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NOTE TO EDITORS

Following is an extract of a report from the Council of the International Civil Aviation Organization to the Twelfth Session of the ICAO General Assembly which will meet in San Diego (California, U.S.A.) on 16 June 1959.

Civil aviation in 1958

Historically speaking, the most important civil aviation event in 1958 was the actual introduction into scheduled service of the first of the large new jet aircraft. From the short-range standpoint, however, another event seemed of almost equal importance — namely, the sharp drop that the year marked in the rate of the world's traffic growth. The latter event is the more significant in view of the great increase in capacity that will occur when service on the world's main air routes will be performed primarily by the large jets.

Inauguration of turbo-jet service

AFTER some years of testing and preparation, the first of the modern large jet aircraft appeared in scheduled service in October 1958.* At 09:30 hours on 4 October 1958, a Comet IV aircraft sped down the runway at London Airport to inaugurate BOAC's service to New York. Three weeks later, on 26 October, a Pan American Airways B-707 headed east from New York to begin a daily scheduled service to Paris, later extended to London and Rome.

*The brief appearance of the Comet I in 1952 was, of course, a forerunner of this development.

The most striking aspects of this development are the dramatic reduction in scheduled flight times between the centres served, and the extremely large carrying capacity of the new equipment. The following brief table (*see* Table 1 on page 2) of non-stop, east-bound scheduled times between New York and London shows the tremendous speeding-up that has taken place between the introduction of the latest and fastest piston-engined aircraft (the Douglas DC-7C in 1956 and Lockheed 1649A in 1957) and the appearance of the jets.

When these speeds are multiplied by passenger-carrying capacities of up to 170, and weekly movements up to 5 flights in both directions, the largest of these aircraft are seen to generate as much passenger-mileage a year as a 40,000-ton ocean liner. (Actually, the fastest times recorded up to the end of February 1959 have been: for the B-707, 5 hours 41 minutes, non-stop New York-London on 11 December 1958; for the Comet, 5 hours 58 minutes, non-stop New York - London in January 1959.)

The main impact of these turbo-jet aircraft on the world air transport situation remains to be felt, however, during 1959 and 1960, when most of the planes ordered will come into service. The present status of procurement for aircraft expected to be delivered prior to 1962 is given in Table 2 on page 2.

From this table it can be seen that only 12 of the 481 turbo-jet aircraft ordered for delivery during the next three years had been delivered by the end of 1958. Another fact that appears is that 205, or over 40%, of the total were ordered in 1955. Since that year, the number of aircraft ordered has remained in the neighbourhood of a hundred per annum. It should also be mentioned that, in addition to the data shown in the table, orders have been placed for 35 Vickers VC 10's and 24 de Havilland 121's for delivery starting in 1963 and 1965 respectively.

It is clearly too early to make any observation as to the costs and other elements constituting the performance of the jets in scheduled services, other than perhaps to note the high load factors that

Description	Piston-engined			Turbo-Propeller	Turbo-jet	
Aircraft	Stratocruiser	DC-7C	L-1649A	Britannia	Comet IV	B-707
Airline	PAA	PAA	TWA	EL AL	BOAC	PAA
Time (hr:min)	12:30	11:00	11:05	9:20	6:45	6:35

Table 2 — Orders for Aircraft

Aircraft	Number of aircraft ordered during			Aircraft on order 31/12/57	Number of aircraft in 1958			Aircraft delivered and on order 31/12/58
	1955	1956	1957		Ordered	Cancelled	Delivered	
Boeing 707	76	37	38	151	3	12	6	142
Boeing 720	-	-	11	11	25	-	-	36
Douglas DC-8	98	21	15	134	11	3	-	142
Convair 880	-	40	4	44	9	-	-	53
Convair 600	-	-	-	-	25	-	-	25
Comet IV	19	-	6	25	8	-	6	33
Caravelle	12	-	8	20	30	-	-	50
Total	205	98	82	385	111	15	12	481

Table 3 — Scheduled Services - Revenue Traffic

COUNTRY	Passenger Kilometres		Percentage Change 1957-1958					
	1957	1958	Total		Domestic		International	
	total operations in millions		%		%		%	
United States	50 310	50 680		+ 1		0		+ 4
United Kingdom	4 445	4 720	+ 6		- 9		+ 9	
France	3 835	4 100	+ 7		+ 7		+ 7	
Canada	2 760	3 250	+ 18		+ 10		+ 29	
Brazil	2 290	2 700	+ 18		+ 20		+ 5	
Australia	2 065	2 200	+ 7		+ 2		+ 21	
Netherlands	1 975	2 035	+ 3		+ 3		+ 3	
Scandinavia	1 685	1 925	+ 14		+ 16		+ 14	
Mexico	1 755	1 945	+ 11		+ 11		+ 10	
Belgium	930	1 235	+ 33		+ 13		+ 51	
Switzerland	875	1 015	+ 16		0		+ 16	
60 Other Countries	8 970	10 355	+ 15		+ 9		+ 21	
Total other than U.S.A.	31 585	35 480		+ 12		+ 9		+ 15
World (rounded off)	82 000	86 000		+ 5		+ 3		+ 10

Table 4 — Indices † of Civil Air Transport 1948-1958
(index base 1953 = 100)

Year	Total volume	Passengers	Cargo	Mail
1948	45	46	40	61
1949	53	52	54	68
1950	64	61	73	71
1951	78	75	89	86
1952	88	86	95	93
1953	100	100	100	100
1954	112	113	108	118
1955	131	131	127	136
1956	150	152	145	146
1957	169	172	158	157
1958	176	181	159	168

† based on tonne-kilometres.

their operation. Pan American, for example, is stated to be operating its B-707's at an average load factor of well over 90%. This public appeal of the new equipment was expected and may be assumed to be based on speed, comfort and novelty.

Apart from performance, two other aspects related to the introduction of the jets seem worth mentioning here. One was the wave of airline strikes, in the United States and elsewhere, that marked controversies over rates of pay for jet aircrews and over the need for a third pilot. Demands for substantially higher pay have been put forward by pilots and other crew members; indeed, some formulae advocated would yield salaries up to U.S. $45,000 per annum for senior pilots. As to numbers of crew, it has been claimed, chiefly by the Airline Pilots Association, that the operation of the new, high-speed jets is more exacting and requires, for safety, the presence of a third pilot in the cockpit. Some airlines have now agreed either to add a third pilot to the crew or to require that the navigator or flight engineer be qualified as a pilot.

