TrueNoord
Regional Aircraft Leasing

TrueNoord Insight

Large Turboprop Report

The Evolving Marketplace

December 2019 & June 2020

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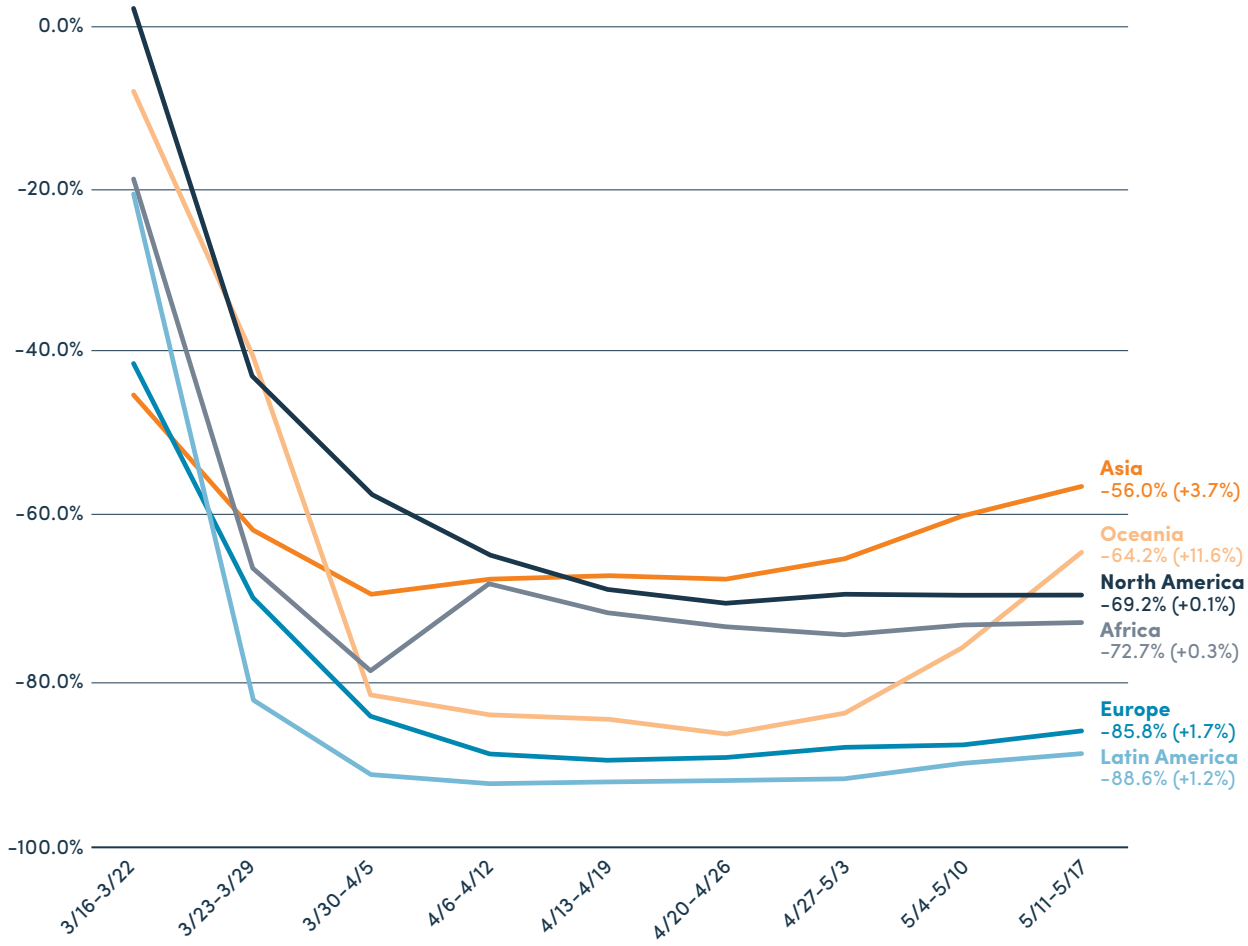
Contents

COVID-19 Related Update

Since the following report was completed in December 2019, the world has witnessed both the start of the most serious health and economic crisis in memory, which renders some of its sections materially out of date.

With both demand and supply for air travel down by at least 60% and in some areas by as much as 90% (Figure A), the short-term landscape looks markedly different than late 2019. Figure A also suggests that flight activity has reached its low point and is beginning to recover in some areas.

Figure A: Average Decrease in Flights by Region (Week by Week v Jan 4-16 2020)



Source: mba

Therefore, this update provides fresh insight on the Market Review (section 3), Market Availability & Demand (section 5) and some comments on TrueNoord CMV & FV Assessment (section 6). It would be premature to provide extensive and confident insights on current or future market values since there are as yet almost no data points to assess. Some appraisers have already been tempted to reduce current market values and lease rates, but a lack of transactional data, particularly in the relatively small regional sector renders such an approach fraught with risk especially as the appraisal community should be led by the market and not vice-versa. However, some of the drivers that may impact values and some opinions are briefly assessed.

3. Market Review Update

3.1 Numbers in Service

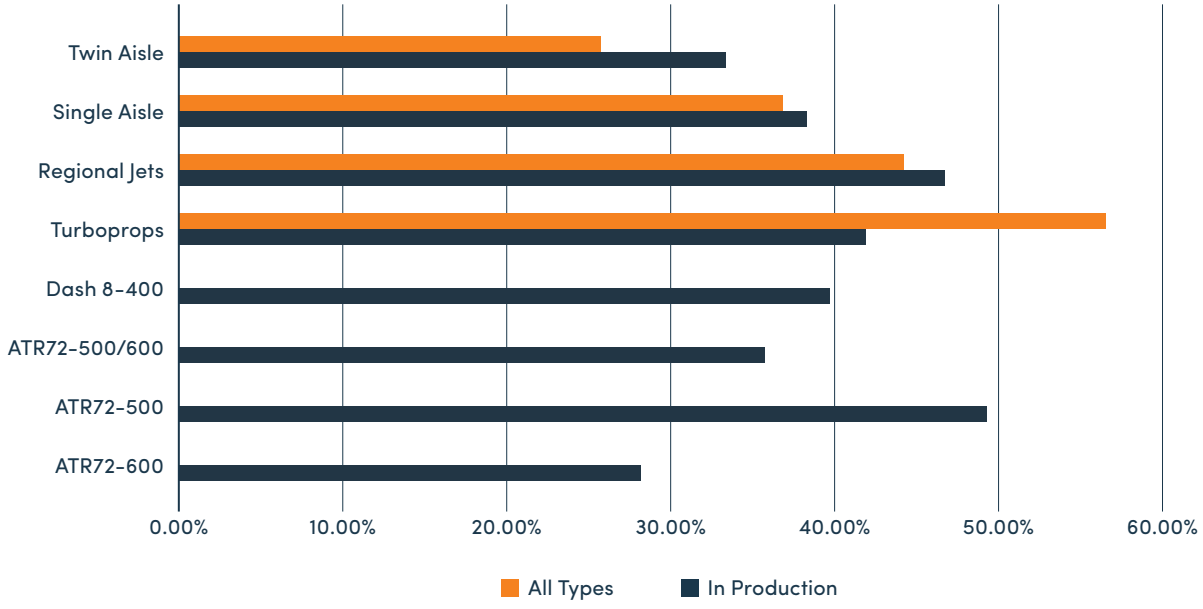
Since early 2020 the number of ATR72s and Dash 8-400s in service has declined dramatically in line with most other aircraft types.

Of the previously active fleet, the number of in service ATR72-600s has reduced to a low point of 136 aircraft with 350 now temporarily parked. This means that under 30% of the fleet remains in service as shown in Figure B below. By contrast the number of the older ATR72-500s that remain in active service is greater at 49% of the fleet. The difference in active fleets across the two models is driven by some of the large ATR72-600 operators grounding all or most of their entire fleets. This includes many APAC fleets including: New Zealand's Mount Cook; Indigo; Bangkok Airways and a substantial proportion of Lion Air's Wings operation, which since the start of Indonesia's ban on domestic flights, has diminished the active fleet.

Although the proportion of the ATR72-500 fleet that remains in service is higher, the part of the fleet that is not grounded also contains a large number of aircraft (64) that were already stored before the COVID-19 outbreak.

At first glance, the Dash 8-400 fleet looks more active (39.7%) than the ATR72-600 fleet or similar to the combined active fleets of both ATR72-500 and ATR72-600 versions, but this masks the reality that much of the reduced active Dash 8-400 fleet has only been hastened rather than caused by, the current pandemic. This has affected its European footprint in particular. The demise of Flybe, the world's largest Dash 8-400 operator, was only accelerated by COVID-19 and has since been followed by the bankruptcy of LGW. Eurowings had previously stated that it intended to phase out the use of the Dash 8-400s in LGW. Similarly, Air Baltic and Austrian had already announced the phase out of the type. Accordingly, it is likely that few of these specific fleets will resume service in the post COVID-19 environment.

Figure B: Proportion of Total Fleet in Service (April 2020)



Source: Ascend by Cirium & CH-Aviation

3.3 Firm Order Backlog

At this time, the current pandemic has not yet had a material impact on turboprop orders although there have been some changes unrelated to COVID-19.

ATR states that it has not suffered from any recent cancellations, but orders for the ATR72-600 have already been slowing over the last year. During 2019, orders reduced to 41 aircraft although commitments for the ATR family showed greater stability as 38 orders for the smaller ATR42-600 were also recorded so that the combined total of 79 units represents growth over 2018. The sizeable order for the cargo version of the ATR72-600 from Fedex, with deliveries planned for 2020-21, makes the ATR orderbook look relatively robust.

De Havilland has also not experienced any known COVID-19 related cancellations or deferrals, but has nevertheless suffered from the cancellation of 20 aircraft by Spicejet. This represents close to half of its remaining Dash 8-400 backlog. This cancellation is now the subject of a widely reported legal dispute between the OEM and the airline.

3.5 Large Turboprop Operator Base

It is premature to determine the liquidity of the subject turboprops based on the incumbent operator base as a consequence of COVID-19.

However, there have already been a few unrelated short-term effects. Primarily, the Dash 8-400 has suffered the loss of two of its largest 10 operators with the bankruptcy of Flybe and LGW as mentioned in 3.1 above.

While the disappearance of some operators could negatively impact demand for both used and new aircraft, the current crisis may also create opportunities for such aircraft. As passenger demand has melted away in the short-term, some carriers are now substituting mainline aircraft on short sectors with turboprops. For example, Qantas is now deploying its Dash 8-400s on trunk routes between Sydney, Melbourne and Canberra in place of single aisle jets. A number of others are operating as freight only aircraft including some of the Ethiopian fleet. As traffic recovers beyond the initial stage, narrow bodies are likely to displace smaller aircraft on some trunk routes, but turboprops could remain on other less dense shorter routes hitherto operated by single aisle aircraft for much longer periods.

Section 5 Update

5.1 Demand and Supply Drivers

In an environment where even top-tier carriers see drastically reduced revenue and cash-flow as well as increased uncertainty on the level of future demand, most are seeking to minimise or defer capital expenditure in the short to medium term. Inevitably, this will reduce the demand for new aircraft whether by outright purchases or by way of leases so that new orders and deliveries are likely to be subdued until passenger demand recovers substantially. Furthermore, the lower price of fuel reduces the economic attractiveness of new aircraft over current and older generation less capital intensive aircraft.

However, as demand recovers and is satisfied beyond the redeployment of suitable temporarily stored aircraft, there is likely to be a rebalancing of the fleet mix for airlines to match demand. Some of the currently stored aircraft may never return to service either because their capacity is inappropriate for the demand which exists, or their age and maintenance condition may render their re-entry to service uneconomic. In addition, the onset of tighter environmental regulations will accelerate the retirement of some less efficient aircraft.

At the higher capacity end of the turboprop market for ATR72s and Dash 8-400s, this is initially projected to mean a faster service re-entry for these types than other, larger aircraft types. This is driven by both the expected faster recovery of short-haul domestic travel combined with overall new passenger demand below recent historical levels that would support more operations of smaller capacity aircraft to "right-size" to the new demand patterns. At the same time, a substantial portion of the existing turboprop fleet of all types is older than jet aircraft of all types so that accelerated retirement of the older types is also likely. This should also support the demand for existing younger turboprops in the medium-term and lead to a faster recovery of new aircraft orders.

5.2 Large Turboprop availability

While the majority of the ATR72-600 and Dash 8-400 fleets are temporarily grounded, a proportion of these will not return to service with current operators that have now ceased operations. This means availability for both types has increased. For the ATR72-600 this includes 13 units at Braathens in Sweden. There are also 23 aircraft recorded as inventory held by NAC. This represents a significant increase in short-term availability.

With respect to the Dash 8-400, short-term availability of aircraft is substantially greater with the Flybe fleet of over 50 units now added to stored aircraft not attached to any operator. In addition, the LGW fleet operated for Eurowings, currently 15 units, is now also available. Furthermore, Air Baltic has announced that its 12 aircraft will not re-enter service. Most of these additional aircraft are, however, older generation models that are not NG variants except those at Air Baltic, whose aircraft are 2010-2013 year of manufacture. Although at first sight less impacted by COVID-19, the availability of ATR72-500s was already high with many aircraft being redelivered to lessors in favour of the -600s.

