

787s have been in service for more than four years. An analysis of airline fleet and schedule data reveals that many have been deployed on new routes. They have also been used on established services between major hubs. A number of case studies provide an insight in to how they are being used by different airline business models.

787 market focus: How is the aircraft being deployed?

The 787 was first operated in October 2011. There are now 370 787s in commercial service. The 787 family offers lower cash operating costs over previous generation aircraft. It will provide similar capacity to a medium-widebody aircraft and a range more typical of larger aircraft, such as the 777 or 747.

The 787 has since been marketed as an ideal platform for generating new route and airport- and city-pair opportunities on long-haul sectors with lower demand levels that cannot sustain large widebody operations. These new routes might include new point-to-point services between secondary cities. This is possible because the 787's unit cost per available seat-mile (ASM) would be comparable with larger aircraft, thereby making routes with lower demand levels economically viable.

The 787's lower cash operating costs will also see it replace older generation aircraft on existing markets.

Aircraft Commerce has analysed airline fleet and schedule data to identify how operators are deploying the 787 four years after it entered service. The analysis focuses on medium- and long-haul routes, and whether the 787 is being used to open new markets, or replace other types on established routes and markets. A general market overview is given, with a number of specific airline case studies.

787 family

The 787 family includes three variants: the 787-8, -9 and -10. The 787-8 and -9 are already in service. The first 787-10 is due to enter service in 2018.

The 787-8 and 787-9 have a

maximum range of 7,355 nautical miles (nm) and 7,635nm with a full two-class passenger payload (*see table, page 18*). Boeing claims the 787-10 will have a range of up to 6,430nm with a full two-class passenger payload.

According to Boeing, the 787-8, 787-9 can accommodate up to 242 and 290 seats in a typical two-class configuration (*see table, page 18*). Boeing claims the 787-10 will seat up to 330 passengers in a two-class layout.

In reality the capacity of each 787 variant can vary by operator. Airlines are increasingly viewing the cabin interior as an important product differentiator in the competitive long-haul market. This has led to a wide range of different seating configurations. One particular influencing factor among the 787 fleet is the economy cabin layout. Some operators, including Japan Airlines (JAL) have chosen an eight-abreast configuration in economy, while most have chosen nine-abreast economy class seating.

The difference in 787 capacity between a full service operator and a holiday airline shows the wide range of configurations possible. JAL operates 787-8s with only 161 seats in a three-class arrangement consisting of business, premium economy and economy cabins, while Thomson Airways is flying the same variant with up to 291 seats with premium economy and economy cabins.

A similar contrast is apparent among 787-9 operators. JAL is flying this variant with as few as 195 seats in a three-class set-up with business, premium economy and economy cabins, while Norwegian has configured its first 787-9 with 344 seats in a two-class arrangement with premium economy and economy cabins.

The 787-8 can be configured with a similar number of seats to the 767-300ER and A330-200 (*see table, page 18*). The 787-8 is slightly larger than the 767-300ER, but has 1,850nm longer range. The 787-8 has a 100nm range advantage over Airbus's latest 242-tonne maximum take-off weight (MTOW) option for the A330-200.

The 787-8 also has 300nm longer range than a 777-200ER, and similar range to a 777-300ER. These two 777 variants have 71 and 154 more seats based on typical manufacturer configurations.

British Airways (BA) operates the 767-300ER, 777-200ER, 777-300ER and 787-8. It configures the 787-8 with 214 seats in a three-class layout with business, premium economy and economy cabins. On long-haul flights it configures its 767-300ERs with 189 seats in a similar three-class arrangement. This is 25 fewer than the 787-8. BA configures its 777-200ERs with 224 seats or 275 seats in three- or four-class arrangements. This is 10-61 more seats than the 787-8. BA's 777-300ERs are configured in a four-class arrangement with 299 seats, 85 more than the 787-8.

The 787-9 has similar seat numbers to the A330-300 (*see table, page 18*). The 787-9 offers nearly 1,300nm longer range than Airbus's latest 242t MTOW option for the A330-300.

Virgin Atlantic operates the 787-9 and A330-300 in a three-class layout consisting of upper class, premium economy and economy cabins. In this layout the A330-300 accommodates 266 seats, two more than the 787-9 with 264.