The other aspect had to do with rates. A lively controversy was touched off among the airlines on the subject of whether a surcharge should be imposed on jet airline fares. For competitive and other reasons, several airlines favoured such a surcharge which, they felt, was well justified by the superiority of the new accommodation, both as regards speed and comfort. Opponents of the surcharge argued that the jet airline transportation was expected to be cheaper on a seat-mile basis and that therefore no surcharge was justified. The IATA Traffic Conference finally agreed to a surcharge of about 5% on the North and mid-Atlantic, as well as to a scale of surcharges covering all international routes likely to be operated by jet aircraft in the Western Hemisphere.

Except where otherwise specifically stated, traffic and other data given in this Chapter do not include material from the Soviet Union and the People's Republic of China.

Rate of traffic expansion decreased

DEVIATING sharply from the trend of the last six years, which had shown average growths in total traffic of about 15% per annum, the rate of expansion in airline traffic decreased to less than one-third of that figure, or about 4.3%. An overall increase of about 400 million tonne-kilometres (274 million ton-miles) brought the total tonne-kilometres performed throughout the world from about 9,220 million tonne-kilometres in 1957 to approximately 9,620 million tonne-kilometres in 1958 (6,315 million ton-miles to 6,589 million ton-miles).* This overall increase is the smallest annual percentage gain, and the next smallest actual number of tonne-kilometres gained, in post-war period.**

There is danger of oversimplifying the situation if the figures just given are taken as being generally true throughout the world. Actually, the rate of traffic growth for airlines in different countries varied considerably, as the following figures for passenger traffic carried by the world's 13 largest carriers of air traffic show (see Table 3 on page 2).

Reversal of trend due to U.S.A. developments

It will be seen that five of the 13 countries listed realized traffic gains of less than 10%. Among these, the smallest gain of any was realized by the United States, whose domestic operations account for 47% of the world total while its international operations account for an additional 11%. The fact that there was no increase in United States domestic operations and only a 4% increase in its international operations accounts in large measure for the showing of the world as a whole.

It is difficult to assign reasons for this sudden reversal of trend. We must note a general lowering of the level of economic activity associated with business recessions in North America and elsewhere in the latter part of 1957 and continuing into the first half of 1958, as well as the fact that domestic United States fares were increased by about 4%-5% in the early part of 1958. However, the growth of air transport in the past has shown a marked independence of general economic trends, and the increase in United States fares does not seem great enough to have had any significant deterrent effect on traffic. It must also be noted that the year was marked by considerable unrest among the personnel in various sections of the air transport industry, with strikes causing serious disruption of services operated by such major airlines as KLM, BOAC, TWA, Capital, American and Eastern Airlines.

*The expression "tonne-kilometre" means metric tonne-kilometre, and the expression "ton-mile" means short ton-statute mile (the equivalent of 1.46 tonne-kilometres).

**In 1948, the gain over the previous year was only 370 million tonne-kilometres (253 million ton-miles).

Passenger, air-cargo and mail statistics

A breakdown of the total traffic carried by the world's scheduled airlines in 1958 (see Table 4 on page 2) indicates that the increase over 1957 in passenger-kilometres was 4.9%; in cargo tonne-kilometres, 0.6%; and in mail tonne-kilometres, 6.8%. In air cargo, a slight gain of 25 million tonne-kilometres (17 million ton-miles) in the international sector of the market was all but cancelled out by an estimated loss of 1.5% in the volume of domestic cargo. Mail seems to be the only category of traffic that has maintained approximately the same rate of increase as was obtained in the 1956-1957 period.

The share of passenger traffic in the total traffic has further increased, rising from 77.2% in 1957 to 77.7% in 1958. Cargo's share has been correspondingly reduced, following a continuous trend for the previous seven years, from 22.1% of the total traffic in 1950 to 17.4% in 1958. The proportion of mail traffic, being about 5% of the total volume, has remained approximately the same as for the last several years.

Ever since 1954, the proportion of international traffic to domestic traffic has been increasing.* International traffic now represents the highest percentage of total traffic in history, namely 37.3% as compared with 34.3% in 1954. The average distance travelled by international passengers is also on the increase, having risen during the last three years to 1,765 kilometres (1,097 miles), an increase of 180 kilometres (112 miles). It will be interesting to see to what extent the ability of the new jet aircraft to carry passengers to the most distant parts of the world at far greater speeds than ever before will accentuate these trends.

*In 1958, international traffic accounted for 60% of the total traffic gain.

The largest increase in passenger traffic was on the North Atlantic services, where 1957 had been the first year in which passengers carried by airlines exceeded the one million mark. In 1958, the total was 1,292,000, a gain of 273,000 passengers or 26.8%. The number carried on the airlines' scheduled flights was 1,193,000; on their charter and special flights, nearly 100,000. Of the former group, more than one-half, or 662,600 passengers, travelled by the new economy-class service, which began only in April 1958. The remainder were almost equally divided between first-class and tourist-class passengers. The number of air passengers now surpasses that of sea passengers by about 327,000 (34%).*

*Air 57%, sea 43%.

Load factors down again

Average load factors for all classes of traffic experienced their second successive drop, reaching the lowest figure since the war. (The previous low was 55% in 1949, and the previous high was 62.5% in 1951.) In 1958, the load factor was 54.8%, as compared with 57.4% and 59.3% in the previous two years. As has been the case in the past, the load factor for international services exceeded that for domestic services (57.3% as against 53.4%). If passengers alone are considered, load factors had decreased from the 1956 figure by almost 5 points, to an unprecedented low of 57.9% in 1958 — this fluctuation being greater in the international than in the domestic field.