6. TrueNoord CMV and FV Assessment update

Since the onset of the COVID-19 pandemic, there have been very few known transactions for new turboprops other than some scheduled new deliveries. Those that have occurred were based on pricing agreed before the pandemic. This dearth of recent transaction data means that it is not possible to determine its impact on CMVs. However, some appraisers believe that CMVs are likely to fall when more transactions occur. Others recommend that soft value projections may be a better guide to current values given that the normal valuation criteria of "willing buyer and willing seller under balanced market conditions", cannot be satisfied at present. As always, even in normal times, these are appraiser opinions on CMVs and the lack of sufficient data points means that the deviation between those opinions and actual transactions is likely to be greater than before in the short-term.

With respect to the ATR72-600 and Dash 8-400, the appraisal community is expecting large turboprops to benefit from an earlier domestic travel recovery than international services. Consequently, there is a consensus that new or young examples will only be impacted modestly. New ATR72-600 CMV opinions are stable within a range of US$20-21m. By contrast appraisers, who had previously ascribed a US$1-2m premium to the Dash 8-400 compared to the ATR72-600, have reduced this difference to under US$1m so that on average new value opinions have declined by around 5%.

For used large turboprops, there is some level of opinion consensus that CMVs for ATR72-600 aircraft between three and five years of age are down by about 10% compared to pre-COVID-19 levels. There is also a widely held view that the older the aircraft, the greater the level of CMV decline. Although the expected faster recovery of short sector domestic travel, coupled with historically low fuel prices and the relatively lower capital costs of used aircraft may, in the short-term, support used values and lease rates that were already discounted before the pandemic.

For the Dash 8-400, there is now considerable imbalance in supply and demand of used aircraft, particularly those manufactured before 2010 when the NG variant was introduced. Driven by the availability of the Flybe and LGW fleets along with the expected continued phase out from Horizon (most of which are pre-2010), older used values are expected to decline significantly. Most of the Air Baltic fleet is 2010-2013 and may therefore be more attractive to secondary operators.

Executive Summary

Large Turboprop Strengths

- Best operating economics of any sub-150 seat aircraft on sectors up to 300Nm
- Optimised for performance driven missions e.g. short runways
- Increasingly well diversified global operator base
- Much improved acceptance of this asset class among lessors and finance community
- Long economic useful life

Large Turboprop Weaknesses

- Perceived lower on-board product quality and reduced on-board baggage capacity
- Lower appeal to network carriers compared to regional jets for hub and spoke operations particularly in US market
- Limited range capability
- Lack of significant technological advancement in this century particularly in relation to power plant

Large Turboprop Opportunities

- Significantly underserved markets ideal for turboprops remain in Asia, Latin America and Africa
- Any continued fuel price increases or new taxes on aviation fuel imposed at national or supra-national level will increase the attractiveness of turboprops relative to other types

Large Turboprop Threats

- Continued technological and economic improvement of regional jet aircraft could erode benefits of large turboprops
- Introduction of a new 90-100 seat turboprop by Embraer could reduce the appeal of current generation 70-90 seaters
- Future hybrid and electric powered aircraft will probably affect existing turboprop fleets and small jets before any other larger aircraft types

ATR72-600 Strengths

- Best in class operating economics ideally suited for emerging markets
- Mature class-leading technology that will not become obsolete in short to medium term
- Largest operator base of any regional aircraft type. Over 130 airlines with ATRs including some 65 ATR72-600 operators
- Geographically well diversified penetration particularly in APAC region
- Proven historical market liquidity
- Strongest regional aircraft type among low cost operators
- Firm order backlog exceeding 200 aircraft

ATR72-600 Weaknesses

- Less strong performance characteristics compared to rival Dash 8
- Still some used aircraft available on the market, but far fewer than earlier in 2019
- Market demand for older used aircraft continues to soften

ATR72-600 Opportunities

- Further growth in emerging markets particularly in Asia, and potential entry into Chinese market
- High capacity 78 seat variant offers further growth opportunities in Asian LCC market in particular
- Additional growth in Eastern Europe and CIS countries
- Further growth of the freighter market, which could absorb more used older ATR72-500 examples

ATR72-600 Threats

- A re-launch and development impetus in the Longview owned Dash 8-400 and or future competition from COMAC MA-700 although the latter is more likely to be a threat limited to the Chinese domestic market
- Discord among principal shareholders so that no fundamental long-term strategy for future product development exists beyond incremental upgrades
- Lessor forward orders have diluted the market

Dash 8-400 Strengths

- Superior performance characteristics that enable good inner city and hot & high operations in particular
- Faster cruise speed for those that need it
- Quality of Dash 8-400 operator base
- Supply and demand for new aircraft in reasonable equilibrium
- New 90 seat Extra Capacity version gaining traction in Asia where ATR has thus far dominated
- Lessor penetration increasing and projected to reach 35% in the near future

Dash 8-400 Weaknesses

- Higher operating costs compared to ATR72 although difference on a per seat basis has narrowed to almost nothing with high capacity 86-90 seat EC variants
- No family of aircraft
- Heavily outsold by its closest rival the ATR72 in recent years
- Lack of available recent post 2010 examples
- Over supply of mid-life and older generation aircraft
- More sensitive to maintenance issues

Dash 8-400 Opportunities

- Demand from second tier operators in developing regions is increasing and many wish to lease
- Bombardier previously under invested in the Dash 8 platform for many years. Longview has access to resources to invest in the programme if it chooses to do so
- Termination of production in 2023, although increasingly unlikely, could bolster the economic life and values of the existing fleet in the same way that ceasing Q200 and Q300 values did

Dash 8-400 Threats

- Some level of concentration among largest operators
- Sale and fleet re-structuring of key operators
- Closure of Downsview production site in 2023 may mean the end of Dash 8-400 production
- While the sale to Longview has completed, the long-term impact is still not clear and may reduce confidence in the product and its ongoing support

Values

- New ATR72-600 values have stabilised within US$20-21million range in 2019
- New Dash 8-400 values are in the range of US$21-22million
- New vintages of both types are projected to depreciate to between 45-50% over a 10 year horizon. According to some appraisers, used examples may depreciate to closer to 40-45% over a similar period
- Values for used ATR72-600 continued to be depressed in 2018/19 due to some oversupply although much of this capacity has recently been absorbed
- Values for used Dash 8-400s are strong for NG aircraft manufactured from 2010 onwards, but depressed for older variants
- As with most other aircraft types, there is some divergence of opinion on values for both types between different recognised appraisal firms. This divergence amounts to about US$2m at all points in time, which represents some 10% of new values and around 15% for used aircraft. The divergence is strongest for ATR72-600s between three to five years of age
- Older 1990s ATR72-500 vintage values have stabilised to serve the cargo conversion market or, in some cases, to lower utilisation public service and fly-in fly-out type operations
- The long-term impact of the sale of the Dash 8 programme to Longview on values remains uncertain, but Cirium has stated that it sees no downside value risk

Lease Rates

- New ATR72-600 lease rates are in the range of US$180,000 per month, although naked, almost new, unplaced aircraft from previous forward orders have been recently offered for lower rates
- Like values, lease rates for used ATR72-600s are depressed in the short-term, but appear to be recovering
- Lease rates for the Dash 8-400 are stable in the region of US$190-200,000 for new examples down to US$110-150,000 for 2010 vintage examples. This represents lease rate factors of 0.9% or above for new aircraft and above 1% for 2010 examples

1 Introduction & Scope

Aircraft Types covered in this Report

ATR72-600

The French-Italian ATR72 was first launched in the late 1980s as the ATR72-200. This is an older generation aircraft which is not a target type for TrueNoord although a single freighter version is on lease to ASL in Ireland. The -200 series was superseded by the -500 series in 1995 which, in turn, was further developed into the latest -600 series variant from 2011. Initially the ATR72 was a 68-72 seat aircraft. The standard European versions are now 70-72 seats, but today a high density 78 seat version is proving popular particularly in Asia.

The ATR72 is the world's most popular current generation turboprop and is considered to be the workhorse for a majority of regional airlines outside North America where the regional market is dominated by jet powered aircraft.

Dash 8-400

This aircraft (previously branded by Bombardier as the DHC8Q-400 or simply the Q400, and now the de Havilland Canada Dash 8-400) is the world's largest turboprop commercial airliner. First entry to service was in 1998 with SAS when the standard configuration was 74 seats. Today the densest version has increased to 90 seats with Spicejet in India.

The aircraft was developed in the 1990s as a high-speed turboprop (360 knots high speed cruise compared to 270 knots high speed cruise for the ATR72-500/600) in order to compete with regional jets on shorter sectors but with the aim of achieving turboprop economics particularly in relation to fuel burn. At the time, Bombardier believed such an aircraft would perfectly complement its CRJ regional jet range, which was optimised for thin markets on longer sectors in excess of ninety minutes. Since development and sales of the Dash 8-400 were overshadowed within Bombardier by its emphasis on the C-Series, it has not seen the same commercial success as the ATR72 in all its variants. Nevertheless, in excess of 500 aircraft have been sold, a similar volume to its discontinued smaller and earlier Q100/200/300 family. The Dash 8 programme is now owned by Longview after the completion of its sale by Bombardier earlier in 2019.

Scope

This report provides an overview of the 70-90 seat turboprop market primarily covering the above referenced in-production aircraft. Although now out of production the ATR72-500 will also be covered as it is still widely in use and fundamentally differs little from its successor. TrueNoord already owns eleven ATR72-600s and intends to grow its portfolio. TrueNoord does not yet own any Dash 8-400s, but intends to include the aircraft in its portfolio and will shortly take delivery of its first two units.

This report will examine both aircraft's characteristics, applications, market penetration, and operating economics as well as addressing the current dynamics in values of these aircraft, which continue to see some variety of values from the appraisal community.

2 Summary Specifications, Performance, Economics & Developments

2.1 Development Timeline

The ATR (Avion de Transport Regional) comprises a current generation two aircraft family: the ATR42-600 and the ATR72-600. The programme was launched in 1984 as the 42 seat capacity ATR42-300 and followed in 1988 by its larger 68 seat capacity ATR72-200 sibling. These aircraft were powered by four-bladed Pratt & Whitney Canada PW120/121 and 124 series engines.

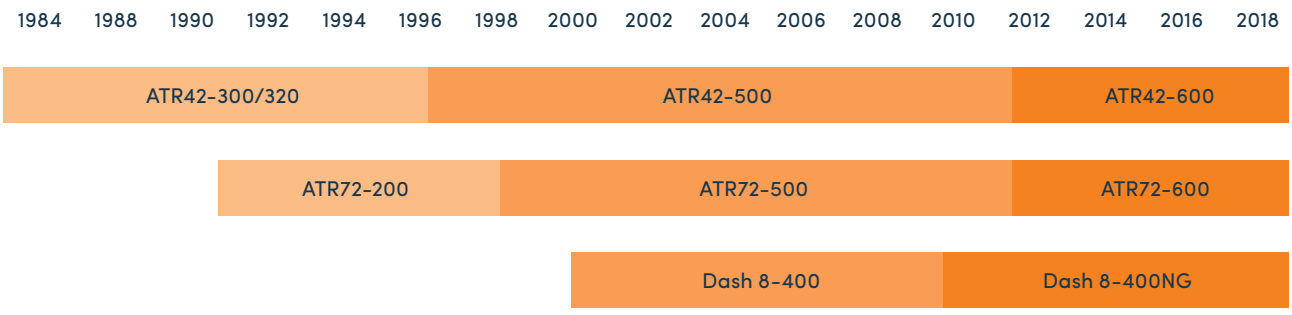
From 1996 onwards the family was substantially upgraded and re-engined with the current generation of six-bladed PWC127 engines and marketed as the ATR42/72-500. The capacity of the ATR72-500 was also offered with increased capacity of 72 or 74 seats. Other improvements at the time included improved performance and a higher maximum take-off weight. During this period other turboprop manufacturers including Saab and Fokker ceased production and Bombardier launched a stretch of the DHC8-300, which has become the only competitor to ATR. The timeline of both the Dash 8-400 and all ATR42/72 variants are shown in Figure 1 below.

In 2008 ATR launched the current -600 generation, which first went into service in 2011. For a period of some 12 months, both the -500 and -600 were produced in parallel for those customers seeking to maintain a consistent -500 fleet.

By contrast, the Dash 8-400 as it is now branded by de Havilland Canada is a substantial redevelopment rather than just a stretch of the previous Dash 8-100/200/300 family of 37-50 seat turboprops. To accommodate the larger capacity of the aircraft, the previous aircraft was not only stretched by 6.8m compared to the Dash 8-300, but has a larger wing. It is constructed with newer generation lighter materials, and most importantly is powered by the PWC150A engine that was designed for this aircraft and any future stretched versions. In 2010, the Dash 8-400 was updated with a number of enhancements including a re-designed interior. This was described as the "NG" (next generation) version and designated as the Dash 8-402.

Both ATR and Bombardier have considered larger 90-100 seat turboprops. However, Bombardier (previous owner of the Dash 8 programme), whose resources were focused on the former C-Series also concluded that a further stretch of the aircraft posed significant design risks and shelved the programme. Subsequently ATR's Italian shareholder continued to push for a larger aircraft, but Airbus as the other main shareholder was against a new turboprop so this project was also shelved less than a year later than the Q400X.

