced to join the others and in December 1923 the Air Ministry and the British Foreign and Colonial Corporation signed an agreement for an Imperial air transport company (*Cmd. 2010*).

The arrangements made by the British Foreign and Colonial Corporation bore fruit with the creation of Imperial Airways, Ltd., in March. It was managed by Col. Searle and Mr. Woods Humphery, though Searle left after clashing with Sir Eric Geddes, the Chairman. For fourteen of its fifteen and a half years the company was in the hands of "WH." The older companies were bought out by means of cash payments and shares in the new company.<sup>11</sup>

A document survives from the pre-operating days of Imperial Airways which gives a good idea of how the company planned its operations and what it cost the older companies for theirs.<sup>12</sup> Sticking to the London-Paris figurings, we find that the new company estimated 1,484 single trips per year divided as follows:

- 162 trips with 648 passengers in the winter months of November through February,
- 458 trips with 2,290 passengers in the intermediate months of September, October, March and April,
- 864 trips in the summer with 5,184 passengers.

It was estimated that this would amount to 326,480 miles a year at 3/2.31d per service mile for a cost of £52,115. Revenue was expected to amount to only £39,049; therefore, the subsidy for this route had to be £13,066. Estimated revenue was figured as 8,122 passengers at £5 apiece totalling £40,610, less agents commission of 10% (£4,061) and

<sup>11</sup> The four older companies received a total of £148,750 in cash and paid-up shares in Imperial Airways as follows:

Handley Page	£51,500 (£17,166 and 34,334 shares)
Instones	£46,000 (£15,333 and 30,677 shares)
Daimler	£30,000 (£10,000 and 20,000 shares)
B.M.A.N.C.	£21,250 (£ 7,083 and 14,167 shares)

<sup>12</sup> Since all the estimates were based on the use of DH 34's and the schedules from which these figures were taken came from Daimler Hire, it is presumed that this document was the work of Searle and Woods Humphrey in March 1924. See Tables E and F.

car hire of £2,500. However, it was expected that £5,000 would accrue from freight and excess baggage charges; thus bringing the total revenue to the £39,049 figure given above.

TABLE E

Schedule 22. Estimated costs, mileage, and receipts for 1924 with actual workings of the companies, 1922-1923.

	<i>Paris</i>	<i>Cologne</i>	<i>Hamburg- Berlin</i>	<i>Channel Islands Flying</i>	<i>TOTAL</i>
old mileage	207,920	268,258	63,733	(14.8.23- 30.11.23)	539,911
new mileage	326,480	345,960	170,269	103,490	946,199
old cost	£59,447	£54,911	£13,572		£127,930
proposed	£52,115	£55,223	£27,179	£16,519	£151,036
<i>Total net receipts</i>					
old	£33,971	£19,042	£ 1,269		£54,282
estimated	£39,049	£32,470	£ 2,032	£ 3,364	£76,915
<i>Net passenger receipts</i>					
previous	£30,055	£11,148	£ 1,269		£42,472
estimated	£34,049	£14,470	£ 2,032	3,364	£53,915
<i>Freight Receipts</i>					
previous	£ 3,916	£ 7,370	negligible	unknown	£11,286
estimated	£ 5,000	£18,000			£23,000

Note 1. The Budget of £159,268 is based on 1,000,000 service miles. The above routes account for 946,199 miles at a cost of £151,036. The balance of mileage to be allocated to routes according to needs.

Note 2. Insurance provided for at rate of 3d per mile on 1,000,000 miles — £12,500. It may be advisable to increase this to 4d to build up a reserve in the early years.

Note 3. An allowance has been made in the Budget for petrol and oil for use of the HP W8's on 200,000 miles. No addition has been made for extra maintenance. [see services estimates]

Note 4. Dead mileage is taken at 3% of service mileage; 30,000 miles at 1/5 1/2d cost per mile (excluding petrol, oil, maintenance and obsolescence already provided for). Therefore take £2,131 from the estimated surplus.