Financial results indicate further deterioration of airline position in 1958

1957 Using preliminary estimates, last year's Report indicated a deterioration of the financial situation of the world's scheduled airlines for 1957. Revised figures based on additional information received in the past twelve months show an even less favourable picture than that which appeared in last year's Report. Total operating revenues were U.S.$3,971 million (previous estimate, $4,100 million) and expenses

Table 5 Changes in Airlines' Financial Position

Year and description	1953 US$ millions	1953-54 (Percentage increase)	1954-55	1955-56	1956-57	1957 US$ millions
REVENUES						
Passengers	$1 772	+ 12.3%	+ 18.9%	+ 15.8%	+ 13.4%	$ 3 109
Cargo	258	+ 8.5%	+ 21.8%	+ 10.3%	+ 7.4%	404
Mail	175	+ 4.6%	+ 3.8%	+ 10.0%	+ 2.9%	215
Charter	45	+ 13.3%	+ 21.6%	+ 32.3%	+ 65.9%	136
Incidentals	64	- 12.5%	+ 16.1%	+ 56.9%	+ 4.9%	107
Total operating revenues	$2 314	+ 10.6%	+ 18.2%	+ 16.0%	+ 13.1%	$ 3 971
EXPENSES						
Flight operation	$ 694	+ 8.5%	+ 15.9%	+ 15.1%	+ 21.3%	$ 1 219
Maintenance & overhaul	448	+ 8.7%	+ 17.9%	+ 20.0%	+ 11.9%	771
Flight equipment depreciation	201	+ 12.4%	+ 2.2%	+ 11.7%	+ 35.3%	349
Other	974	+ 9.0%	+ 19.5%	+ 16.2%	+ 13.5%	1 673
Total operating expenses	$2 317	+ 9.1%	+ 16.6%	+ 16.3%	+ 17.1%	$ 4 012

	1953	1954	1955	1956	1957
Operating profit or loss (US$ millions)	$ - 3	$ + 32	$ + 78	$ + 84	$ - 41
Operating ratio (revenues as a percentage of expenses)	99.9	101.3	102.6	102.5	99.0

Table 6 Distribution of Revenues and Expenses

REVENUES	Percentage distribution of operating revenues			
	1954	1955	1956	1957
Passengers	77.7	78.2	78.1	78.3
Cargo	10.9	11.3	10.7	10.2
Mail	7.2	6.3	6.0	5.4
Charter	2.0	2.0	2.3	3.4
Incidentals	2.2	2.2	2.9	2.7
Total operating revenues	100.0	100.0	100.0	100.0

EXPENSES	Percentage distribution of operating expenses			
	1954	1955	1956	1957
Flight operations	29.8	9 6	29.3	30.4
Maintenance and overhaul	19.3	19.5	20.1	19.2
Flight equipment depreciation	8.9	7.8	7.6	8.7
Others (including administrative costs, sales, ground expenses, etc.)	42.0	43.1	43.0	41.7
Total operating expenses	100.0	100.0	100.0	100.0

$4,012 million (previous estimate, $4,050 million), indicating a net operating loss of $41 million for 1957, as compared with an annual net operating profit of $84 million for 1956.* Changes in the airlines' financial position from 1953 to 1957 are shown in Table 5 on page 4.

In 1957, airline revenue increased by U.S.$461 million (13.1%), but expenses rose by $586 million (17%). As a result, total world operating revenues remained below the $4,000 million mark, while total operating expenses exceeded that mark for the first time. The largest percentage increase in airline receipts appears to have been in non-scheduled and charter operations, which rose from $82 million for 1956 to $136 million for 1957, a gain of about 66%; but this item still represents less than 4% of total operating revenues. In spite of a 16% increase in passenger traffic from 1956 to 1957, passenger revenues increased by only $368 million, or 13.4%, the smallest numerical and percentage gain since 1954. The rates of increase in cargo revenues experienced their second successive drop.

Among the main categories of expense, the largest percentage increase appears to have been in flight equipment depreciation, which rose from $258 million for 1956 to approximately $349 million for 1957, an increase of 35.3%. Since 1950, this item has represented between 7% and 9% of total operating expenses, but will probably reach 10% for 1958. Flight operations expenses had indicated an annual rate of gain of approximately 15% from 1954 to 1956; however, the increase from 1956 to 1957 was from $1,005 million to $1,219 million, or 21.3%.

On the whole, the percentage distribution of the various categories of revenues and expenses has not undergone any significant change since 1954. Comparative figures for the four-year period from 1954 to 1957 are given in Table 6 on page 4. It will be noted that, although mail traffic has remained about 5% of the total volume, the percentage of mail revenue has steadily dropped from 7.2% of total revenues for 1954 to about 5% for 1957. In 1949 the figure was 17.2%.

1958 It is not yet possible to give a clear picture of the financial situation of the world's scheduled airlines in 1958. Preliminary indications are that their overall financial position has further deteriorated during the past year. Although total operating revenues appear to have reached the level of $4,200 million in 1958, total operating expenses are likely to have risen to $4,360 million, indicating an operating ratio of about 96.1. For the third year in succession, the rate of increase in expenses appears to have exceeded the rate of increase in revenues.

Taking all categories of traffic as a whole, the average unit revenues per tonne-kilometre performed in 1958 came to approximately 41.0 U.S.cents, as compared with 40.5 cents for 1957 (59.9 and 59.1 cents per ton-mile). For capacity tonne-kilometres available, the average unit revenue was 22.8 cents, as compared with 23.3 cents for 1957 (33.3 and 34.0 cents per ton-mile), and the average unit expense was 23.8 cents, as compared with 23.6 cents for 1957 (34.7 and 34.5 cents per ton-mile). Between 1957 and 1958, while the world average load factor (scheduled and non-scheduled operations combined) dropped as indicated above, the average unit expenses increased by about 0.2 cents per tonne-kilometre available.

Safety record

PRELIMINARY figures indicate that there were 29 accidents involving passenger fatalities on the world's scheduled air services in 1958, one less than the number reported for the previous year. In the light of additional information received from government sources in the past year, it is now possible to make certain revisions in the accident figures reported previously for 1957: number of fatal accidents, 30 (previous report, 29); number of passengers killed, 506 (previous estimate, 453); fatality rate per 100 million passenger-kilometres, 0.62 (previous estimate 0.55); number of fatal accidents per 100 million kilometres flown, 1.06 (previous estimate, 1.02).

Notwithstanding the smaller number of accidents, more persons were killed than in 1957 (604 passenger fatalities as against 506). Owing, however, to an increase of 4,000 million in passenger-kilometres performed (2,740 million passenger-miles) it would appear that the overall fatality rate in 1958 was only 0.08 points higher than for the previous year, which was the lowest on record (0.70 as against 0.62 per 100 million passenger-kilometres, or 1.13 as against 0.99 per 100 million passenger-miles). The second best year was 1955, with fatality rate of 0.66 per 100 million passenger-kilometres (1.04 per 100 million passenger-miles).