Figure 1: ATR42/72 and Dash 8-400 Production Timeline



2.2 Current Specifications

2.2.1 Configuration and Access

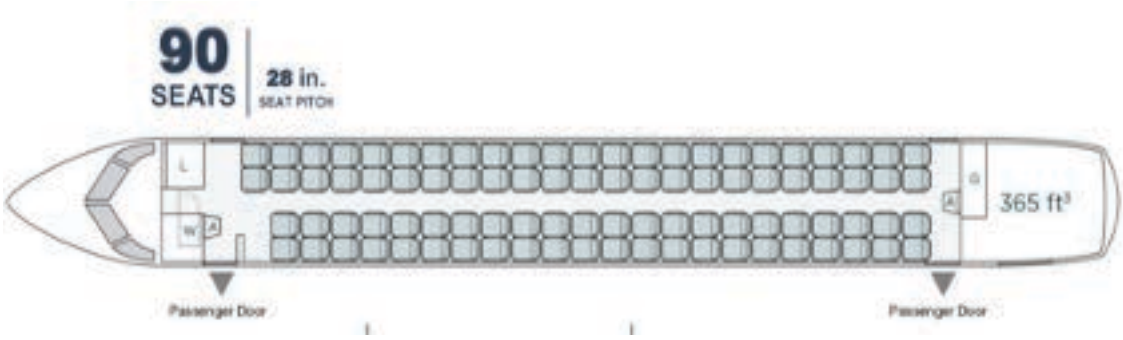
Following the trend by all manufacturers to increase seating capacity, both have up-gauged the maximum number of seats offered in their respective aircraft. Their latest high capacity variants are shown at the bottom of Figure 2 below with 78 seats for the ATR72-600 and 90 for the Dash 8-400 (designated by the manufacturer as Extra Capacity (EC)). These high capacity versions are primarily aimed at the high growth Asian continent where the average weight per passenger with baggage is lower than Europe or North America.

In other parts of the world, the standard configuration remains at 70/72 seats for the ATR72-600 and 78/82 for the Dash 8-400.

Figure 2: ATR72-600 and Dash 8-400 high capacity configurations

ATR72-600 78 seats Single Class
78 x seats @ 28”

Dash 8-400 90 Seats Single Class



Access

From an aircraft servicing perspective, the passenger door is located at the rear of the ATR72-600 while the Dash 8-400 has conventional front access. This means that airbridges cannot be attached for rear boarding to the ATR72-600. While airbridge access is not used for turboprops in most of the world, North America is the exception. This is a major reason why the Dash 8-400 has traditionally been favoured over any ATR variant in that market. Furthermore, since most US carriers offer first class seating even in their regional aircraft operations, and these seats are at the front of the aircraft, rear boarding presents logistical complexity.

2.2.2 Principal Specifications and Weights

The principal weights and specifications associated with both aircraft are shown in Figure 3 below. Since the capacity of both aircraft has been increased, their full weights have also risen. This impacts both the range and runway performance of the Dash 8-400 as shown.

Figure 3: Specifications Comparison

Variant	AT72-600	ATR72-600(HC)	Dash 8 400NG	Dash 8-400NG EC
MTOW	22,500Kg	23,000Kg	29,583Kg	30,481Kg
Max. payload	6,718Kg	7,500Kg	8,386Kg	10,125Kg
Engines (2x)	PW127M	PW127M	PW150A	PW150A
Range	825Nm	825Nm	1,140Nm	740Nm
Take off Distance	1,367m	1,367m	1,425m	1,573m
Landing Distance	1,068m	1,068m	1,289m	1,346m
Max Pax Capacity	68-72	78	78-82	86-90

Differences Between Standard and High Capacity Variants

The high capacity ATR72-600 is essentially an upgraded standard aircraft which incorporates higher weight and payload. These weight upgrades can also be applied to lower capacity versions, if required. Unlike the Dash 8-400, the high capacity ATR does not have any range or performance penalties although the reduced range performance of the Dash 8-400 (still greater than the ATR72-600) has no material impact on live operations since almost no turboprop service requires the maximum range offered by that aircraft.

2.3 Engines

All ATR72 models have always been powered by various derivatives of the PW120 series engine. Today's ATR72-600 is powered by the PW127F or M variant. The PW127 is considered a very mature engine and is the only remaining 120 series that is still in production. By contrast the competing Dash 8-400 is equipped with the larger and more expensive PW150 power plant. The Chinese manufactured MA700 is also powered by the 150 series.

While the PW127 power plant is mature it also has certain disadvantages. On the ATR72-600, the engine has reached its thrust limit so that it cannot be materially adapted for markets that require a strong performance aircraft. There have been some incremental modifications for hot and high operating conditions with an "N" variant. However, to date, this PWC127N variant has only been selected by Avianca.

The principal benefits of the PW150A are that it can power the larger airframe and enable faster climb performance and greater speed (see Fig 4). This enables both shorter sector times for the same distance and better performance at restricted airports particularly in hot and high conditions.

However, there are also disadvantages. The faster cruise speed has limited value on typical 45-90 minute sectors by bringing a limited 5-10 minute flight time improvement only. Many airlines do not consider this to be a material benefit. Secondly, the larger power plant consumes more fuel than the PW127. For this reason, many operators have slowed the cruise speed in operation to under 300 knots from 360 knots as this brings the trip fuel burn closer to that of the ATR72-600. Only by slowing the cruise speed and increasing capacity closer to 90 seats can the Dash 8-400 compete with the ATR72-600 on fuel burn per seat mile. (See section 2.6)

2.4 Range

In its current standard configuration, the range of the ATR72-600 at 825Nm with a full load is some 300Nm less than the Dash 8-400. However, as a range in excess of 1,000Nm is very rarely a mission operated by any turboprop aircraft this capability is of limited practical value. The vast majority of turboprops operate sectors of less than 400Nm and generally the optimal sector length is in the region of 200-300Nm. Accordingly, the range penalty of adding up to 12 in the Dash 8-400 EC version is minimal for the vast majority of missions.

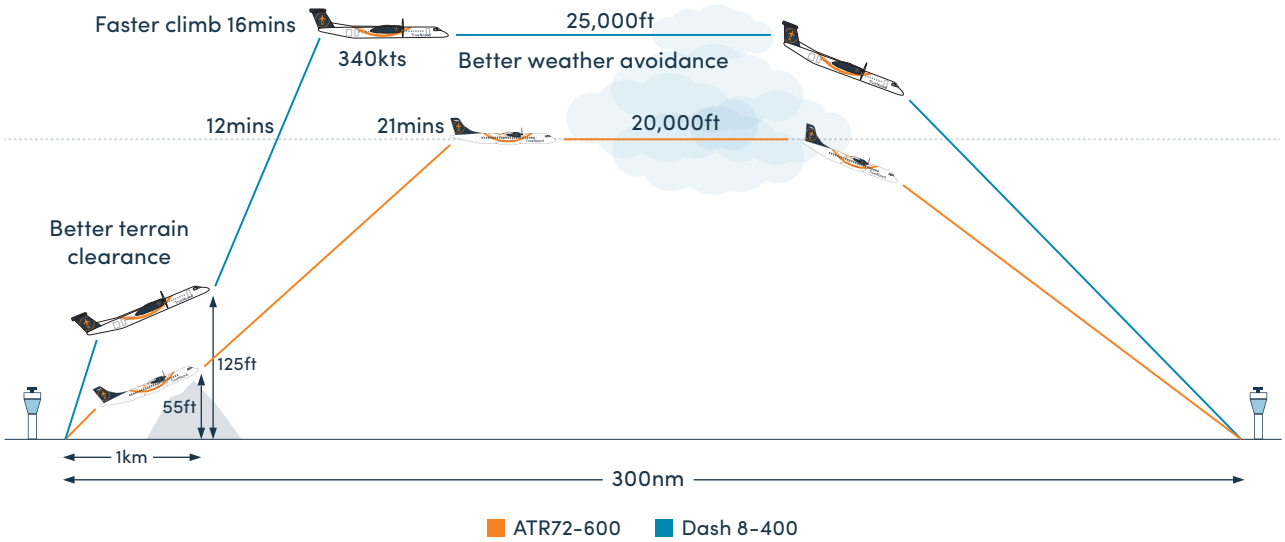
2.5 Performance

The ability to operate from restricted airports with short runways or in built-up areas is often a key attribute of regional aircraft. Typically, this favours turboprops over regional jets. However, although both turboprops offer superior performance characteristics on short runway airports compared to jets, the aircraft were primarily built to offer increased capacity and competitive operating costs thereby compromising some potential performance capabilities. While neither aircraft is a short take-off and landing (STOL) performance aircraft capable of taking off on runways shorter than 1,000m, both can nevertheless achieve a respectable 1,300m take-off field length, which is sufficient for most restricted airports that require high capacity turboprops.

Climb performance is also important where physical obstacles exist such as high-rise buildings in cities or mountainous terrain, as well as those areas where it is both hot and high. For example, the superior climb performance of the Dash 8-400 enables it to operate optimally from London City airport. Strong climb performance can also be important to meet local area noise restrictions.

In the 300Nm illustration in Figure 4 below, the mission profile is shown where the ATR72-600 takes 21 minutes to reach 20,000ft compared to 12 minutes for the more powerful competing Dash 8-400. The trip time for the Dash 8-400 at high speed cruise (360 knots) is 62 mins and 75 mins for the ATR72-600 at 270 knots. Not only can this provide the bad weather avoidance as shown, but is critical in hot and high areas such as Kenya, Ethiopia and parts of South Africa where the ATR72-600 struggles to perform the required missions and the Dash 8-400 is the favoured option.

Figure 4: ATR72-600 v Dash 8-400 Climb Performance



2.6 Economic Comparison

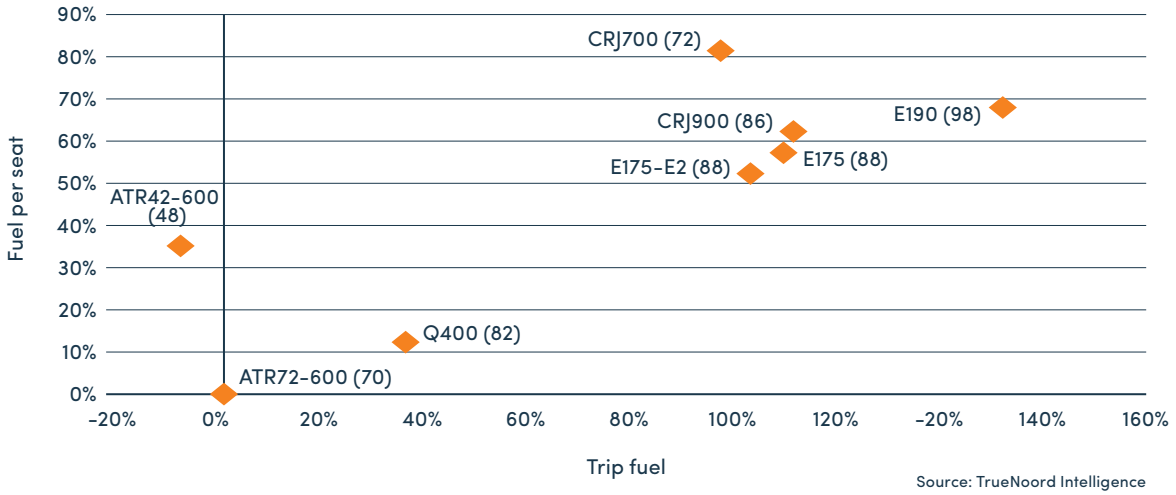
The elements of operating costs, apart from the aircraft capital portion, are often referred to as cash operating costs (COC). The elements that are driven by the aircraft itself are briefly reviewed below. Crew costs are a major COC component, but are not reviewed as these are largely the same for any similar capacity regional aircraft. Likewise navigation and landing charges are not reviewed as these are largely driven by aircraft weight in many parts of the world. The ATR72-600 is lighter than the larger Dash 8-400 in both absolute terms and on a per seat basis.

Fuel Burn

The ATR72-500/600 has generally been considered to have lower operating costs than any of its competitor aircraft in a similar seat capacity. In the example shown in Figure 5, the ATR72-600 burns some 850 kg compared to 1,100 kg for the Dash 8-400, which represents a substantial 30% difference in the trip cost. While de Havilland agrees that the ATR72-600's fuel consumption for a 300 Nm trip is in the region of 850-900 kgs, it now claims the Dash 8-400 consumption to be around 980 kg or a more modest 10-12% difference.

Nevertheless, the ATR72-600 still has the lowest fuel burn of any regional aircraft on both a trip and a per seat basis at this sector length. As the trip length increases (not shown), the faster speed of both the Dash 8-400 and the regional jets begin to erode the fuel efficiency of the ATR72-600 so that the fuel burn advantage against the Dash 8-400 reduces to under 20% on a per seat basis, and under 50% for the regional jets.

Figure 5: Block Fuel Relative to ATR72-600 (300Nm at US$1.14/kg fuel*)



Source: TrueNoord Intelligence

(*) Compared to previous type reports, note that TrueNoord has increased the assumed fuel price for the European environment to reflect both slightly increased oil prices, but primarily to demonstrate the impact of the likely introduction of EU wide aviation fuel taxes.

The ATR72-600 not only offers strong fuel efficiency benefits against regional jets, but also competes favourably with mainstream single aisle jets where only the newest generation B737MAX and A320Neo offer similar or better fuel consumption per seat on short sectors. However, the large jets do offer greater efficiency on sector lengths above 500Nm.