On the other routes to be operated, the company figured that the London-Cologne route would cost £55,223 a year for 610 trips with 3,050 passengers necessitating a subsidy of £22,753. The London-Amsterdam-Hamburg-Berlin line was expected to carry only 640 passengers in 253 trips and to require a subsidy of £25,147 a year to offset operating costs of £27,179. (No wonder Daimler said that it really did not matter too much whether they carried passengers or not on this run.) The Channel Islands service was only run from August to November 1923, but on the results of these operations it was predicted that revenues would be only £3,364 versus operating expenses of £16,519, calling for a subsidy of £13,155.

For operating from London to Paris, Basle and Zurich, to Brussels and Cologne, and to Amsterdam, Hamburg and Berlin Imperial Airways was

to receive a subsidy of £137,000 per year. In 1928 it was sensibly decided that competition in Europe with surface transport was too great for profitable unsubsidized operations, and the main emphasis was shifted to Empire routes. In 1936 British Airways came into being as a rival subsidized company in Europe. However not all of the routes there were, for reasons never satisfactorily explained, turned over to this company. B.O.A.C. was created in 1939 and had not yet taken over when war nationalized both lines. Since 1946 Continental routes have been the sphere of British European Airways operations.

Perhaps the most important point in early airline operation, well made by the Daimler management, was that both personnel and equipment must be utilized to the maximum. At the same time emphasis was placed upon standardization. When the same management took over Imperial Airways it had the opportunity to extend its practice. This resulted in the establishment by 1937 of a fairly standard distribution of costs between the various items of expenditure for operations. These figures have been used as a control. Table G places them against the percentages of Daimler Airways' operations for 1922-23, Instones' prognostications for 1924-5, and Imperial Airways' own plans for 1924-5. In the latter case, the management had the advantage of access to the operating figures of all the British lines and was able to effect some economies by a new centralization of maintenance and staff. By the end of 1937 the annuation of pilots and the increasing costs of modern equipment had caused some adjustment in the original percentages. More tellingly, the Air Ministry turned the company's efficiency against it in drawing up contracts for the carriage of mail and for subsidies. Nevertheless, Imperial Airways averaged dividends of 4½% for the sixteen years of its existence.

TABLE F

Control percentages.

Imperial Airways percentage distribution of costs based on five years of operations from 1932 through 1937 in comparison with the same percentages taken from Daimler Airway accounts for the year 1 November 1922 - 31 October 1923. These figures should be compared with the percentages inserted in Tables A and B. Imperial Airways' 1924 plans covered only existing European routes. In the case of these two airlines, they both operated relatively homogeneous fleets. Daimler's consisted almost exclusively of DH 34's, while of Imperial Airways' fleet during the five-year period, the majority of the aircraft were fitted with the same engines, obsolescent aircraft were used for development work, and centralization of operations at London and Cairo considerably reduced overhead. It should also be borne in mind that the company operated over routes from London to Australia with approximately the same route mileage in Europe as that operated by the pre-1924 companies. During the period in question, Imperial Airways received an average of 32% of its revenue from government subsidies. During the year under consideration for Daimler Airways the subsidy amounted to 83% of the revenue received. The Instone Air Line submitted proposals in May 1923 for a £1,000,000 operating company which would be granted monopoly privileges by the Air Ministry. The Instone estimates provided in the first year for maintenance of the existing services in Europe. Therefore their figures for the first year may be taken to reflect fairly accurately their operating experience, both as airline and shipping people.