The 787-9 also has a nearly 600nm longer range than a 777-200ER, and

LONG-HAUL AIRCRAFT CAPACITY AND RANGE

Aircraft type	787-8	767-300ER	A330-200
Two-class seating	242	236	
Three-class seating			247
Range (nm)	7,355	5,500	7,250
Aircraft type	787-9	A330-300	777-200ER
Two-class seating	290		313
Three-class seating		277	
Range (nm)	7,635	6,350	7,065
			325
			7,590
Aircraft type	787-10	777-300ER	A350-1000
Two-class seating	330	396	
Three-class seating			366
Range (nm)	6,430	7,370	7,950
			410
			7,730

Notes:

1). Seat capacity figures based on standard manufacturer examples. These may vary by airline. Range is based on full passenger payload.

250nm longer range than a 777-300ER. The two 777 variants have about 23 and 106 more seats according to the standard manufacturer two-class configuration.

The 787-10's seat capacity positions it between the 777-200ER and 777-300ER. In a standard two-class configuration, the 787-10 will provide 17 more seats than a 777-200ER and 66 fewer than a 777-300ER. The 787-10 is likely to have a seat capacity close to the 777-200ER.

The 787-10 will have about 600nm and 950nm shorter range than the 777-200ER and 777-300ER.

The latest competition for the 787 family comes from the A350-900, which entered service in late 2015. The A350-900's standard three-class layout is up to 325 seats. Airbus indicates that the A350-900 might accommodate about 315 seats in a standard two-class layout.

These seat numbers position it between the 787-9 and 787-10. In a two-class layout, the A350-900 has 25 more seats than a 787-9, and 15 fewer than a 787-10. The A350-900 would most likely offer a similar range to the 787-9, and an extra 1,000nm of range over the 787-10.

The A350-1000 will be larger and potentially offer more range than all of the 787 variants. It is more likely to compete with Boeing's 777X series.

787 fleet

There are 370 787s in passenger service with 36 operators. This includes 284 787-8s and 86 787-9s.

The 787-8 fleet includes 196 aircraft with GENx-1B, and 88 with Trent 1000 engines. The 787-9 fleet includes 41 aircraft with GENx-1B engines and 45 with Trent 1000 powerplants.

The largest 787 operators are All Nippon Airways (ANA) with 44 aircraft, United Airlines (28), JAL (26), Qatar Airways (26) and Air India (21). Other significant operators include American Airlines, BA, Ethiopian Airlines and China Southern Airlines. These are due to

take delivery of more aircraft over the next few years.

ANA, United and JAL all operate 787-8s and -9s. Another five operators have both variants in their fleets: LAN Airlines, BA, Air Canada, Scoot and Norwegian.

The largest 787-8 fleets are operated by ANA (35), Qatar Airways (26), JAL (23), Air India (21) and American Airlines (15). The 787-8 is in service with 30 operators.

The largest 787-9 fleets are operated by United (16), ANA (9), Virgin Atlantic (9) and LAN Airlines (8). BA, Scoot, Air New Zealand and Vietnam Airlines all have six 787-9s in service. The 787-9 is in service with 14 operators.

There are almost 760 787s on order, including a backlog for 456 787-9s, 162 787-10s and 139 787-8s.

According to Flightglobal's Fleets Analyzer database, the largest outstanding orders, accounting for all variants, are for Etihad Airways (66), Air Lease Corporation (50), AerCap (45), ANA (39) and Singapore Airlines (30). There are also 51 787s on order for an unannounced commercial customer.

The largest outstanding orders for 787-8s are for Aeroflot (18), Delta Air Lines (18) and the Republic of Iraq (10).

There are 49 787-9s on order for an unannounced customer. The next largest outstanding orders for 787-9s belong to AerCap (42), Etihad (36) and ANA (35). The largest outstanding orders for 787-10s are for Etihad (30), Air Lease Corp (30) and Singapore Airlines (30).

787 network trends

Aircraft Commerce has analysed annual non-stop scheduled airline capacity data from Innovata for 2016, and compared it to data from 2010, the year before the 787 entered commercial service. This will help identify the impact the 787 has had on airline network, capacity and fleet planning strategies

since it entered service.