Maintenance/FH/FC

As the ATR72-600 and Dash 8-400 are both mature aircraft there is a strong base of real maintenance data available. The principal scheduled maintenance tasks, intervals and estimated costs are as follows:

Figure 6: Maintenance Comparison ATR72-600 & Dash 8-400

ATR72	Dash 8-400
Airframe (FH & FC)	
Airframe maintenance heavy check (C-check) currently 5,000FH. Pending regulatory approval, C-check intervals will shortly be escalated to 7,500 hours. The first C1 check has the lowest number of tasks and C2 and C4 have the largest number of tasks at 10,000 and 20,000FH respectively. The estimated average C-check event cost is in the region of US$35-40 per FH.	Airframe maintenance heavy check (C-check) intervals were escalated from 6,000 to 8,000 FH in 2017. According to de Havilland Canada the labour input ranges from 775 man hours (MH) to 2,600. The first C1 check has the lowest MH and C4 and C6 have the largest number of tasks. The estimated average C-check cost is in the region of US$45-50 per FH.
Airframe Calendar Checks	
At 2, 4 and 8 years with associated costs of 7,500/month respectively, and a major structural inspection at 36,000 cycles.	At 6, 9 and 12 years with associated costs of US$ 6,000/month respectively and a major structural inspection at 40,000 cycles.
Landing Gear **After the engines, the landing gears are the single most expensive items on any turboprop aircraft. The scheduled overhaul of a landing gear set costs in excess of $550,000**	
Overhaul limits are 20,000 FC or 9 years. After the engines, the landing gears are the single most expensive items on any turboprop aircraft. Average overhaul costs are in around US$25-30 per FC.	Overhaul limits 20,000 FC or 12 years for the nose gear and 30,000 or 12 years for the main gear. Average overhaul cost are around US$25-30 per FC. Unscheduled costs are also high as the Q400 landing gear is a design weakness, a maintenance-sensitive part.
Engine Overhaul	
While engines are maintained on-condition, the first hard time limit is at 12,000FC for the first life limited parts (15,000 for most) at which time a major overhaul would also take place. In between, an intermediate hot section inspection (HSI) at around 5,000-7,000 FH. The average cost per hour is around US$125 per engine FH over a cycle of a full and intermediate overhauls.	While engines are maintained on-condition, the first hard time limits are for some life limited parts at 15,000FC at which time a major overhaul would also take place. In between, an intermediate hot section inspection (HSI) at around 7,500 hours would take place. The average cost per hour is about US$170 per engine FH over a cycle of a full and intermediate overhauls.

ATR72	Dash 8-400
Engine Life Limited Parts (LLPs)	
P&WC the engine OEM refers to LLPs as life-cycle fatigue parts (LCFs)	
LCF costs are estimated to be in the region of US$470,000 or US$25/FC excluding high pressure turbine blades. The majority of LLPs have a 15,000 FC limit.	LCF costs are estimated to be in the region of US$750,000 or US$43/FC. The majority of LLPs have a 20,000 FC limit.
Propeller	
Propeller hubs and blades have a hard time limit of 10,500FH. The estimated costs are around US$20/FH.	Propeller hubs and blades have a hard time limit of 10,500FH. Overhaul costs are estimated at US$15-20/FH.
APU	
The ATR has no APU. Instead the right hand engine may be operated in Hotel mode to provide ground power when needed.	While maintained on condition, the APU is estimated to have a shop visit at 10,000 FH at an estimated cost of US$20/APU hour.

Comments on Maintenance

The above maintenance costs and intervals are based on fixed intervals except for engines, which are maintained on condition. The actual maintenance costs will vary considerably according to how the aircraft are operated and the environments in which they fly. For example, in harsh climatic environments the ATR72-600 is often less robust than Dash 8-400 aircraft and additional findings at major events can often increase the maintenance costs significantly.

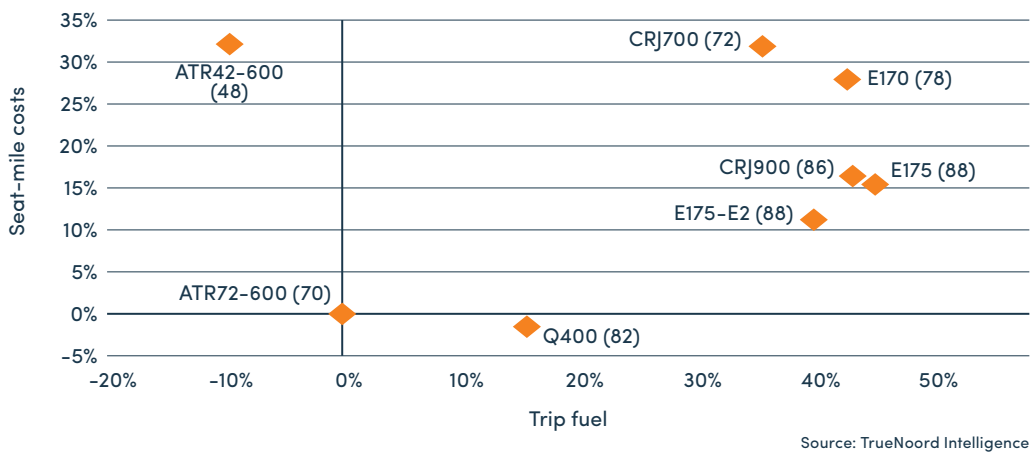
With regard to engines there is considerable disparity between benign and inhospitable climates with several historical examples of engine removals below 5,000 FC in harsh environments.

2.7 Discussion of Performance & Economic Comparison Points

The ATR72-600 has a number of benefits over its principal competitor the Dash 8-400, but the latter also has some advantages:

- The aircraft has best in class operating economics despite its smaller size. In relation to operating costs particularly in relation to fuel burn, weight based airport charges and to some extent maintenance costs, the cash operating costs of the ATR72-600 have to date been better or equal to those of the Dash 8-400 so that the majority of turboprop operators that do not require the enhanced performance of the Dash 8-400 have opted for the ATR. Figure 7 below shows the direct operating costs, which includes capital costs for the aircraft. This shows that ATR72-600 remains marginally the most attractive turboprop for most markets.
- The exceptions are those areas where superior performance characteristics, mainly in terms of climb and operational ceiling, are needed. This is important for those carriers operating at inner city obstacle restricted airports, mountainous regions, or hot and high climates. For example, this has driven Alpine carriers such as Austrian Airlines to select the Dash 8-400 aircraft and some African airlines such as Ethiopian to do likewise.
- The Dash 8-400 has a faster cruise speed that enables it to compete with, or more effectively complement, regional jets. In regions where sector lengths can be long such as certain North American markets, this can be beneficial and provide greater operational flexibility. A few larger European carriers have also recently positively evaluated or re-evaluated the Dash 8-400 to provide this type of flexibility which an ATR72-600 cannot provide. For example, a Dash 8-400 can operate off-peak services alongside regional jets on some routes and maintain a relatively consistent schedule at lower cost.
- In practice, some have not selected the Dash 8-400 for its speed benefit but for the extra capacity and a more jet equivalent product. They now operate them at slower long-range cruise (approx. 300knots) to minimise fuel consumption.
- ATR has now developed a high capacity 78 seat variant, which is well adapted to competitive Asian regional markets in particular. The ATR is the undisputed leader across Asia.
- The ATR72-600 can be applied to markets requiring a capacity of up to 78 seats whereas the Dash 8-400 is only optimised from a capacity perspective for routes where a capacity from 78-90 seats is required and where regional jets either cannot be operated or are economically inefficient.
- However, now that the 90 seat EC version of the Dash 8-400 has been launched at Spicejet with 12 additional seats compared to the ATR72-600, the seat costs of both have now converged although the trip costs still favour the ATR.

Figure 7: Direct Operating Costs Relative to ATR72-600 (300Nm at US$1.14/Kg fuel)



Source: TrueNoord Intelligence

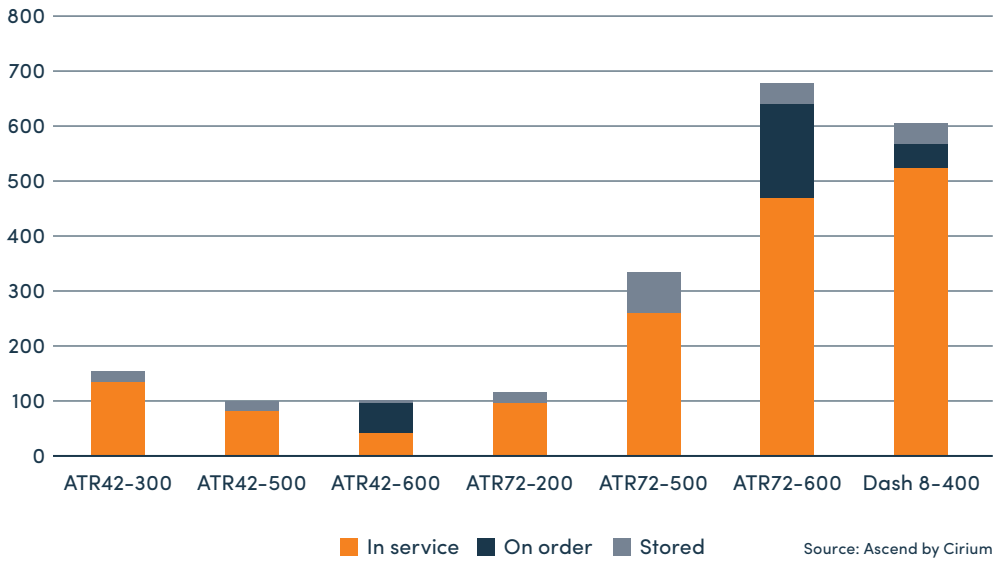
3 Market Review

3.1 Numbers in Service Update

The total number of ATR72s in service of all variants is currently 826 units of which the latest -600 has been the most successful with 466 in active operation in its relatively short history since 2011. The smaller ATR42 has a worldwide population of 267 units. The breakdown between the various models is shown in Figure 8 below.

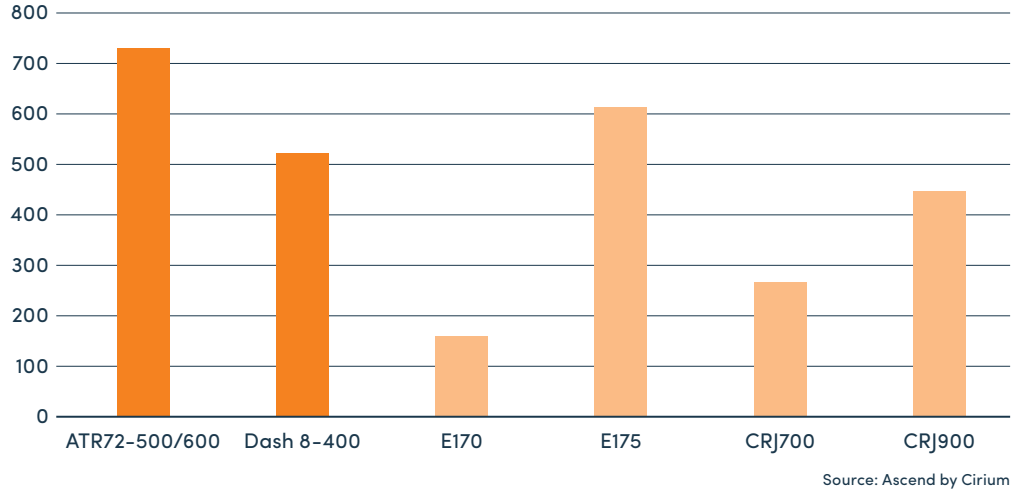
In comparison, the status of the competing Dash 8-400 fleet is also shown in Figure 8 and this includes all variants of that aircraft since it was launched in the late 1990s. While the active Dash 8-400 fleet appears to exceed that of the ATR72-600, for a comparable view the ATR72-600 launched in 2011 should be combined with the very similar previous -500 variant. Accordingly, for in service aircraft, the ATR72-500/600 leads the Dash 8-400 by some 200 units as can be seen in Figure 8.

Figure 8: ATR42/72 & Dash 8-400 Population (October 2019)



When compared to all aircraft types with a capacity of between 70 and 90 seats the ATR72-500/600 and Dash 8-400 populations look respectable compared to similar regional jets. In the case of both ATR and de Havilland, the turboprop fleet size exceeds comparable regional jet populations as shown in Figure 8 above and in the chart below.