In terms of aircraft distance flown, moreover, the 1958 rate of 0.98 fatal accidents per 100 million kilometres (1.57 per 100 million miles) is the lowest rate on record for scheduled air services as a whole.

Reasonably complete statistics concerning crew fatalities on the scheduled passenger services are now available for 1957 and 1958, so that it is possible to include in this Report some figures showing the respective chances of survival by passengers and crew members. Out of the 59 accidents involving fatalities in 1957 and 1958, 33 were of such a nature as to preclude survival by either passengers or crew, and 26 had survivors of one or both of these categories. Figures for the latter accidents are given in Table 7.

The fact that some crew members are stationed more or less permanently in the nose of the plane, which is the most likely part of the fuselage to suffer damage, would seem to account for the higher percentage of crew fatalities. A factor working in the opposite direction is that crew members usually are in better physical condition than the majority of passengers.

Accidents on Scheduled Passenger Services — Table 7

1957 : 11 accidents 1958 : 15 accidents	Number of Fatalities and Survivors		Percentage of total		Average number per accident	
	1957	1958	1957	1958	1957	1958
Passengers:						
Fatalities	167	200	45%	41%	15	13
Survivors	208	292	55%	59%	19	20
Crew:						
Fatalities	34	41	59%	53%	3	3
Survivors	24	37	41%	47%	2	2

*Net operating profits were $78 million for 1955 and $32 million for 1954.

Many new routes and services since last major Assembly

There has been a steady increase in the number of scheduled services in all parts of the world. A substantial portion of this increase is attributable to the activities of newly established airlines. Since the Report to the last major Assembly was prepared in 1956, more than 75 new airline companies have entered the scheduled air transport field. In the same period, however, some 30 carriers have either ceased operations or lost their corporate identity through acquisition, reorganization or merger, so that there are all told about 45 more airlines — most of them of minor size — operating scheduled services in the world than there were three years ago. Financial difficulties forced Aquila Airways, the only remaining airline using flying boats in the United Kingdom, to cease operations in 1958. One of the pioneer air cargo carriers in the United States, Slick Airways, discontinued scheduled service after having flown a total of more than 700 million tonne-kilometres (500 million ton-miles) of freight in twelve years of domestic operations. The airline had been operating at a loss of from $200,000 to $300,000 per month for over a year.

Africa and Asia

Among the recently formed airlines is Ghana Airways, organized to operate domestic and international services of the new State of Ghana with a nominal capitalization of $1,120,000, of which 60% was subscribed by the government and the remainder by British Overseas Airways Corporation Associated Companies Ltd. Using Boeing Stratocruisers leased from BOAC, it began operating a once-weekly service between Accra and London in the summer of 1958 under a seven-year pooling arrangements with the British company. Other airlines starting scheduled operations in Africa in the last three years include Sierra Leone Airways, Air Ivoire (Ivory Coast), Hunting-Clan African Airways, Nigeria Airways, Royal Air Maroc (operating routes formerly served by Air Atlas and Air Maroc), and Libiavia-Nord Africa Aviazione, S.p.A. (Libya). The last-named airline is wholly owned by local private interests. Scheduled services between Tripoli and Ankara are being flown with chartered DC-6B's. In Asia, Borneo Airways was formed to take over services formerly operated by Malayan Airways in Northern Borneo. Using aircraft loaned to it by Indian Airlines Corporation, the Royal Nepal Airlines Corporation has begun operations over a network of short-distance routes linking Katmandu with several points in Nepal.

Latin America

Latin American airlines starting to operate scheduled international services in recent years include the Chilean airlines, CINTA-Linea Aérea Chilena and ALA-Sociedad de Transportes Aéreos. The former serves Miami and New York via Peru, Ecuador, Panama and Cuba, and the latter operates once weekly to Miami. Through an interchange arrangement between three non-IATA airlines (TAN-Transportes Aéreos Nacionales of Honduras, Compañía Ecuatoriana de Aviación of Ecuador and Aerolíneas Peruanas of Peru) it is now possible to travel by one-plane DC-6C service from Buenos Aires to Miami for only $251, as against the IATA one-way tourist fare of $412. This represents the latest development in the fare controversy between IATA and non IATA airlines in this region. Early in 1959 the civil aviation authorities of Argentina, Brazil, Chile, Colombia, Ecuador, Peru, Uruguay and the United States of America met in Rio de Janeiro at a regional conference called for the purpose of studying, among other matters, questions relating to the airline fare situation in South America.

In Argentina there has been a notable expansion of privately financed airline companies in the last three years. The stronges private airline to emerge since 1955 is TSA-Transcontinental formed in September 1956. After operating domestically for more than a year, it inaugurated services to New York with new Super H Constellations in the latter part of 1958. The airline has ordered four Convair 880 jets costing approximately $21 million.

Europe

Austrian Airlines (Oesterreichische Luftverkehr, A.G.), formed in September 1957, inaugurated scheduled operations on 1 April 1958 with a daily tourist-class Viscount service between Vienna and London. Its operation has now been extended to several other European capitals. The Czechoslovakian airline, CSA, has started a non-stop Prague-Cairo service with the Russian-built twin-jet TU-104's, indicating a trend toward the development of routes outside eastern Europe in competition with services using slower aircraft operated by western European countries. At the end of the year, Aeroflot began operating direct flights between Moscow and Cairo with TU-104's.

In addition to the direct air links already established by SAS and Aeroflot between eastern and western Europe, non-stop services were inaugurated during 1958 by Air France between Paris and Moscow, and by Sabena Belgian World Airlines between Brussels and Moscow, using Super-Constellations and DC-7C's respectively. The Sabena service connects at Brussels with the airline's non-stop flights from New York and Montreal. Additionally, KLM Royal Dutch Airlines started a once-weekly direct service between Amsterdam and Moscow with DC-6B's. All of these services offer first-class and tourist-class accommodations, and are operated in conjunction with Aeroflot which uses TU-104a jets. A direct air link has also been established between Delhi and Moscow, with Air India International operating a weekly service via Tashkent.

Boom in inclusive tours

This is the type of operation in which a single comprehensive price is charged for transportation and accommodation. Using scheduled as well as non-scheduled services and sometimes combining air with surface transportation, operators of these tours offer a variety of travel plans designed to suit the convenience and vacation needs of individuals or groups of individuals wishing to spend less than they would have had to if they arranged and paid for their transportation and accommodation separately. Airline activity in connection with inclusive tours has grown rapidly in recent years.