The following analysis only considers capacity and schedule data for routes of 1,500nm or more. It focuses on medium- and long-haul schedule trends, since the 787 is primarily designed for long-haul missions. In addition, only sectors with a minimum of 10 annual frequencies are included in this analysis. Irregular services, including short-haul aircraft familiarisation exercises, are filtered out.

These sector length and frequency filters mean that not all 787 operated flights and seats are accounted for. Some operators will use 787s on shorter and more irregular sectors.

787s are scheduled to operate 200,786 flights and provide more than 54 million seats on sectors of 1,500nm or more in 2016. 787-8s will operate at least 140,743 of these flights and provide more than 35 million seats.

The 787-9 fleet will operate at least 52,255 seats and provide more than 17 million seats. It was not possible to identify whether the remaining 787 flights will be operated by 787-8s, 787-9s or a mixture of the two.

Regional trends

Asia Pacific, Europe and North America will be the largest origin markets for 787 services on medium- and long-haul sectors in 2016. These three regions will account for 73% of originating 787 flights and capacity.

The largest 2016 capacity on 787-operated services longer than 1,500nm will be on intra-Asia Pacific services (see table, page 22). The next largest 787 market will be between North America and Asia Pacific, Europe and North America, Europe and the Middle East and Europe and Asia Pacific.

Operator trends

Qatar Airways will operate the most 787 flights and generate the most 787

Top 787 markets by two-way capacity in 2016 - sectors longer than 1,500nm

Regional traffic flow	2016 Seats	2016 Flights
Asia Pacific - Asia Pacific	10,073,880	37,002
North America - Asia Pacific	7,191,195	27,675
Europe - North America	6,842,962	23,599
Europe - Middle East	4,694,898	17,891
Europe - Asia Pacific	3,998,324	14,554

Source: Innovata

capacity on sectors of 1,500nm or more in 2016. The next largest capacity providers will be ANA, United, BA, Air Canada and Air India.

All of Qatar Airways' 787 capacity will be provided by 787-8s. The next largest 787-8 operators by capacity will be Air India, Ethiopian Airlines, Jetstar Airways, ANA and JAL.

The largest 787-9 operator by capacity in 2016 will be Virgin Atlantic. The next largest are likely to be United, BA, ANA and Air Canada. LAN Airlines could also feature in this list, but it is not possible to determine how much of its 787 capacity will be split between 787-8s and 787-9s in 2016.

Route trends

A route is classified as an airport-pair with a minimum of 10 annual frequencies in each direction.

A new route is one that did not exist in 2010, or that was served by fewer than 10 return rotations in that year.

787s will operate on 429 routes with sector lengths of 1,500nm or more in 2016.

The route with the most 787-operated capacity will be London Heathrow (LHR) to Delhi (DEL) (see table, page 24). Other routes with considerable 787 capacity include: LHR to Los Angeles (LAX); and Doha (DOH) to Copenhagen (CPH) and Johannesburg (JNB).

Most of the 10 largest 787 routes link main hub airports.

LHR is the origin airport with the most departing 787 flights in 2016. The next two largest origin airports are Tokyo Narita (NRT) and DOH.

New routes

About 135, or one-third, of the new routes served by 787s in 2016 are new airport-pairs. These were either not served in 2010, or were served with fewer than 10 return frequencies.

787s are scheduled to provide 69% of the annual flights and capacity available on the 135 new airport-pairs in 2016.

In some cases, capacity on these new

markets is provided exclusively by 787s.

This indicates that some routes may only have been introduced due to benefits associated with the 787's design or economic performance. The 787 has therefore made their operation possible.

Examples of new airport-pairs operated exclusively by 787s in 2016 include a range of services from Ethiopian Airlines' main hub at Addis Ababa (ADD). Ethiopian Airlines' 787-8s will provide the only scheduled services from ADD to Cape Town (CPT), Dublin (DUB), São Paulo (GRU), Hong Kong (HKG) and Vienna (VIE).

On some of the new routes, 787s operate alongside other types including 777s, A330s, 767s, 747-400s and even A321s, A320s and 737-800s. This is due either to a single carrier using more than one type on the route, or because the airport-pair is served by multiple airlines operating different equipment.