Figure 9: ATR72-500/600 & Dash 8-400 Fleet Size v Similar Regional Jets (October 2019)



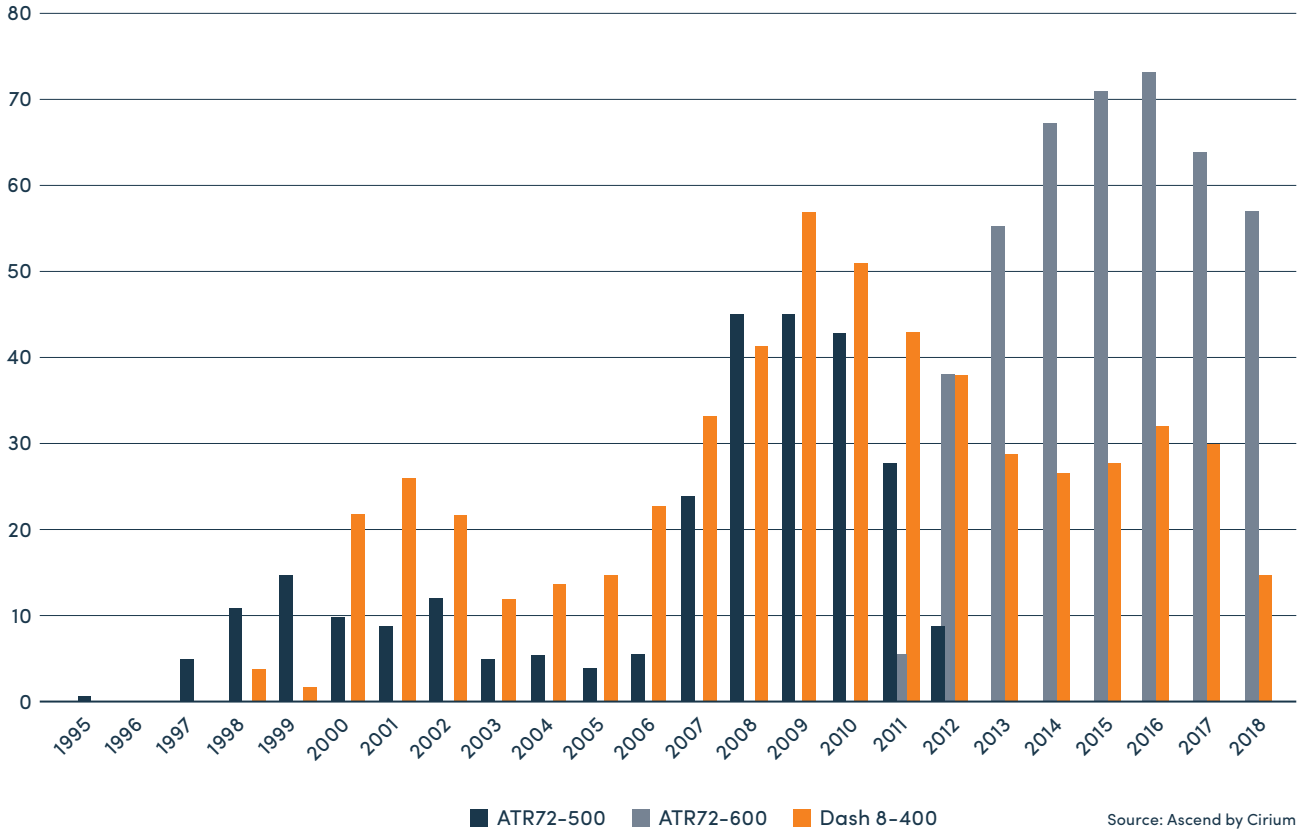
3.2 Delivery Profile

The delivery profile of large 70 to 90 seat turboprops is an important consideration for TrueNoord as it enables the age of any proposed aircraft acquisitions to be compared with the population of aircraft manufactured. In general, more recent vintages are considered to be more attractive to the used market so that younger aircraft should facilitate easier future placement opportunities and premium lease rates.

As shown in Figure 10 below, the ATR72-600 delivery profile peaked in 2016 and has trended downwards thereafter which reflects both production capacity with increased ATR42-600 output, as well as fewer ATR72s to correct the slight overproduction to lessors of units that occurred in the two preceding years. Figure 11 also depicts the delivery profile of the Dash 8-400, which shows that aircraft leading until 2011 after which the ATR has outperformed the Dash 8-400 by more than 2:1. This reflects the greater importance of competitive operating costs in the Asian market, which is now ATR's largest market in comparison to the previously dominant North American market where the Dash 8-400 has the biggest market share.

Preliminary data for 2019 indicates that some 50 ATR72-600s and 10 Dash 8-400s have been delivered so far, which suggests that new aircraft deliveries may be stabilising at levels similar to 2018.

Figure 10: ATR72-500/600 & Dash 8-400 Delivery Profile (1995-2018)



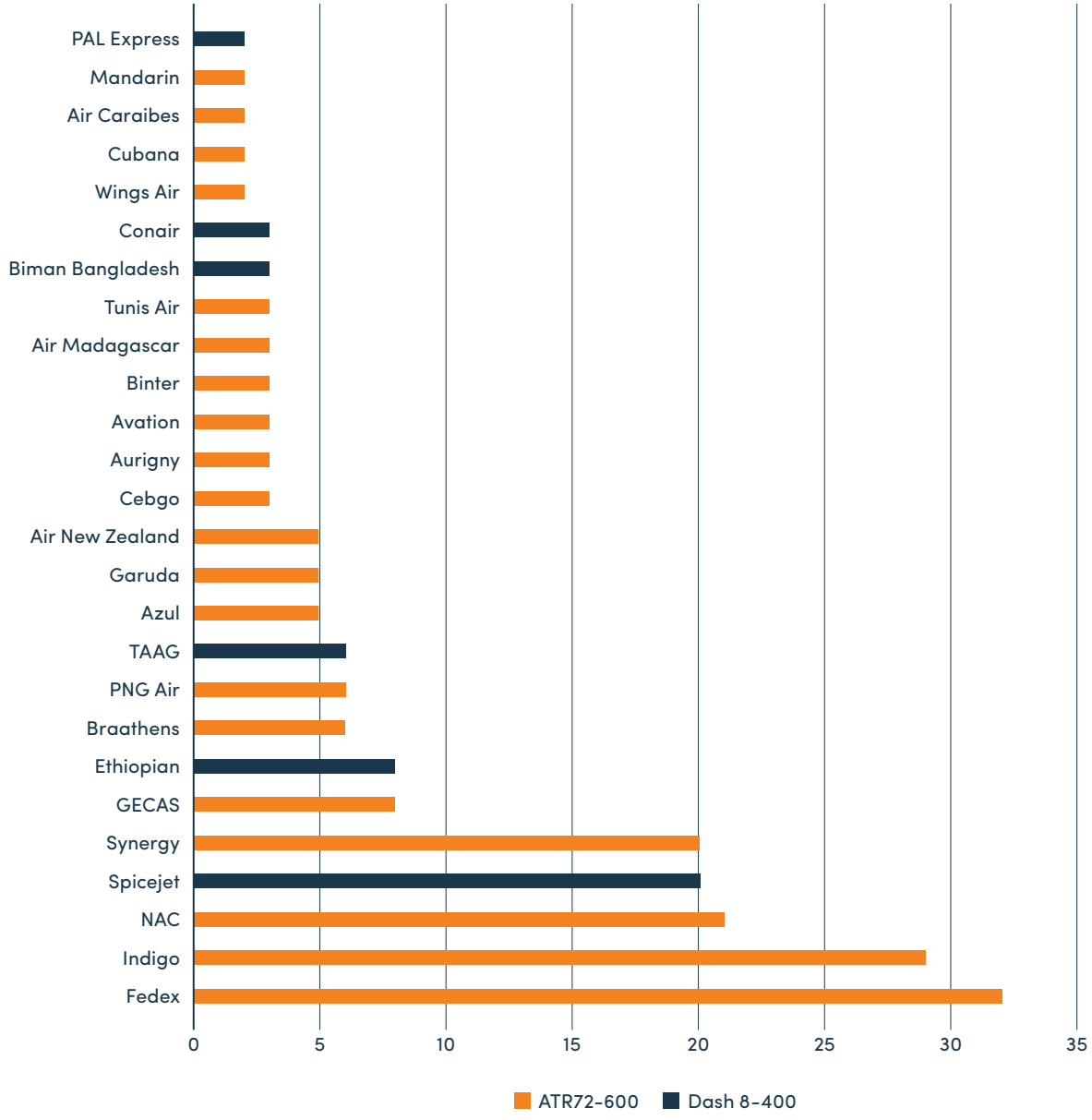
Source: Ascend by Cirium

3.3 Firm Order Backlog

The firm order backlog for the large turboprops stands at 205 in October 2019 (Figure 11) of which the majority are for ATR72-600s with some 43 for the Dash 8-400 although 32 of the former are freighter versions for Federal Express. While the APAC region continues to absorb the majority of deliveries, the immediate centre of gravity has shifted to India with substantial outstanding orders for both types.

In addition, of the outstanding orders, in excess of 30 ATR72-600s are due to be delivered to lessors as part of their own speculative order positions. Some of these lessor delivery positions (9 aircraft) are allocated to TAROM in Romania.

Figure 11: Large Turboprop Orders (Oct 2019)



Source: Ascend by Cirium, ATR, de Havilland

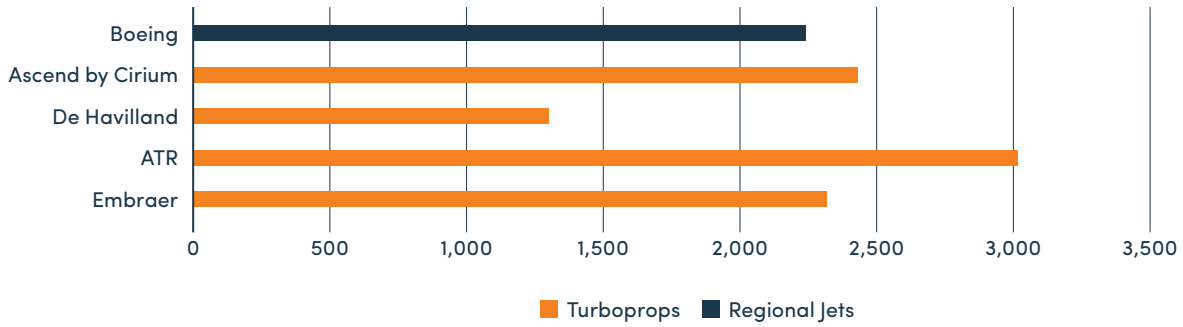
3.4 Future Large Turboprop Forecast

The provision of forecast future market fleets is outside the scope of this report so that Figure 12 is intended as an overview of third party projections only. The turboprop forecasts are compared with Boeing's opinion for regional jets up to 90 seats.

The range of forecast demand for turboprops over the coming 20 years is wide, but is not entirely prepared on a like-for-like basis. The de Havilland forecast, which is the most conservative, only provides projections for large turboprops above the 70 seat category, while those of ATR and Embraer cover all turboprop classes. The de Havilland forecast focuses on the class of aircraft it manufactures so that it excludes part of the 70 seat market that it deems to be too small for the Dash 8-400. Since the baseline variant of the Dash 8-400 now has 82 seats, the forecast cuts out a substantial part of the 70+ seat market and goes a long way to explaining why its forecast is less than half of ATR's.

Furthermore the Ascend by Cirium view not only includes all classes of turboprop, but also assumes a 90+ seat category comprising 460 units of an aircraft type that does not yet exist and will only come to market towards the late 2020s. The ATR forecast appears the most bullish as it only covers aircraft in the class that it can currently supply from 40 to 80 seats.

Figure 12: Turboprop and Regional Jet Forecast 2019-2038



Source: Boeing, Ascend by Cirium, de Havilland, ATR & Embraer

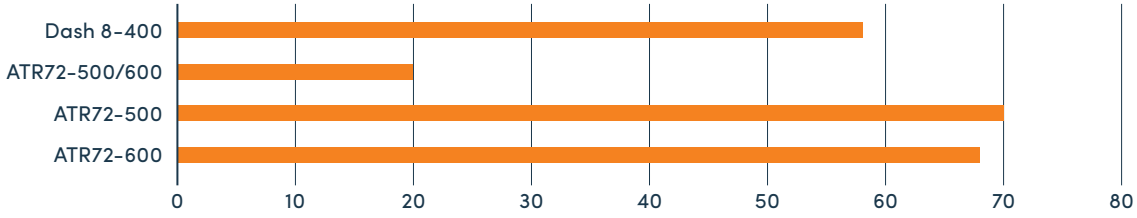
3.5 Large Turboprop Operator Base

The absolute number of operators of any particular type is a vital determinant of its suitability as a leasing product. This is a prime driver of liquidity by showing the number of operators that could absorb incremental aircraft. On its own the number of operators is not a sufficient indicator of liquidity. A strong operator base can be materially weakened if there is an excess concentration of aircraft with a small number of operators. This can reduce liquidity and poses a risk if any of the largest carriers go bankrupt or unexpectedly phase out the type thereby creating a large pool of available aircraft. This means that the level of concentration is an equally important measure.

3.5.1 ATR72-500/600 Operators

Currently the number of ATR72-500/600 operators exceeds 100 with 20 carriers operating a mixed fleet of both types as shown in Figure 13 below. This is the largest operator base of any regional aircraft type and has grown further since December 2017. (There are currently 68 ATR72-600 operators compared to 56 in December 2017). This comprises both new -600 carriers and existing -500 operators that have transitioned to the newer type. The number with a mixed fleet has remained relatively stable but this comprises both some that have become -600 only operators to achieve a single type fleet and others which previously operated the -500 only and that today have both types.

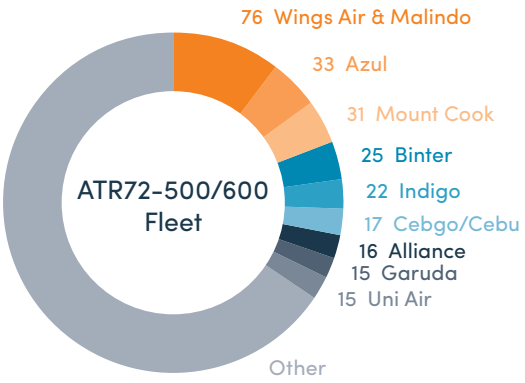
Figure 13: Number of Large Turboprop Operators



Source: Ascend by Cirium & CH-Aviation

The overall breadth of this operator base should be considered positive for future liquidity and residual values of the type. Within the total fleet there are only four carriers with fleets of more than 20 aircraft as shown in Figure 14. The largest operator is Wings Air with 64 ATR72-500/600s and its sister airline in Malaysia (Malindo) with a further 12. This represents 9% of the global fleet, followed by Azul with a fleet of 33 ATR72-600. The next largest operator is Air New Zealand subsidiary Mount Cook Airlines with 28. As such, while there is some level of concentration at Wings and Malindo, there are no other carriers that account for concentration levels exceeding 4% of the installed active operator base.