In the United Kingdom, the inclusive-tour business handled by independent or private operators is reported to have experienced a six-fold increase since 1952, although it still accounts for less than 5% of their revenues. The government-owned corporation, BEA, which has claimed that the inclusive tour operations of the independent airlines were causing material diversion of its scheduled traffic, had itself earned more than U.S.$4.8 million (£1.7 million), or 14% of its summer revenue from this type of activity in the financial year 1957-1958. However, except for a limited number of charter flights sanctioned by the government, nearly all BEA's inclusive tours are on its ordinary scheduled services, whereas all tours operated by the independents are on special flights approved by the government *en bloc* once each season. Particularly in view of different rates being applied, the

situation presents an interesting aspect of air transport competition, especially as its various aspects involve operators of both scheduled and non-scheduled services, and is being studied by governments and ICAO.

Mutual assistance between aviation interests

There are indications of closer inter-governmental and inter-airline co-operation in the field of air transport, particularly in Europe and Latin America. In addition to the co-operation effected through the European Civil Aviation Conference there are even closer arrangements — *e.g.*, for the control of European airspace and for a common market — between smaller groups of European countries.

SAS, Swissair arrangement

One particularly striking instance of European inter-airline co-operation is the arrangement worked out between Swissair and SAS. Swissair had on order five Convair 880's and SAS sixteen Caravelles, both companies also having ordered DC-8's which, through co-ordinated action of the two carriers, were exactly the same as to model. The DC-8's are extremely long-range aircraft, the Convairs intermediate (5,600 kilometres or 3,500 miles), and the Caravelles relatively short (2,400 kilometres or 1,500 miles plus).

In order to balance their respective fleets, the two companies are cross-leasing a number of the shorter-range aircraft — Swissair to lease two Convairs to SAS, and SAS to lease four Caravelles to Swissair. The leases involve registration in the country of the lessee, and the two governments are expected to take steps to facilitate this and other matters for which government sanction is desirable. Maintenance arrangements of both airlines are centralized, Swissair maintaining all the Convairs and SAS all the DC-8's and Caravelles. One of the incidental advantages of the arrangement is Switzerland's strong foreign exchange position.

Six U.S. airlines enter financial agreement

Another new development in the field of inter-airline co-operation took place in the United States. Six major airlines — American, Capital, Eastern, Pan American, Trans World and United — entered into an arrangement whereby any one of them whose flight operations were disrupted by a labour dispute would receive financial assistance from the others still operating. The form taken by the assistance is that the amount of additional revenue received by the airlines still operating and derived from traffic diverted from the strike-bound airline is turned over to the latter.

In December 1958, American Airlines was reported to have paid Capital Airlines the sum of $437,000 for the period ending 31 October as assistance under this arrangement in respect of the suspension of the latter's services from 16 October due to a strike on the part of its union mechanics. By mid-January 1959, total amounts paid out by all six of the airlines under the mutual aid agreement had reached well over $5 million. At this writing, the Civil Aeronautics Board in the United States has begun an inquiry into the legal and economic implications of this kind of co-operative arrangement, with particular attention to the general effect it may have on labour-management relationship throughout the air transport industry.

Helicopters slowly gaining ground

THE rotary-wing aircraft performs a multitude of different civil operations throughout the world, having now been in service a little more than a decade. Complete figures are not available, but a mid-1958 estimate of the number in use places the total at some 700, in no less than 24 countries. Not unexpectedly, perhaps, Canada, eleven European countries, and the United States account for 90% of the registrations, the remaining eleven countries are scattered throughout the world.

The great majority of helicopters are employed in aerial work. When those in the service of commercial and industrial concerns, flying schools and government agencies are also accounted for, not more than 10% of the total are found to be engaged in public transport operations. Such operations consist for the most part: *1*) in the inter-city type operations that predominate in Europe, and *2*) in regular services of the inter-airport feeder variety that predominate in the United States. There appears also to be increasing awareness of the unique flexibility offered by the helicopter when used for air taxi services, such services now being operated in the United States by no less than ten companies and on a more modest scale in Europe by two operators, one in France and the other in Italy, serving the seasonal traffic of Alpine winter-sports resorts.

Sabena still remains the only carrier operating scheduled international helicopter services. The network of routes radiating from Brussels to various other city centres in Belgium, Holland, Northern France and Germany has not radically changed since 1956, the year in respect of which helicopter developments were last treated in this Report. A notable extension, however, was the inauguration in March 1957 of a Paris-Brussels service operating twice daily with connections, at Brussels, to New York and affording, moreover, a saving of better than an hour in the overall time required of a passenger making the journey between the two capitals by fixed-wing aircraft.

The Sabena network is now served by eight Sikorsky S-58 helicopters, the 1956 fleet of four having been doubled during 1957. This added capacity enabled operations to be intensified in 1957 with the result that scheduled services yielded triple the capacity offered as well as payload carried, transporting almost 40,000 passengers, an increase of 134% over the previous year.* With no new additions to fleet in 1958, increases in payload and capacity were less startling than for 1957, but passengers carried on scheduled services nevertheless increased by 55% to some 63,000 individuals. Non-scheduled flights provided an increase of 75% in capacity available and throughout the year carried nearly 55,000 passengers on sight-seeing trips about the World Exhibition in Brussels.

Little has occurred in the development of passenger helicopters to occasion modification of the comparative table of different designs presented in last year's Report. References to a 65-seat version of the British Fairey Rotodyne have appeared but precise information as to its specifications or production schedule is lacking. The first order for the 48-seat version was placed at the Farnborough Air Show in 1958, by a Canadian non-scheduled operator who plans to use the Rotodyne for inter-city transport in British Columbia. British European Airways contemplates ordering six of a developed version of the 48-seat prototype with an option on the 65-seat version, foreseeing an ultimate need for 20 Rotodynes for its shorter cross-channel and domestic routes. Interest is also being shown by Japan Air Lines in the Rotodyne for helicopter service between Tokyo and Osaka.

*A smaller but nonetheless marked expansion also occurred in non-scheduled operations, with payload totalling 1,3,000 tonne-kilometres, 80% more than in 1956.

Aerial work

The use of aircraft for what has come to be called aerial work, that is to say, for purposes essentially other than transport, has not been dealt with in this Report since 1955. Aerial work is here taken to include such activities as agriculture, forestry, and certain types of patrol and inspection, but to exclude private pleasure flying.