Sector lengths vary widely across the 135 new airport-pairs on which 787s will operate in 2016, ranging from 1,615nm to 7,334nm. Three-quarters of the 787 flights operated on these new routes will have sector lengths of 3,000nm or more. This indicates that many 787 operators are using it for long-haul services.

In cases where it is possible to determine the exact 787 variant, there is a slight difference in the range of sector lengths flown by 787-8s and 787-9s on the new airport-pairs. The 787-8 will operate on sectors of 1,615-6,449nm, while the 787-9 will operate on routes of 1,958-7,334nm. The slight tendency towards longer distance operations for the 787-9 is not surprising given that model's range.

In many cases the new airport-pairs either connect a main hub to a secondary destination, or directly connect two secondary markets. An example of a new hub-to-secondary market link is the route between Shanghai (PVG) and ADD. An example of a link between two secondary markets is the route between Brisbane (BNE) and Honolulu (HNL). The profile of these new routes suggests that airlines are using 787s on new, thinner demand long-haul markets.

Existing routes

The remaining two-thirds of 787 flights will be operated on established routes in 2016. The large number of established routes now being served by 787s suggests that airlines are equally keen to deploy these assets on established markets where they might provide more efficient operations than existing aircraft.

787s will operate on nearly 300 established airport-pairs with sector lengths in excess of 1,500nm in 2016. These are airport-pairs that were already served by at least one airline before the 787 entered service.

In some cases, 787s have completely replaced older aircraft types on these established routes. An example of this is the LAN Airlines service between Auckland (AKL) and Santiago (SCL). In 2010 LAN operated A340s on this route. In 2016 it will operate twice as many frequencies with double daily rotations split between 787-8s and 787-9s.

There are also examples of 787s operating alongside other aircraft types on the established airport-pairs. They have partially replaced these older aircraft types in some cases.

Types that have been completely or partly replaced by 787s since 2010 include 747-400s, 767, A340s and 757s.

Airline focus

The long-haul fleets and route networks of some of the largest 787 operators have been analysed to provide more detailed insight into the type's operational deployment. These case studies cover airlines from Asia Pacific, Europe and North America. They also provide an insight into how the 787 is being deployed under full-service, low-cost and holiday airline business models.

ANA

ANA is a Japanese full-service airline that provides international and domestic flights with a fleet of narrowbody and widebody aircraft. Its largest hubs for international sectors longer than 1,500nm are NRT and Tokyo Haneda (HND).

ANA was the launch customer for the 787, and it introduced the 787-8 in 2011. ANA's 787 fleet now includes 35 787-8s and nine 787-9s. The carrier has a further 35 787-9s, three 787-10s and a single 787-8 on order.

In parallel with increasing its 787 fleet, ANA has withdrawn or reduced its use of some older widebody types. Since 2010 it has completely withdrawn the 747-400 from service, and reduced its 767-300 fleet from 32 to 13 aircraft. Its 767-300ER, 777-200ER and 777-300ER fleets have also grown since 2010.

ANA will operate 787s on 21 routes with sector lengths longer than 1,500nm in 2016. Most of these have been introduced to the airline's route network since 2010. 787-8s will operate on 18 routes and 787-9s on six routes. Three routes will be operated by both variants during 2016. 787-8s will operate from HND and NRT, but ANA's 787-9s will all operate from HND in 2016.

ANA will operate 787s on 17 routes that are new to the airline's network since 2010. This includes nine new services from HND and eight from NRT.

The new destinations served by 787s from HND are Paris (CDG), Jakarta Indonesia (CGK), Frankfurt (FRA), HAN, Honolulu (HNL), Manila (MNL), Munich (MUC), Sydney (SYD) and Vancouver (YVR). ANA will serve the HND-HAN sector exclusively with 787-8s. The CGK, MUC and SYD sectors will be served exclusively by 787-9s and the CDG and YVR routes will be by both 787-8s and 787-9s during 2016. The service between HND-FRA will be operated by 787-8s and 777-300ERs, while the services between HND-HNL and HND-MNL will be served by 787-8s and 767s.

HND was mainly used as a domestic hub until 2010, when international flights were re-introduced. This is no doubt an influencing factor on the number of new services opened from HND since 2010, as

well as any possible operational benefits provided by the 787.