Figure 14: Largest ATR72-500/600 Operators (Oct 2019)

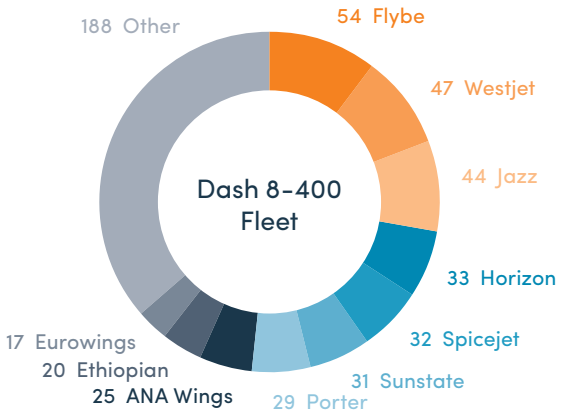


3.5.2 Dash 8-400 Operators

Currently the number of Dash 8-400 operators comprises 58 carriers as shown in Figure 15. This is a reasonably substantial base that has grown by 15 additional airlines over the last 5 years.

While there is a large Dash 8-400 operator base, there are also a number of large carriers within the customer base. Flybe is the largest operator with 54 aircraft, which accounts for 10% of the worldwide fleet. When Westjet, Jazz and Horizon are added, around 200 aircraft of the total fleet of 520 aircraft are concentrated in 4 carriers. As shown in Figure 15 below, this does represent a certain level of concentration among key operators.

Figure 15: Largest Dash 8-400 Operators (Oct 2019)



Source: Ascend by Cirium & CH-Aviation

However, while the Dash 8-400 fleet does exhibit a level of concentration, the fleets of similar sized regional jets are more concentrated within a small number of airlines.

3.5.3 Relative Concentration

For the ATR72 such levels of concentration are no different to the large fleets of narrow bodies operated by some of the large US legacy airlines and LCCs such as Southwest or Ryanair.

For both the ATR72-500/600 and Dash 8-400, the fleets of similar sized regional jets, the CRJ900 and E175 are substantially more concentrated within a small number of airlines with the former heavily dominated by Endeavour (for Delta), PSA and Mesa (both for American Airlines). Similarly, the E175 fleet is heavily concentrated at Republic and Skywest. Each of the CRJ900 and E175 have narrower operator bases of some 20 carriers each.

Furthermore, the concentration levels of the ATR72 compare favourably with those of the Dash 8-400 where some 200 of the total fleet of over 500 aircraft are with only four airlines. While the ATR is less concentrated the Dash 8-400 still has a strong operator base relative to similar capacity regional jets.

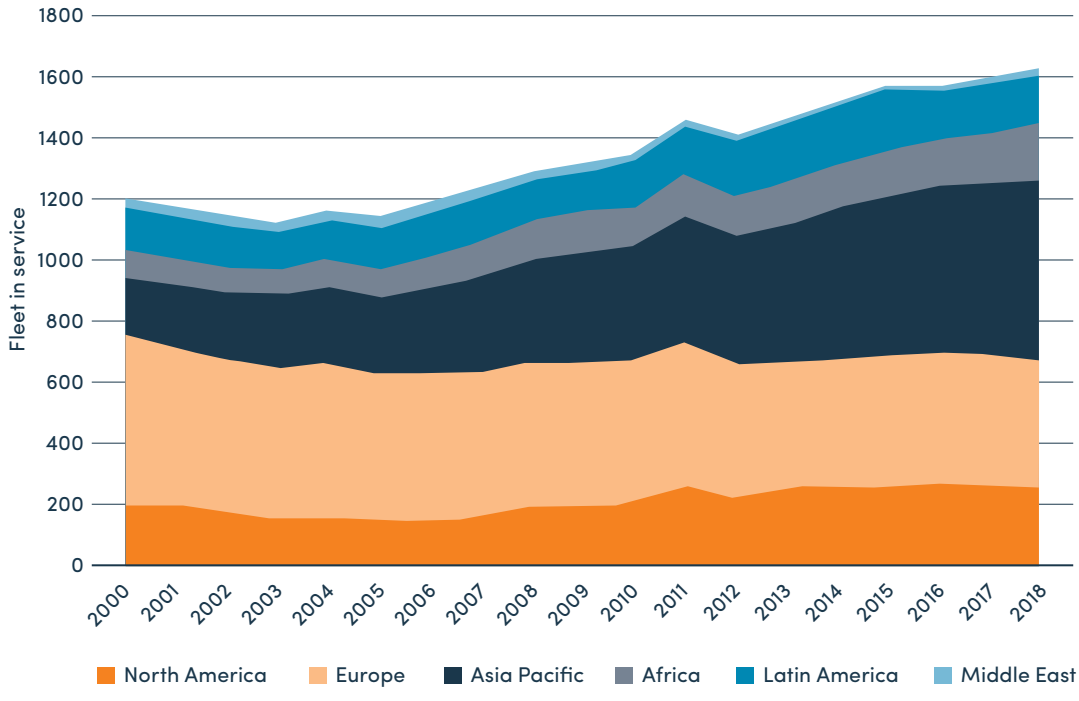
3.6 Geographical Dispersion

3.6.1 Historical Perspective

From a lessor perspective a wide geographical distribution is desirable since this not only underscores the versatility of large turboprops, but also assists market liquidity and placement opportunities in the secondary market. Often, if a type falls out of favour in one region (such as North America for turboprops in the early part of the century - see Figure 16) this can affect several operators in the same region, so the ability to place used fleets in other regions is important.

While Figure 16 shows large turboprops upwards of 50 seats to indicate the regional evolution since 2000 when the current 70+ seaters were less prevalent, there has always been geographical dispersion. However, while Europe accounted for almost half the entire market in 2000, APAC has become the largest market in 2018. The European market share has declined and all others have grown or remained stable. During the period the US turboprop market also declined, but was compensated by substantial growth in Canada. Today's large turboprop market can be described as geographically well diversified.

Figure 16- Global Turboprop Fleet trend by region 2000-2018 (Oct 2019)



Source: Ascend by Cirium

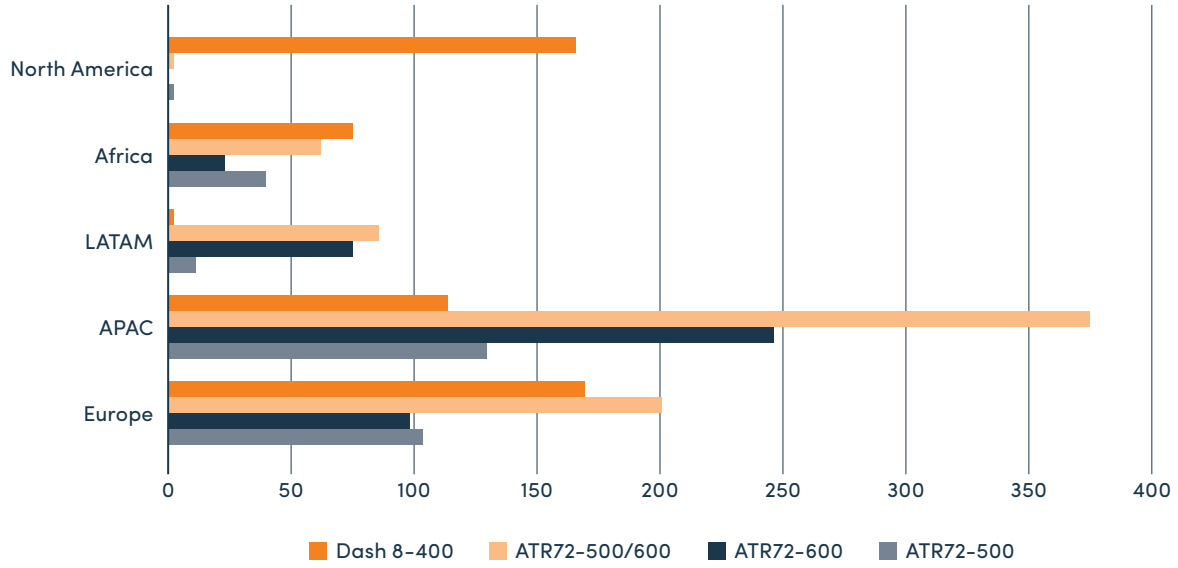
3.6.2 ATR72-500/600 & Dash 8-400 Geographical Dispersion

The world's fleet of ATR aircraft remains widely dispersed with the Asia Pacific region and Europe accounting for the largest portion of the entire fleet (Figure 17). This makes the APAC region the world's largest current generation turboprop market with almost 500 units. The ATR is the dominant turboprop in all markets except North America where the Dash 8-400 is market leader. In the smaller African market the Dash 8 is also slightly ahead.

At present the geographical distribution of the newer ATR72-600 fleet is more concentrated in the APAC region. This region now accounts for 56% of in service aircraft, while its second largest market in Europe accounts for 22%. North America is absent from current generation equipment. However, Federal Express has placed a large order, as has Florida-based Silver Airways although the latter is mainly for the smaller ATR42-600 variant.

By contrast the Dash 8-400 has performed strongly in North America primarily in its Canadian home market and Europe where the respective market shares are more balanced. Its performance characteristics also make the Dash 8-400 more suitable to the African market.

Figure 17: Geographical Distribution of the ATR72 & Dash 8-400 Fleet (Oct 2019)



Source: Ascend by Cirium

3.7 Operator Quality

The ATR72-500/600 operator base comprises some strongly regarded carriers including Air New Zealand subsidiary Mount Cook, Azul and Binter Canarias, but there is a larger proportion of less well-known independent regional airlines in the fleet and large carriers in developing countries. Some of these are financially less strong and operate in less stable jurisdictions.

By contrast, the Dash 8-400 operator base comprises an extensive list of better known airlines as many are either owned by major national carriers in developed jurisdictions or operate on their behalf. For example, this includes Horizon which operates on behalf of Alaska, Sunstate which operates as Qantas Link in Australia, as well as ANA in Japan. Many of these are considered to be strong credits.

Part of the explanation for this divergence in their respective types of operator base is that the ATR72 is a lower cost regional aircraft optimised for short regional flights while the Dash 8-400 offers benefits as a feeder aircraft to larger carriers. For example, the Dash 8-400 is faster, if needed, thereby offering speeds closer to those of jets and equally importantly in some markets, passengers board the Dash 8-400 from the front (rear boarding in an ATR), which means airport air bridges can be attached. The latter is important in North America.

An additional contributing factor is a long-term strategy by ATR with respect to the secondary market: nurturing small operators deploying used aircraft, as they may order new aircraft in the future.

4 Large Turboprop Aircraft Owned by Lessors

4.1 Comparative Lessor Penetration

The number of aircraft as a proportion of the total fleet is a strong indicator of the maturity of any type among the leasing community. A deep level of lessor penetration suggests that the aircraft is perceived as a strong asset class with good liquidity characteristics and high value retention. It is therefore not surprising to see the most popular narrow body aircraft with a penetration approaching 50% of all aircraft as shown in Figure 18 below.

Lessor penetration of the active ATR72 fleet at levels exceeding 40% is close to those of narrow bodies. (The proportion of leased ATR72-600s is even greater at around 52% and lower for the ATR72-500 (30%)). By comparison the proportion of leased Dash 8-400s stands at 31%, which is more similar to some of the regional jet types.

However, the number of active lessors in the large turboprop market is a small fraction of those active for the single aisle types (See Figure 19) and less than for some regional jets. Although the scale of the large turboprop leasing market is much smaller than for larger aircraft, the smaller number of active lessors with scale is a positive factor that underpins their business models since this reduces the number of lessors that compete to fund aircraft for those operators seeking this type of finance.