Agriculture The largest and probably the most important category of aerial work is agricultural aviation, particularly if this is taken to include forest preservation and soil conservation. In the United States there were 5,100 aircraft engaged in various forms of agricultural aviation in 1957, and in New Zealand, with only about one-eightieth of the United States population, there were 300 aircraft being used for agricultural purposes. The number of acres treated from the air increased in the United States by almost two-thirds, from 37 million in 1952 to 61 million in 1957. In New Zealand the number of acres treated from the air increased a hundredfold from 1949 to 1958, 500,000 tons of fertilizer being applied to 5 million acres in the year 1957/58.

The many varieties of aerial work in agriculture and forestry include the protection of crops and forests against insects and bacteriological disease; killing weeds and brush; defoliation of crops to improve harvesting conditions; applying hormones and synthetic pollens; soil conservation through fertilization and seeding; exterminating such pests as rabbits and wild dogs with poisoned bait; and drying fruit and preventing frost by creating turbulence in the surrounding air.

Aircraft are also extensively used for the inspection of herds and crops and for forest fire warning and control, and to a limited extent for the artificial production of rain. In these activities, the dusting and spraying of crops accounts for a large proportion of the hours flown. In some areas, however, particularly in New Zealand, a greater effort is expended on soil conservation through the aerial application of fertilizer and seed to restore pasture to denuded hill country and thus to prevent erosion. One of the more spectacular categories of agricultural aviation is the spraying done against plagues of locusts and grasshoppers in the Middle East and Africa and a number of other regions.

It is interesting to note the lasting predominance of the single-engined machine in agricultural flying. In the United States in 1957 over half of the 866,000 hours flown for agricultural purposes were in single-engined biplanes and just under half in single-engined monoplanes; multi-engined aircraft and helicopters accounted for less than 1% each. In general, agricultural flying calls for aircraft that are sturdy, easy to maintain and cheap to operate, that have a low stalling speed, a high rate of climb and good all around visibility, that require short take-off and landing runs, and that are stable in flight and highly manoeuverable. The chief disadvantage of the helicopter is its relatively high operating cost.

Health campaigns A second category of aerial work where the techniques are similar to those used in agricultural flying is public health. Aircraft are used extensively and effectively particularly in the Union of South Africa and British African colonies, in campaigns against the tsetse fly and disease-bearing mosquitoes. Likewise in the Belgian Congo, successful operations against these insects have been carried out by a team of three Sikorsky S-55's in the vicinity of Leopoldville.

Surveying More extensive than public health flying is surveying, largely carried on by photography. For example, in Afghanistan and Iran general surveys for mapping purposes have been undertaken. In Ethiopia and Paraguay survey work is being done in connection with construction and the resources surveys are under way in Ethiopia and Qatar. Airport sites are being surveyed in the Philippines and a site for a hydroelectric development in Pakistan. Oil resources are being appraised by aerial survey in Guatemala, Iran, Pakistan and Paraguay. Photographs record the basic characteristics of the surface such as contours, water resources, nature of soil and vegetation. They also detect special features such as archaeological remains and large craters caused by meteorites, such objects being often so eroded and overgrown that they are unidentifiable from the ground and require the perspective of vertical distance to bring out their lines. Aerial surveying can also be used, with the aid of electric and magnetic devices, in the detection of mineral deposits.

Patrolling and other activities Another category of aerial work is patrol and inspection. Aircraft are widely used to patrol and inspect oil and gas pipeline and electric power lines. They are also used in the control of floods and in the planning and direction of rehabilitation work in areas stricken by floods, earthquakes and other disasters. Other activities that may be considered as falling within this category are the spotting, tracking and observation of storm centres; search and rescue operations; the spotting and reporting of whales and schools of fish in commercial operations; actual stocking of lakes with trout and other game fish that are dropped from the air with surprisingly little apparent damage; and the appraisal of wild life.

Trend in Cost of North Atlantic Internationally Financed Facilities Compared with Volume of Traffic on the Route — **Table 8**

Description	1951	1955	1959 (Forecast)	1963 (Forecast)
Cost of Internationally Financed Communications, Radio Aids, etc.	$ 1 150 000	$ 1 600 000	$ 1 950 000	$ 3 300 000
Cost of Ocean Station Vessels	$11 440 000	$10 500 000	$10 500 000	$10 500 000
Number of North Atlantic Crossings	12 250	21 550	38 000	55 000
Number of Passengers Carried by IATA Carriers	341 523	691 800	1 380 000	2 700 000
Total Cost of Ocean Station Vessels and other Facilities per Passenger Carried	$37	$17	$9	$5

Economic position of route air navigation facilities

In 1958 ICAO had occasion to consider the finances of route air navigation facilities. In March of that year an international conference on route facilities charges* was held at the Organization's headquarters in Montreal, corresponding to the similar conference on airport charges held in 1956. The statistical material prepared for this conference provides a useful picture of the order of magnitude of the costs of air navigation facilities and services on international routes and the position which they occupy in the economics of international air transport.

In the year 1955, the most recent year for which sufficient information was available to provide approximate world-wide estimates, the total annual cost of route air navigation facilities and services allocable to international air transport throughout the world was estimated to have been of the order of $50 million per annum, with an addition of about $10.5 million for the operating costs of the Ocean Station Vessels in the North Atlantic.** The larger part of this aggregate cost appears to be accounted for by communications and radio aids to navigation, but the cost of the meteorological service is also considerable, even after a substantial part has been allocated to non-aviation activities and to utilization by domestic aviation.

The total world cost figure of about $60 million per annum for international route air navigation facilities could be compared with the estimated $1,200 million in total revenues of scheduled air services from purely international operations throughout the world in 1955. This suggests that the cost of route facilities is equal to about 5% of the total revenue of international air transport. The estimated cost of the airports utilized by international air transport comes to about twice this figure.

In general, route air navigation facilities and services are provided by governments without charge and, where a charge is made, it seldom covers more than a small proportion of the costs. In some parts of the world the airlines provide certain route air navigation facilities themselves, either individually or on a co-operative basis, but facilities so provided represent a small part of the total. The total amount contributed by the airlines to the aggregate costs chargeable to them of all international route air navigation facilities and services is difficult to estimate, but governments probably bear over 80% of such costs.