The new ANA destinations served by 787s from NRT in 2016 are Mumbai (BOM), Brussels (BRU), CGK, Dusseldorf (DUS), Kuala Lumpur (KUL), MNL, Seattle (SEA) and San José (SJC). Most of these routes will experience an annual daily return frequency operated exclusively by 787-8s. The MNL sector will be mainly served by 767s in 2016, with a small number of frequencies provided by 787-8s.

Seven of ANA's 17 new routes are airport-pairs that were served by other carriers in 2010: HND to CDG and HNL; and NRT to BOM, CGK, KUL, MNL, and SEA.

Most of ANA's 17 new routes link one of the two Tokyo airports to other major international hubs, but the services from NRT to DUS and SJC indicate that the airline is also using 787s to open new markets to secondary destinations.

ANA has also deployed 787s on four existing routes linking HND and NRT to Bangkok (BKK) and Singapore (SIN). In both cases 787s have replaced capacity previously provided by 767s.

HND-BKK and HND-SIN were previously operated by 767s with an annual frequency equivalent to one return flight per week. In 2016 they are exclusively operated by 787s with

frequencies equivalent to double-daily return flights. HND-BKK is served by 787-8s, while HND-SIN will be operated by a mix of 787-8s and 787-9s.

787-8s and 777s will provide the equivalent of twice daily return services on NRT-BKK and NRT-SIN. These sectors were also previously operated by 767s at lower frequencies.

ANA's 787-8s will operate on sectors between 1,615nm and 5,524nm, on routes longer than 1,500nm. This compares to a range of 2,856nm 5,254nm for the airline's 787-9s.

BA

BA is the flag carrier of the United Kingdom (UK) and its main hubs are at LHR and London Gatwick (LGW). It is a full-service operator with a mix of domestic and international services operated by a fleet of narrowbodies and widebodies.

BA's fleet of 787s includes eight 787-8s and six 787-9s. It has an additional 15 787-9s, 12 787-10s and a single 787-8 on order. BA's widebody fleet has undergone several developments since 2010. As well as adding 787s, BA has introduced A380s and 777-300ERs, and reduced its in-service fleet of 747-400s from 49 to 40, and its active fleet of 767-300ERs from 21 to 11, during the same period.

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TOP 10 787 ROUTES BY TWO-WAY CAPACITY IN 2016 - SECTORS LONGER THAN 1,500NM

Airport Pair	Origin Country	Destination Country	Seats	Flights
London Heathrow (LHR) - Delhi (DEL)	UK	India	928,712	3,354
Madrid (MAD) - Bogota (BOG)	Spain	Colombia	474,928	1,832
London Heathrow (LHR) - Los Angeles (LAX)	UK	USA	463,400	1,324
Auckland (AKL) - Santiago (SCL)	New Zealand	Chile	437,004	1,464
Tokyo Haneda (HND) - Singapore (SIN)	Japan	Singapore	426,968	1,464
Miami (MIA) - Santiago (SCL)	USA	Chile	393,417	1,348
Bangkok (BKK) - Delhi (DEL)	Thailand	India	376,164	1,472
Singapore (SIN) - Taipei (TPE)	Singapore	Taiwan	366,100	1,046
Doha (DOH) - Copenhagen (CPH)	Qatar	Denmark	361,608	1,464
Doha (DOH) - Johannesburg (JNB)	Qatar	South Africa	361,608	1,464

Source: Innovata

Notes: Figures for each airport-pair include both directions of travel. Seat and flight numbers are therefore based on two-way capacity.

In 2016 BA will operate 787s on 24 routes longer than 1,500nm. All of these routes will be flown from LHR where BA bases its entire 787 fleet. 787-8s will be used on 12 routes, and 787-9s on 16.

Five of the 24 routes are new to BA's network since 2010. These are LHR to Austin (AUS), Chengdu (CTU), Seoul Incheon (ICN), KUL and SJC.

LHR-CTU and LHR-ICN will be operated exclusively by 787-8s, while LHR-KUL and LHR-SJC will be exclusively operated by 787-9s. Capacity on LHR-AUS is scheduled to be split between 787-9s and 777s in 2016.