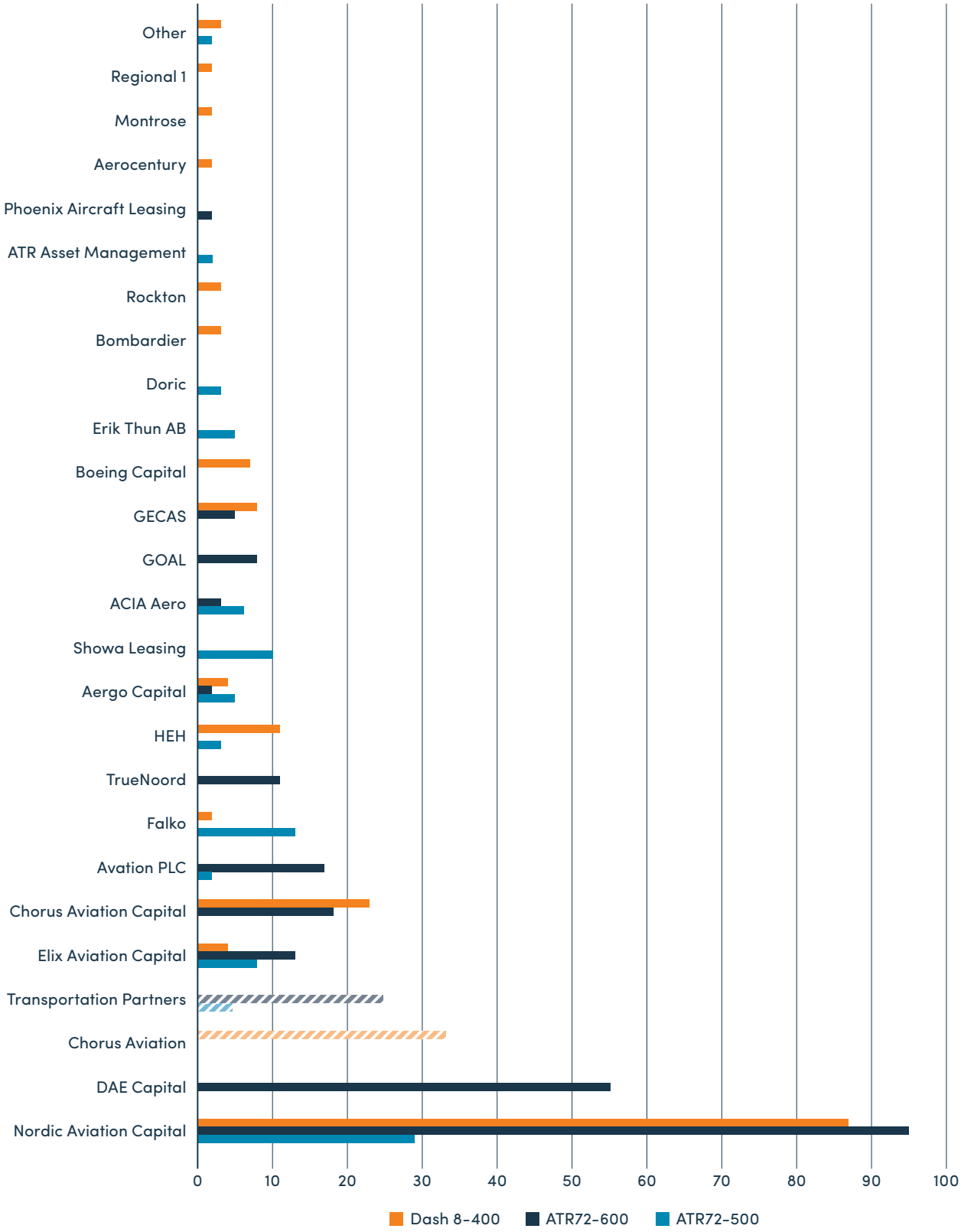
Figure 18: Operating Lease Penetration Comparison by Aircraft Type

Source: Ascend by Cirium

4.2 Turboprop Leased Fleet Review

A breakdown of the main lessors of large turboprops is shown in Figure 19. This shows that NAC is the dominant ATR lessor with 84 ATR72-600s and a further 36 ATR72-500s. (NAC is also the dominant Dash 8-400 lessor with 90 of the type). DAE is the second largest lessor approaching a fleet of 60 aircraft. Chorus has a similar number of Dash 8-400s when the fleets of its captive leasing arm for Jazz and Chorus Aviation Capital (CAC) are combined. Note that Chorus Aviation as a captive lessor is shown separately to CAC in different shading, as is Transportation Partners, a captive lessor for the Lion Air Group.

Figure 19: Large Turboprop Lessors Who's Who (Oct 2019)



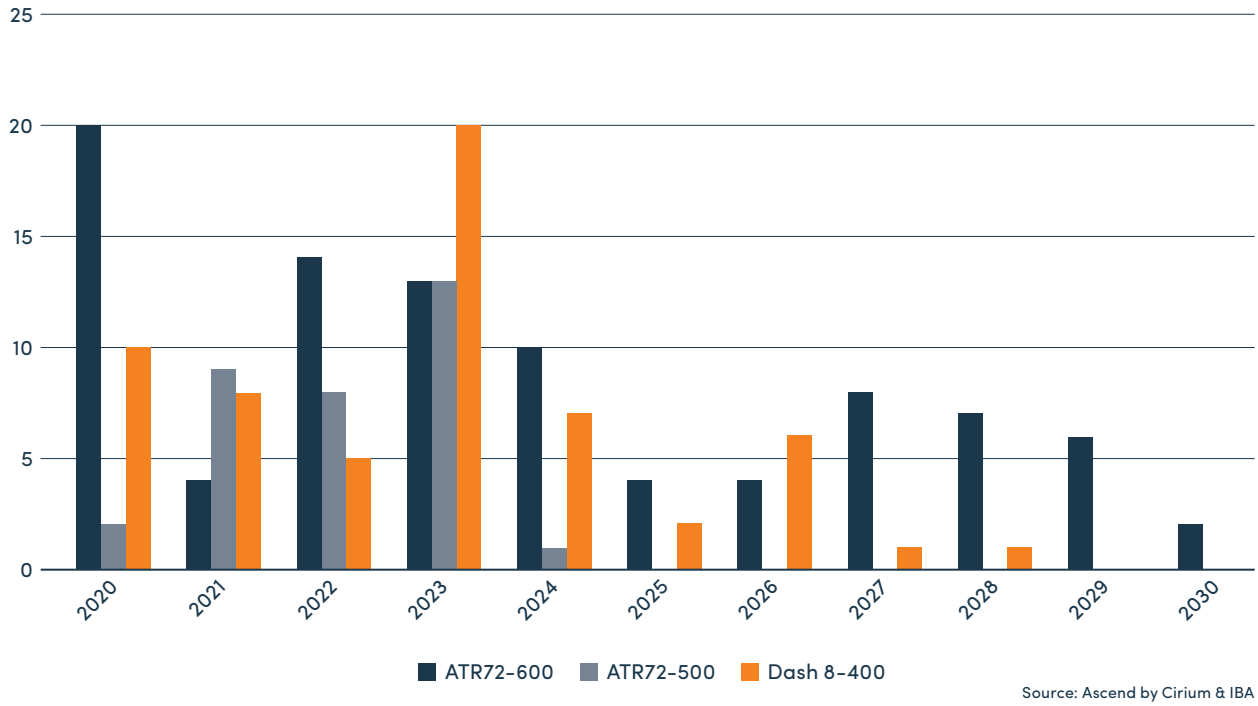
Source: Ascend by Cirium & CH-Aviation

A significant driver of the ability to place an aircraft at a good rental at any particular point in time is the competitive position at that time. From a lessor's perspective, the case for leasing large turboprops improves if its lease returns are staggered over time, and are scheduled to avoid periods when large numbers of similar aircraft also become available on the market as this minimises competition with other available aircraft.

However, of the 251 leased ATR72-600s and 96 leased ATR72-500s aircraft recorded, the return dates are only known for 96 -600s and 33 -500s. This is a similar proportion to that known for the Dash 8-400 (76/194).

The recorded known lease returns are shown in Figure 20. This shows that relatively manageable numbers are due to come off lease between 2020 and 2030, but that a few peak return years exist notably 2020 for 20 ATR72-600s that were delivered by lessors in early production years and 20 Dash 8-400s in 2023.

Figure 20: Known ATR72-500 (33/96), ATR72-600 (96/251) and Dash 8-400 (67/194) Lease Returns (Oct 2019)



Source: Ascend by Cirium & IBA

In the peak return years to 2023 there are no known major fleet transitions for the ATR72. During 2019, Air France HOP largely completed its exit from the type and Azul, which had been reducing its fleet size, is keeping the remainder for the foreseeable future and may even make incremental additions. While not confirmed, Garuda Indonesia may also be looking to reduce its ATR72-600 fleet exposure, although its desire to exit from its CRJ1000 fleet has the greatest priority.

Of the known Dash 8-400 lease returns, 16 are due to be returned from Flybe during the next 10 years. Many additional (21) Flybe aircraft are recorded as leased, but without lease end dates so that, depending on the future fleet strategy of its successor Virgin Connect, many of these are also likely to be returned in the period. In this period the Air Baltic fleet will also be returned to their lessor.

In addition, Horizon, which still operates a fleet of 42 aircraft, is known to be transitioning its core fleet to the E175 so that many of the Dash 8-400s will become available over the coming years. Furthermore, ANA (25) is likely to begin a transition process during the next 5 years once the MRJ fleet begins to enter service.

Over a 10 year period it is nearly always the case that some major carriers will decide to divest certain fleets so that the known rollovers are nothing unusual compared to other aircraft types. However, successful transitions assume an active secondary market. The secondary market is addressed in section 5 below.

5 Market Availability & Demand

5.1 Demand & Supply Drivers

As older generation ATR72-500s and early Dash 8-400s continue to age, it is normal for top tier carriers to seek to roll-over their fleets into newer generation equipment. This would normally have the effect of increasing the supply of used aircraft. This could be measured by the number of aircraft in storage in the short-term and the number of projected returns in future. Stored aircraft are reviewed below in section 5.2 and projected returns are discussed in the leased fleet analysis (section 4) above.

For most types, demand for used aircraft comes either from existing operators, who have made the conscious decision to remain with a particular type, or from secondary operators. In this respect, a review of used aircraft placements in recent years is shown in section 5.3 below.

5.2 Large Turboprop Availability – Aircraft in Storage

There is no complete inventory of aircraft available for sale or lease at any point in time. However, stored aircraft data is often used as a proxy. The weakness of this proxy is that it includes aircraft that are in transition between lessees or sellers and buyers as well as those that may be temporarily stored or parked for a variety of reasons. The trends for future lease returns, and likely disposals in the leased fleet analysis above and fleet transition data, are also indicative of the future market. In addition, the analysis of the real availability levels discussed below, which removes some aircraft that are known to be committed to other operators or in maintenance, is also important.

According to Ascend by Cirium, the number of aircraft in storage is trending downwards towards 14% (Figure 21) of the operating fleet (120 aircraft) for all ATR72 variants including older -200 models. This compares with 6% (37 aircraft) for the Dash 8. While storage levels for the Dash 8 are manageably low, the ATR storage levels, despite the large existing operator base, looks more concerning. A large inventory of aircraft stored is normally considered discouraging. However, this can be segmented as described below.

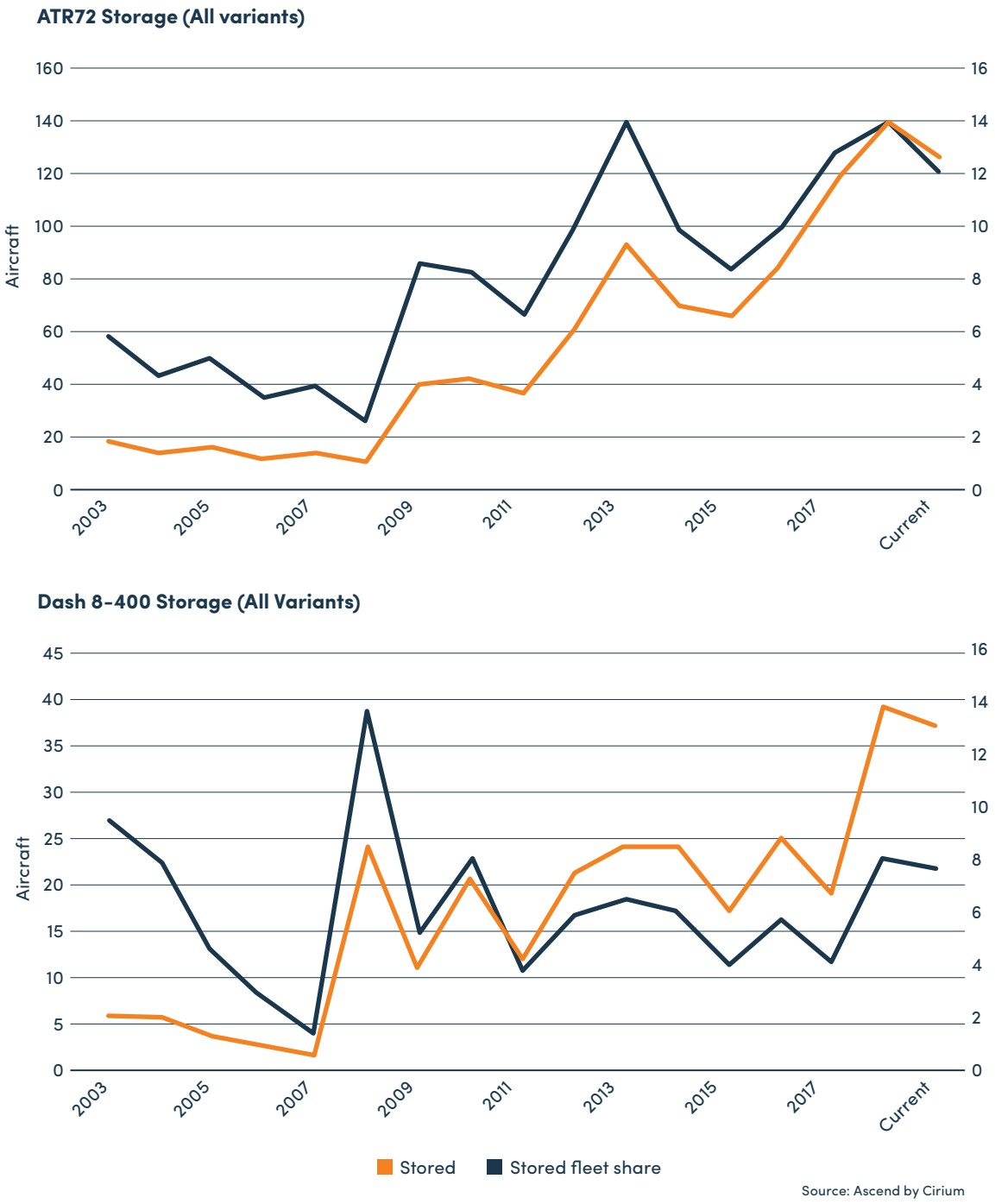
ATR72-600 Stored Aircraft

As TrueNoord is only exposed to the -600 with the exception of a single freighter, the following comments relate to the -600 only. Of the stored aircraft listed by Ascend by Cirium in Figure 21, 35 are ATR72-600s, which is nine units less than earlier in 2019. Many of the stored aircraft are scheduled to enter service post October 2019 and are therefore parked in transition either for maintenance or awaiting delivery. The largest inventory is held by NAC according to Ascend by Cirium, but this supply has reduced markedly since the second quarter of 2019, which suggests that aircraft are being successfully placed. According to ATR, the previous overhang of undelivered new aircraft from ATR that had been ordered by lessors has now been absorbed with no further lessor positions available till later in 2020. In addition, ATR states that the pre-owned inventory of ATR72-600s reduced to five units by September 2019.