The statistics available for years later than 1955 suggest that the total cost of route air navigation facilities and services provided for international air transport has been increasing in recent years at about the same average rate as the volume of international air transport itself — *i.e.*, about 15% per annum — although of course in particular areas and on particular routes the relationship would not be so consistent. If these trends have continued up to the present time, the total world cost of route air navigation facilities and services for international use would be about $100 million in 1959. If the total volume of international air transport in 1959 reaches 4,000 million tonne-kilometres, as seems probable, the cost figure of $100 million for its route facilities and services would represent about 2.5 cents per tonne-kilometre.

It is not possible to make any reliable estimates of the increases in cost of international route air navigation facilities and services over the next few years, owing to the increasing congestion on international routes and the introduction of the large, long-range, high-flying jet aircraft. On some routes considerable new expenditure on certain air navigation facilities is likely to be necessary, and this may or may not cause the total cost of route facilities in that area to increase more rapidly than the volume of the air transport served.

For instance, the trend of costs of that part of the facilities in the North Atlantic route that have been the subject of international financing through ICAO, and its relationship to the trend in volume of traffic, are illustrated in Table 8 on page 8 based on ICAO Secretariat reports and traffic data published by IATA.

From this it will be observed that the cost of the communications and radio aids covered by the international financing arrangements have tended to increase and will probably show a further sharp increase by 1961, owing largely to the cost of leasing a new cable that has been found necessary for communications purposes. On the other hand, the cost of the Ocean Station Vessels was actually reduced at one time and should now remain about constant for a period. The number of aircraft crossings has increased fairly rapidly and is expected to continue to increase. Since larger and larger aircraft are introduced each year, the number of passengers carried on the route increases more rapidly than the number of crossings, and the total cost of the facilities per passenger carried — which was $37 in 1951 — may be expected to be only about $5 in 1963. The internationally financed facilities are, of course, not the only route facilities provided for North Atlantic air services and, similarly, a certain number of passengers are not included in the above figures since they cross the North Atlantic on aircraft belonging to other than IATA carriers, but the over-all total figures would probably show a similar picture.

*See Vol. XIII, Nos. 3-4, page 53, please.

**The total cost of this operation is about $13 million, but 20% of it is considered as allocable to non-aeronautical interests.

Subjects relating to air navigation

Aircraft operations

The noise tests on both sides of the Atlantic that precede the inauguration of service with jet-engined aircraft were extensive. Restrictions imposed on operations in the interest of suppression of noise have involved weight, time and space limitations, as well as the limiting of flights to special times of day and special routings in some instances. Nevertheless, operations have proceeded successfully. There are prospects that, as experience is gained, as operations of that type become routine, and as the general public becomes accustomed to jet aircraft, restrictions will be progressively relaxed.

Aerodrome developments

A vast program of aerodrome development is taking place throughout the world. At practically every major aerodrome serving international air services, existing runways are being extended or strengthened, or new and longer runways are being constructed. In some instances, completely new sites are being planned, as at Stockholm, Rome, São Paulo, Santiago, Lima, Damascus and Melbourne, to name a selection. Improvements are being made to taxiways to speed up ground handling of aircraft, aprons are being extended to provide the necessary loading and manoeuvering areas for the

larger aircraft, fixed refuelling services and other facilities are being installed and, in many cases, new terminal buildings are being constructed. Visual aids in accordance with the modern improved ICAO specifications are being installed or planned for most airports. The following illustrations of the expenditures involved will give some idea of the magnitude of the program: Kandahar, U.S.$8,000,000; Rome, U.S. $17,000,000; Lima, U.S.$12,000,000; Stockholm, U.S.$42,000,000; Geneva, U.S.$22,000,000. A completely new airport has been constructed for Leopoldville, in the Belgian Congo, with the longest commercial runway in the world (4,700 metres or 15,420 feet long, 60 metres or 197 feet wide) to accommodate the largest jet airplanes.

Nevertheless, not all aerodrome problems created by the advent of the new and larger aircraft have been solved. The adequacy of aerodromes as to runway length, strength and sufficiently clear approaches for turbine-engined operations are still the subject of negotiations between the aerodrome authorities and operators. It remains also to be seen to what extent the most ambitious plans of certain airlines to make extremely long flights from other than gateway airports will be realizable, as they appear to involve full loads that will make aircraft heavier than the providers of aerodromes may agree to be justifiable. In this regard, the Council has brought to the attention of aircraft manufacturers and operators the necessity for minimizing, to the greatest possible extent, the requirements of new aircraft for longer and stronger runways.

Aeronautical telecommunications

1958 has been a year in which much effort has been directed towards the improvement of communications techniques and practices in order to keep up with the demands imposed by new types of aircraft and increasing air traffic densities in many areas. The main lines of development have been in the direction of increased automation and speeding up of the time required for the transmission of information. Typical examples are the introduction of automatic processing and computing devices to handle flight plan information for Air Traffic Services, the development of automatic air-ground-air communications systems intended to be capable of querying and obtaining replies from up to 500 aircraft in two minutes, as well as the introduction of high-speed (1,000 words per minute) teletypewriter circuits and equipment for the exchange of meteorological information.

In the field of radionavigation aids, the installation of airborne radar to provide warning of turbulent conditions has been extended until nearly all long-distance airliners are so equipped, while on the ground the use of primary radar as an aid to air traffic control both in terminal areas and *en route* has greatly expanded. The development of the airborne navigation aid known as Doppler Radar has continued, and fully engineered models suited to civil air operations have become available during the year. Considerable attention has been given, particularly in the United States, to studying aeronautical problems from the standpoint of regarding the sum total of all navigational aids in a large region as a single system, and action has been taken during the year to expand facilities that will permit these studies to be carried out by simulated rather than actual operations. These simulations will include the application of radionavigation aids and various communications techniques.

Rules of the air

The recurrence of several mid-air collisions again in 1958 emphasizes the deficiencies of the "see and be seen" principle inherent in flight under the Visual Flight Rules. However, practical considerations prohibit positive control of every aircraft in visual meteorological conditions in the lower levels of the airspace, which are generally recognized as extending to the vicinity of 6,000 metres (20,000 feet). Measures that have been recommended to minimize the possibility of mid-air collisions include the increasing of minimum visibility criteria for VFR flights (*e.g.*, by requiring aircraft to keep at a greater distance from cloud formations) and by placing the onus of taking avoiding action upon both pilots of converging aircraft, rather than giving one pilot the right-of-way over the other.