LHR-ICN and LHR-KUL are existing airport-pairs. These routes linking London to Asia Pacific were already being operated by other airlines in 2010.

LHR-AUS, LHR-CTU and LHR-SJC are entirely new airport-pairs, since they were not operated by any carriers in 2010. BA's introduction of these services shows its willingness to deploy 787s to open new secondary long-haul markets.

BA has also deployed 787s on 19 of its established routes from LHR, including links to major hubs in North America, India and the Middle East.

The 787s have completely and exclusively replaced capacity provided by other types in 2010 on four of these routes. 787s have completely replaced 777s on services between LHR and Abu Dhabi (AUH) and LHR and Chennai (MAA). LHR-AUH and LHR-MAA will be served by single daily 787-9 and -8 frequencies in 2016.

BA will offer a daily frequency, completely replacing capacity previously provided by 767s and 777s, with a mix of 787-8s and 787-9s on services between LHR and Hyderabad (HYD). A mix of 787-8s and 787-9s is scheduled to provide a daily frequency in 2016 on services between LHR and Calgary (YYC). This route was served by a daily 767 service in 2010.

787s will split capacity with other types including 747-400s, 767-300ERs and 777s on the other established routes.

In some cases the introduction of 787s on these routes has led to a reduction in the capacity provided by the other aircraft. On the LHR-BOM service, for example, the introduction of the 787-9 will see less capacity operated by 747-400s and 777s when compared to 2010. In total, the capacity provided by BA on this route will increase by 3% with only a 1% increase in the number of flights.

Fourteen of the 19 established routes that BA's 787s will serve in 2016 have seen an increase in capacity since 2010. Only half of these have seen any real increase in frequency.

On routes longer than 1,500nm, BA will operate 787-8s on sectors from 1,908nm to 4,797nm, and 787-9s on routes of 2,564nm to 5,729nm in 2016.

Norwegian

Norwegian operates more than 400 routes across 130 destinations. It is the third largest low-cost carrier (LCC) in Europe.

Norwegian initially focused on short-haul European operations with a fleet of 737-800s, but has entered the long-haul market since the introduction of 787s.

Its long-haul fleet includes eight 787-8s and one 787-9. There are a further 29 787-9s on order for Norwegian.

In 2016 Norwegian will operate 787s on 30 routes longer than 1,500nm. All of these were opened after the introduction of the 787-8 to the airline's fleet. Its main 787 operating bases are LGW, Stockholm Arlanda (ARN), Oslo (OSL) and CPH. Most of its 787 services link these hubs to destinations in the US, including New York (JFK), Fort Lauderdale (FLL), LAX and Orlando (MCO), and are operated at less than daily frequencies.

"The 787-8 is the workhorse of our long-haul operation, providing low-cost travel on direct transatlantic links between London, Oslo, Stockholm and Copenhagen and the US and Caribbean," explains Thomas Ramdahl, chief commercial officer at Norwegian. "The

787-8 also serves Bangkok from Stockholm, Oslo and Copenhagen.

"We will take delivery of at least four new 787-9s in 2016," continues Ramdahl. "These offer more seats, increased cargo capacity and extended range compared to the 787-8."

Norwegian plans to deploy its first 787-9s on existing services from LGW to Boston (BOS), FLL, JFK, LAX and Oakland (OAK).

Some of Norwegian's 787 routes, such as LGW-OAK and LGW-FLL, demonstrate how the aircraft is being used to open new secondary markets. Many of Norwegian's 787 routes appear to serve thinner demand markets, since only six out of 30 were established airport-pairs in 2010.

Norwegian believes that its low-cost, long-haul business model would not work with other older aircraft types. "The 787 is vital to the success of our long-haul operation," claims Ramdahl. "Others have tried and failed to make low-cost long-haul work in the past, but they did not have the 787. It is up to 20% more fuel-efficient and keeps cash operating costs down. We are able to pass on these cost savings to passengers."

On medium- and long-distance routes, Norwegian will operate 787-8s on sectors from 2,853nm to 4,887nm in length, and 787-9s on routes between 2,853nm and 4,762nm during 2016.

Thomson Airways

Thomson Airways is the UK's largest holiday airline. It operates short-, medium- and long-haul services with a fleet of narrowbody and widebody aircraft, and was the first UK-based airline to introduce the 787.