<i>Item</i>	<i>Daimler Airway</i>	<i>Instone 1923</i>	<i>Imperial 1924</i>	<i>Airways 1932-37</i>
Salaries and wages	18.4%	12.5%	15%	22%
Fuel and oil	24.5	21.6	21	18
Materials used on maintenance & repairs		7.2	23	7
Replacement of flying stock and equipment [Depreciation]	7	14.4	11	14
Rents, subcontracted services and insurance	13	4.6	12.7	17
Advertising	6.9	4	5	4
Ground transportation of passengers and their accommodation	3.9	1.6	[5]?	6
Agents' commissions	U/K	1.6	U/K	2
United Kingdom income tax	N/A?	N/A?	N/A?	1
Development expenditure	U/K	U/K	U/K	2
Dividends	10 (profit)		21.5	2
General Reserves	U/K	U/K	2.8	5

Technical efficiency may be judged from the changing ratios of fuel and oil to other costs. The 3% drop in this item is significant because operational aircraft increased in size and number of engines. In this respect it should be noted that the real technical breakthrough came in the early nineteen thirties with the introduction of constant-speed propellers, retractable undercarriages and the abandonment of the biplane configuration. Conversely, though the size of the crew remained unchanged, except on long-distance flights, in the inter-war years, increasing experience and service called for higher pay scales. By 1937 Imperial Airways had recognized this to the extent of introducing new pay rates for incoming air-crew. This had much the same effect in 1937-38 as the disputes over jet-age crewing have had in America.

The cost of insurance declined relatively over the years, but the increased cost of new models generally negated the savings. This had its effect on depreciation, too. The £10,000 DH 34 had to be replaced with the £33,000 Argosy, and ten years later the Ensigns for European service cost £53,000 apiece.

When the relative ignorance of the pioneers is taken into account, it appears marvelous that their "guesstimates" of revenues and expenses were not farther off the mark. The Instone accounts might well reveal them to have been just as astute businessmen as the Searle-Woods Humphery combination at Daimler, but the Instone Air Line never operated so well with so few machines. Handley Page Transport's operations will probably always remain an enigma for its affairs were complicated by association with world-wide ambitions and the war-surplus business. A. T. & T. is known to have been liquidated for reasons beyond its control, but its early operations were admittedly in the red. Even Imperial Airways with £1,000,000 capital at its disposal only received a truly commercial aircraft when the Handley Page Heracles HP 42/43 class were delivered in 1931.

The significance of this is seen in the figures for load factors in the



period 1919-24 in contrast with those of Imperial Airways, 1924-1940. In the first instance 31,870 passengers were carried for a load factor of 59%, while in the latter 575,900 were carried for a 67.7% factor.<sup>13</sup>

The early British Cross-Channel airlines were in many ways like the pioneer steamship operators; they were in the field of the future; but they were ahead of technology. Not only the French and their subsidies, the British government's self-supporting laissez-faire policy, but also economic factors themselves were against unsupported success. Even Daimler was able to show only a respectable profit owing to heavy financial aid from the government.

Speed has always cost money. Up to about 1928-30 several of the most influential people in British aeronautical circles thought in terms of making civil aviation self-supporting through the development of efficient 100 m.p.h. aircraft which would provide a just sufficient advantage in speed to make the airline an effective competitor with the railroads. Hence the interest in large rigid airships with their low maximum speed. The breakthrough of the early nineteen thirties and then the revolution created by the gas turbine were impelled by pressagentry and prestigial powers. These have made such speed appear mandatory that no airline which is forced to succumb to the mania will fly without a tax-assisted take-off. Therefore, our hats may be taken off to the British pioneers who tried to make air travel a reasonable form of transportation.<sup>14</sup>

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<sup>13</sup> Masefield, *Some Economic Factors in Air Transport Operation*, J. of the Institute of Transport 79-108 (1951).

<sup>14</sup> The late Eric Birkhead and I talked in London in the summer of 1959 of the articles we were then writing on this topic. His "The Financial Failure of British Air Transport Companies, 1919-1924" appeared in IV, J. of Transport History, 133-145 (May 1960). Mine was unavoidably delayed by publishing difficulties and is presented as complimentary to his work which was cut short by an unexpectedly early death.