Air traffic control

The record of mid-air collisions demonstrates the vital need for closer liaison between civil and military authorities in the use of airspace. The high altitude potential of many civil aircraft now coming into service aggravates the problem, since civil aircraft are now beginning to fly at levels previously regarded as being almost exclusively within the preserves of the military. ICAO and its Member States have been keenly aware of this important problem for several years, and extensive efforts have been made toward its solution, particularly in areas of heavy air traffic density.

Development of machinery for the automatic processing of air traffic control is being vigorously pursued in several States and already automatic printing of flight progress strips and electric recording of flight plan data on records from which it is fed to computers is in effect, as well as electronic methods of transfer of control from one centre to another. It is clear that, for the control of traffic in dense traffic areas, considerable automatic processing will be essential to cope with the increasing congestion at high speeds. There is, however, a question as to how far automation should proceed, especially in view of the complications that would arise should a failure of the automatic processes take place.

In some quarters the view is held that automation should be complete and that duplicate systems should be simultaneously in operation so as to provide for continuing operation if either of them fails. Another view is that automation should be resorted to only to the extent necessary to provide assistance to controllers to enable them to meet the increased demands of greater aircraft speeds. In the event of a breakdown of the mechanical element the controllers would then be able to assume the entire workload, although some delays to traffic might ensue. Of course, even the most ardent proponents of complete automation recognize that the very most sophisticated systems require the attendance of controllers to resolve conflicts and take decisions.

Meteorology

With the entry of jet aircraft into regular service over the North Atlantic towards the end of the year, forecasts of weather conditions at greater altitudes (15,000 to 18,000 metres — 50,000 to 60,000 feet) have been provided. In other areas, to meet the needs of increasing numbers of turbo-prop aircraft and the expected introduction of turbo-jet aircraft in the near future, the demand for high-altitude forecasting service is growing, but there has been only a slight improvement in the arrangements made to provide that service. However, the provision of this data has been helped in some areas by the additional upper air observations which have been made as part of the program of the International Geophysical Year, many of which observations are to be continued for at least another year. A number of forecasting problems concerned with turbo-jet aircraft are yet to be solved, one of the most important being the provision of short-range landing forecasts of high accuracy.

The use of electronic devices for meteorological purposes has continued to increase. This applies particularly to airborne weather radar used as an aid in the choice of tracks providing safer

and more comfortable flights through areas of bad weather; to ground-based weather radar used for the same purposes in the neighbourhood of airports and also as a forecasting tool; and to digital computers used in preparing, by numerical processes, general forecasts which are then used as a basis for detailed forecasts for aviation.

The trend towards increased use of radiotelephony for the ground-to-air transmission of meteorological information has also continued and more attention is being devoted to needed improvements in arrangements for the ground-to-ground transmission of aeronautical meteorological information.

Space satellites

LAST year's Report referred briefly to the successful launching by the U.S.S.R. late in 1957 of the two satellites known as "Sputnik I" and "Sputnik II", the latter having a dog as a passenger.

The first of the United States satellites was successfully placed in orbit in February 1958, and it was followed in March by two others (the satellites launched by the U.S. Army being given the name of "Explorer", those of the U.S. Navy, "Vanguard"). The total successful launchings for the year included five satellites by the United States and one by the U.S.S.R.* Two unsuccessful lunar probes were also initiated by the United States during the year. The first penetrated outer space to an estimated height of approximately 115,000 kilometres (71,000 miles), the second to an estimated height of 106,000 kilometres (66,000 miles). In January 1959, a U.S.S.R. probe aimed in the general direction of the moon by-passed the moon and, it is understood, has gone into orbit around the sun. This was followed in March by a United States probe which also by-passed the moon and is reported to have gone into orbit similar to that of the U.S.S.R. probe.

The fifth American satellite, launched in December of the year, was easily its largest [approximately 3,965 kilogrammes (8,750 pounds), of which 76 kilogrammes (168 pounds) consisted of payload], and it included among its instruments communications equipment to enable messages, carried on erasable tape, to be broadcast from the satellite by voice and teletype in response to a signal from the ground. The erasing from the tape in the satellite of the message and the recording and broadcasting of a new message, all by remote control from the ground, proved successful and could lead eventually to the utilization of satellites to provide reliable world-wide transmission, by the use of ultra-high frequencies and micro-waves, of voice, television and teletype.

1958 also witnessed what may be the first conclusive demonstration that transport by rocket between two widely separated points on the earth's surface is a definite possibility. On 12 December 1958, the United States Navy launched a rocket carrying a 2.25-kilogramme (5-pound) squirrel monkey, to whose body were attached devices for measuring respiration, heart beat, breathing, and voice sounds. For some 8 minutes 20 seconds, the monkey was in completely gravity-free flight, during which its bodily responses did not once waver from the completely normal. His heart beat during the take-off acceleration and the landing deceleration rose from its normal 230 beats per minute to about 280 — not regarded by the medical authorities as a significant increase — and this in spite of the fact that the acceleration pull was about 10, and the deceleration about 40, times the force of gravity. Unfortunately, the experiment was marred by the monkey's drowning after its vehicle landed in the sea. Nevertheless, the experiment is regarded by its sponsors as conclusively demonstrating that it is now physically possible to transport living beings from one point on the earth's surface to another by sustained gravity-free flight through space with successful launching and landing.

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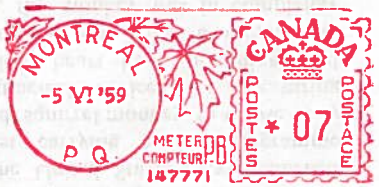
* The launchings during the year are given below in diagrammatic form. The figures quoted, however, must be considered as approximate only.

Satellite	Launched by	On	Weight	Apogee (n. m.)
Explorer I	USA	1/2/58	30.8 lb.	1,366
Vanguard I	USA	17/3/58	3.25 lb.	2,182
Explorer II 1/	USA	26/3/58	31.0 lb.	1,512
Sputnik III	USSR	15/5/58	2,926.0 lb.	1,014
Explorer IV	USA	26/7/58	38.5 lb.	1,192
Atlas 1/	USA	18/12/58	8,750.0 lb 2/	806

1/ Explorer II and Atlas burned up on 27 June 1958 and 21 January 1959 respectively.

2/ As mentioned this includes the weight of the final stage of the rocket plus 168 pounds of instruments.

END



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