Thomson Airways currently has nine 787-8s in operation and is looking to expand its fleet with up to four new 787-9s. The first 787-9 is due to join the fleet in summer 2016.

The 787s have primarily been used to replace 767-300ERs. In 2010 the airline



had 12 767-300ERs in service, but it now has only one.

Thomson Airways' largest 787 operating bases are LGW and Manchester (MAN). It also flies the aircraft from other UK regional airports including Birmingham (BHX), East Midlands (EMA), Glasgow (GLA), Newcastle (NCL) and London Stansted (STN).

In 2016 it is scheduled to operate 787s on about 45 routes longer than 1,500nm. These range from medium-haul services to Cyprus, Greece, Turkey and the Canary Islands to those further afield including flights to Barbados, Mexico and the US.

Six of the 45 routes are new to Thomson Airways' network since 2010. They are all long-haul routes and include services from LGW to Phuket (HKT), Mauritius (MRU) and Puerto Vallarta in Mexico (PVR). There are also new services from MAN-PVR, and from STN to Cancun (CUN) and Orlando Sandford (SFB). The new routes will be operated exclusively by 787-8s in 2016.

All these new Thomson Airways routes are new airport-pairs that were not served in 2010. This shows that the airline is using 787s to operate new secondary destination markets.

"Our ambition when introducing the 787 was always to be able to open new routes and we are now operating to Mauritius, Mexico's Pacific coast and Cuba as well as Costa Rica," says John Murphy, managing director at Thomson Airways. "We will also be introducing Sri Lanka to the route network from November 2016, and are looking at other destinations such as expanding operations in the Eastern Caribbean islands, in the Antilles, and in South-East Asia to Vietnam and Malaysia."

Thomson Airways credits the 787's extended flying range and on-board comfort levels for making these new routes possible.

Another three routes can be classified as new regular services for Thomson Airways, since they were operated with fewer than 10 return flights in 2010. These are BHX to Bridgetown, Barbados (BGI), LGW to Liberia in Costa Rica (LIR) and MAN-BGI. All of these routes will be operated with at least 39 return flights in 2016.

Thomson Airways has also deployed 787s on 36 of its established services. The 787s have completely replaced 767-300ERs on many of the existing long-haul routes since 2010. In some cases frequency and capacity have been increased, in others reduced.

Unlike the new routes, some of the established services link the UK to traditional holiday destinations much closer to home such as Tenerife (TFS), and to medium-haul destinations in Turkey, Greece and Cyprus. 787s typically supplement frequencies provided by the Thomson Airways' 737-800s on these routes. Combined 737-800 and 787-8 operations have replaced capacity previously operated by 757-200s, 767-300ERs and A320s in some cases.

On sectors longer than 1,500nm, Thomson Airways' 787 routes vary in distance from 1,502nm to 5,346nm.

United

United is a full-service US major carrier with hubs at Chicago O'Hare (ORD), Denver (DEN), Houston (IAH), LAX, New York-Newark (EWR), San Francisco (SFO) and Washington Dulles (IAD). It serves 342 destinations across

Airlines have used 787s to add new routes to their networks. Many of these new routes are new airport-pairs that were not served by any airlines in 2010. Some of the new routes are long-haul services which link a hub airport to a secondary location, or offer a direct link between two secondary markets. In 2016 United is scheduled to operate 787s on 26 routes with sector lengths longer than 1,500nm.

58 countries. Its current fleet and network are the result of a merger between United and Continental Airlines.

United currently operates 12 787-8s and 16 787-9s. It has a further two 787-9s and 23 787-10s on order. Since 2010 the combined United and Continental fleet has seen the complete withdrawal of 767-200ERs, and a slight reduction in the number of active 747-400s. The 757-200 fleet has more than halved, but the number of 767-300ERs, 767-400ERs, 777-200s and 777-200ERs has remained stable.

In 2016 United will operate 787s on 26 medium and long routes. Its main hubs for 787 operations will be IAH, LAX and SFO; but there will also be services from DEN and NRT. All of United's 787 flights from LAX will be operated by 787-9s in 2016.

Twelve of the 26 routes are new to United's network since 2010. These include services linking SFO to AKL, CTU, HND, SIN, Tel Aviv (TLV), Taipei, Taiwan (TPE), and Xi'an, China (XIY). Other new routes include IAH to Lagos (LOS) and SCL; LAX to Melbourne (MEL) and PVG; and DEN-NRT. A number of these routes indicate that United is using 787s on new thinner demand long-haul markets.

The airline will exclusively operate 787s on nine of its new routes in 2016. DEN-NRT, IAH-LOS, SFO-CTU and SFO-XIY will be operated by 787-8s; LAX-MEL, LAX-PVG and SFO-SIN will be operated by 787-9s; and SFO-AKL and SFO-TLV will be operated by a mix of 787-8s and 787-9s. The other new routes will see 787-9s split frequencies with 767s or 777s during 2016.

Seven of United's new routes are new airport-pairs that were not served in 2010. Another six were established markets, including services from LAX and SFO to various Asia Pacific destinations.

United will also deploy 787s on 14 of its established routes in 2016. Most of these link IAH, LAX or SFO to major hubs in Asia Pacific, Europe or South America. 787-8s will operate on three of these routes; while 787-9s are scheduled to provide capacity on 11, perhaps indicating that the larger variant's extra capacity is required to serve the major primary markets.

787-8s will provide United's only services between IAH and GRU, and SFO to Kansai (KIX) in 2016. These aircraft have completely replaced capacity previously operated by 767-200ERs and 777s. On IAH-GRU, 787-8s will operate at a similar frequency, but offer more capacity than the previous 767-200ER services. Replacing 777s with 787-8s on SFO-KIX will result in a 15% reduction in capacity compared to 2010, despite an increase in frequency.

United has also introduced 787-8s on IAH-LHR, where they have replaced capacity previously operated by 777s. The airline also has 767s scheduled to operate this route during 2016.

787-9s will exclusively operate United's LAX-NRT service in 2016, and completely replace capacity provided by a mix of 747-400s and 777s in 2010. The route will be operated at the same single daily frequency, but the introduction of the 787-9 will result in a 10% increase in capacity compared to 2010.

On 10 other established routes, 787-9s will share capacity with other types during 2016. Capacity is shared with 777s on nine of these routes. On the other route it is shared with 767s. There are examples of routes where 747-400 operations have been completely replaced by a combination of 787-9s and 777s in 2016, such as LAX-SYD and SFO-SYD.

This resulted in a reduction in annual capacity on both routes compared to 2010. There are also examples of 787-9s and 777s replacing 767-400s on a number of services from IAH.

United's 787-8 medium- and long-distance routes be 4,201-6,449nm. This compares to 2,889nm to 7,334nm for its 787-9 operations.

Shorter sectors

This analysis has focused on medium- and long-haul operations, but evidence suggests 787s are also being used on shorter distance services.

Data from Innovata schedules via Diio Mi indicates that one-third of all scheduled 787 flights in February 2016 had stage lengths of less than 1,500 statute miles. This is equal to 1,303nm.

This statistic could be slightly misleading. 787-8s and 787-9s are being delivered to new operators regularly, so some of the short-distance scheduled sectors highlighted by this data may be due to aircraft familiarisation operations. This are required by an airline to demonstrate its operational competency, and familiarise its flightcrew with a new aircraft type.

There are, however, signs that some operators will be using their 787s on short sectors for regular scheduled

services. ANA operated the most 787 flights with sector lengths shorter than 1,500nm in February 2016. It has used 787s on domestic services in Japan, such as the routes between HND and Fukuoka (FUK), Osaka (ITM) and Matsuyama (MYJ). United Airlines has also been using 787s on domestic services.

Summary

Airlines have clearly used 787s to open new long-haul markets, often linking two secondary airports or one secondary airport with a major hub.

Operators have also deployed 787s on established markets, including on links between two major hubs. In some cases 787s have partly or completely replaced older aircraft on established services. This includes 757s, 767s A340s and 747-400s.

There is some evidence to suggest a trend for 787-9s to deployed on slightly longer-haul routes than 787-8s, but this is not surprising given the larger variant's additional range.

Some airlines are using 787s on relatively short-haul sectors. ANA and United are just two carriers that have deployed 787s on domestic services. **AC**

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