Dash 8-400 Stored Aircraft

Of the 37 stored Dash 8-400s, only eight of these are current post 2010 next generation (NG) models. Of these, three are temporarily parked and due to re-enter service with NOK in Thailand and Westjet, Canada. The third is to return to SA Express, which temporarily had its operating license revoked. This means that only five aircraft may be available for sale or lease. This means that newer Dash 8-400s are in short supply.

Figure 21: Numbers of Large Turboprop Aircraft in Storage (Oct 2019)

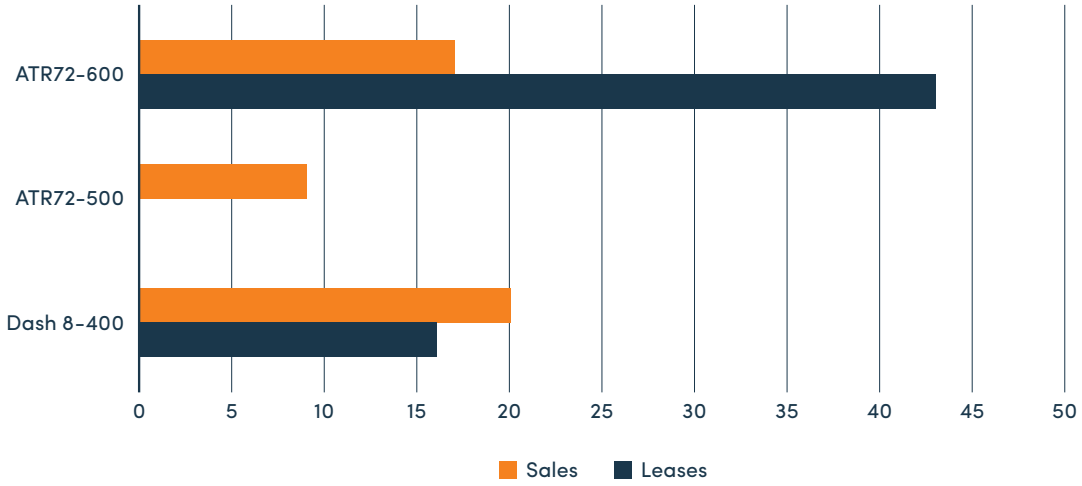


Source: Ascend by Cirium

5.3 Placement of Used Aircraft

Since the beginning of 2018 and as shown in Figure 22, existing owners have demonstrated some success in developing new markets for used large turboprops, with 105 transitions completed since the beginning of 2018 either through aircraft sales or new leases. Of these, 36 related to the Dash 8 and 69 to the ATR72. This represents 7% of the Dash 8 in service fleet and 9% of ATR72-500/600s. This shows a reasonably encouraging level of market liquidity that is, in fact, slightly greater than all other regional aircraft types. Furthermore, these placements were made with a variety of operators in all geographical regions with no dominance of any single or small number of carriers.

Figure 22: Turboprop Secondary Market Transitions Jan 2018 – Oct 2019



Source: AirFinance Journal

5.4 Risk Factors

While both existing lessors and other owners have had considerable success in placing used aircraft with other carriers, some risk factors, which may affect demand, remain. At a macro level these include:

- Any economic deterioration globally or within certain key regions such as South East Asia or Europe could have a substantial negative impact on the demand for aircraft;
- If the strong economic growth of recent years continues, the trend towards up-sizing capacity to larger aircraft could continue and slow the demand for sub-100 seat aircraft from existing operators of this category of capacity. At the same time, this could be compensated by operators of smaller turboprops up-gauging to larger aircraft;
- Any change in the competitive landscape including, for example, the launch of a new large turboprop by Embraer; and
- Any technological step change particularly with reference to propulsion systems could impact the attractiveness of used large turboprops. While electric or hybrid powered aircraft will become a reality in future, there is a wide industry consensus that such technology will not become available for 30-50 seat aircraft for at least 10-15 years. The impact on large turboprops and jets is likely to be even further away.

As the ATR fleet is less concentrated in the hands of a few large operators than the Dash 8-400 or other regional aircraft types, this risk is smaller for the type. However, as in any fleet with a smaller absolute number in service, any major disposal programme by a large operator could leave significant fleets on the market in a short period, which would increase supply and thereby lower values and lease rates.

6 Truenoord CMV & FV Assessment

6.1 General Trends

In recent years there has been some divergence in both current market values (CMV), future values (FV) and lease rates applicable to different vintages of large turboprops.

New Values

In general, values of newly produced aircraft from both ATR and de Havilland destined directly for airlines have remained stable as there has been no evidence of significant discounting to sell excess capacity from either manufacturer. Unlike larger aircraft where major discounting from list price is normal industry practice, these are far smaller in the turboprop market. While there will have been some discounting for large orders such as Indigo or Westjet Encore, these are likely to have been modest compared to larger aircraft. Instead, OEMs will have provided new operators with support during the phase-in period including training packages for crews and maintenance staff along with initial spares provisioning and some additional spares credits. This will have had the effect of maintaining unit prices in the US$20-23million range with ATR72s at the lower end of that range and Dash 8-400s at the higher end. These prices represent a more modest discount on list prices of 10-15%.

By contrast with respect to orders placed by lessors, in the period 2013 to 2016 a number of orders were placed primarily for ATR72-600s by lessors adopting a strategy of securing forward positions similar to large aircraft lessors. Production rates were increased to deliver these aircraft, but as the turboprop market is narrower than the narrow body market, this led to a modest level of over production. Some lessors including some that previously had no turboprop exposure, which had purchased ATRs to both diversify and reduce the average age of its fleet, then began to discount lease rates significantly in order to place their inventory. Consequently, the reduced rentals fed into reduced values for new aircraft. In the meantime, the majority of this excess new capacity has been absorbed. Indeed, both Avation and NAC have placed new firm orders, which would support the view that excess new capacity has been absorbed and that demand from lessors has recovered. This period of excess supply never occurred for the Dash 8-400 as almost no speculative orders were placed by lessors.

Used Values

Used values have taken a different path for the two main types of large turboprop. Until 2019, as a consequence of the low rentals and prices for new ATR72s, the used aircraft market for recent vintage ATR72-600s has been somewhat soft. Values and lease rates for three to seven year old aircraft became impaired. However, unlike for new aircraft where inventory has normalised, the oversupply of used aircraft means that lease rates and values will remain softer for a period of time until the recovery of new aircraft values trickles down to used values. Since the supply of recent used examples is reducing, we expect values to slowly begin recovering during 2020.

Softness in market values for recent used vintages has naturally trickled down into mid-life aircraft values so that particularly late vintage ATR72-500s have also become impaired.

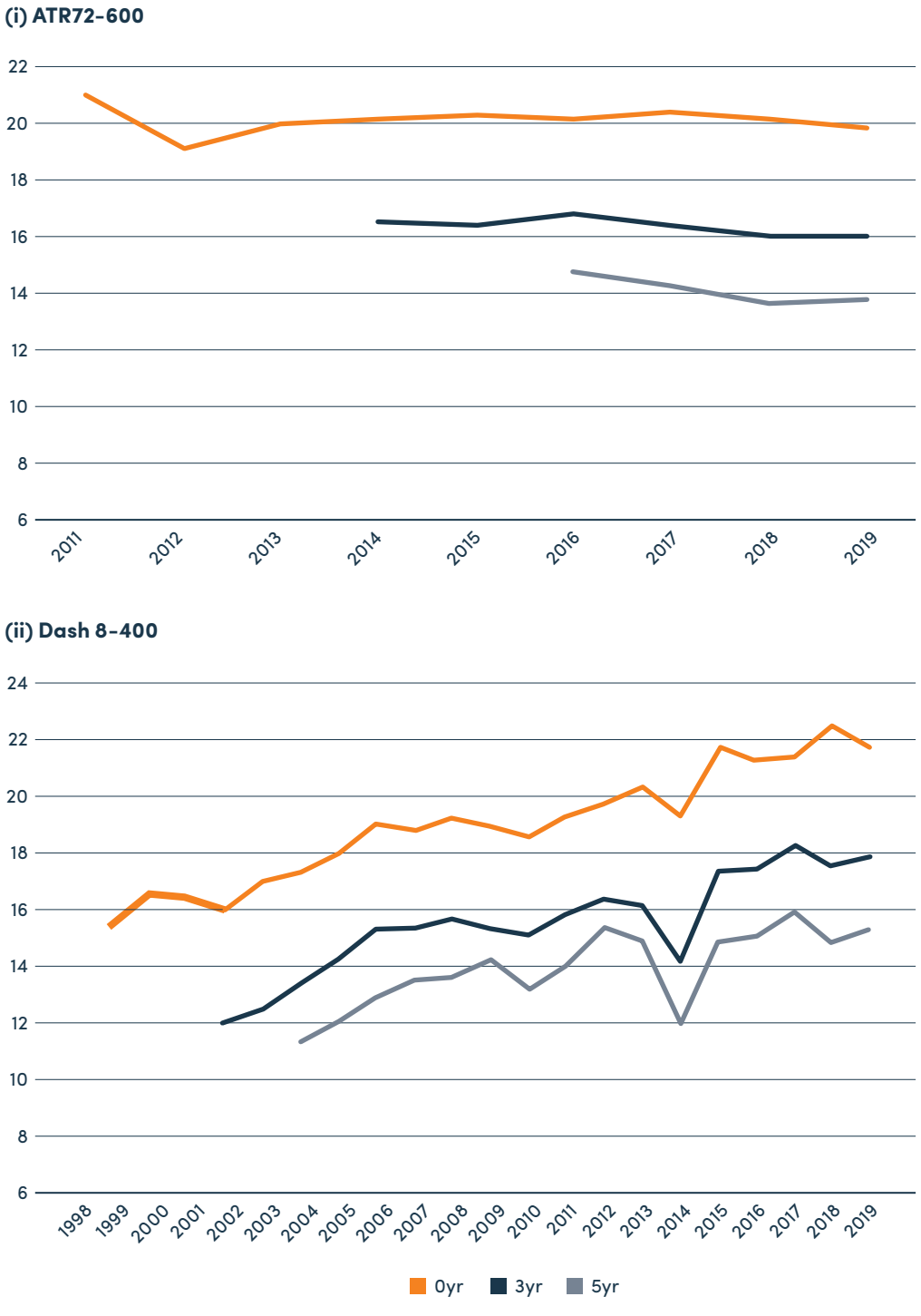
In the late life segment of aircraft manufactured in the 1990s, there is stability and even strengthening of values as the cargo conversion market is now absorbing a greater proportion of early vintage aircraft including, for the first time, older ATR72-500s. According to ATR there have been 10 conversions over the last year.

Since fewer Dash 8-400s have been sold both to end user airlines and lessors, which would typically stress future values negatively, lower production levels have, in fact, restricted supply so that used values have held relatively strongly. This is particularly the case for NG models manufactured since 2010, where demand for used examples is relatively strong.

Value Volatility

Since 2018, TrueNoord has tracked the values of current generation regional aircraft types over time. According to appraisers, there has also been relatively little value volatility for the current generation -600 model over the years since its entry to service in 2011 compared to the Dash 8-400. This can be illustrated as shown in Figure 23 below for both ATRs and Dash 8-400s. (Note: Both large turboprop types are depicted since their respective entry to service.) This shows that while new aircraft have, according to appraisers, shown stable new values, there have been modest declines for used aircraft between three and five year vintages in the case of ATR72-600s and apart from a dip in 2014, relative stability for Dash 8-400s.

Figure 23: Large Turboprop Values Over Time (Sept 2019)



Source: TrueNoord analysis of average CMVs from Avitas, IBA & Ascend by Cirium

6.2 New Value Trends

While new values from ATR were in the region of US$20-20.5million in 2019 and US$22-22.5million for Dash 8-400s, there is some limited divergence for new values among the appraisal community as shown in Figure 24 below. The appraisers currently familiar to TrueNoord estimate new values of US$20.25-21.75million, which is within an expected range and a marginally narrower band of US$22-23million for the competing Dash 8-400.

A similar average gap remains with respect to longer term future values. IBA's valuation, which starts at marginally the highest new value for both types depreciates to a lower value at the highlighted ten year point for the ATR and the lowest for the Dash 8-400, while Ascend by Cirium adjusted its view during 2019 to become the most negative on the ATR72-600 and remains in the average range for the Dash 8-400. The divergence of opinion between the listed appraisers at the ten year point is under US$2million for both aircraft types with a narrower range for the Dash 8-400. The greater disparity in ATR values is probably explained by each appraiser's assessment of the recent ATR72-600 over supply.

Furthermore, the average residual value after 10 years is close to 50% of the new value. This compares similarly to the better residual value performing regional jets and favourably to the less popular types. Furthermore, the residual value performance over time is comparable to mainstream single-aisle aircraft.

Figure 24: Appraised Value Profile New Large Turboprops (Oct 2019)

Source: Ascend by Cirium, Avitas, IBA and mba

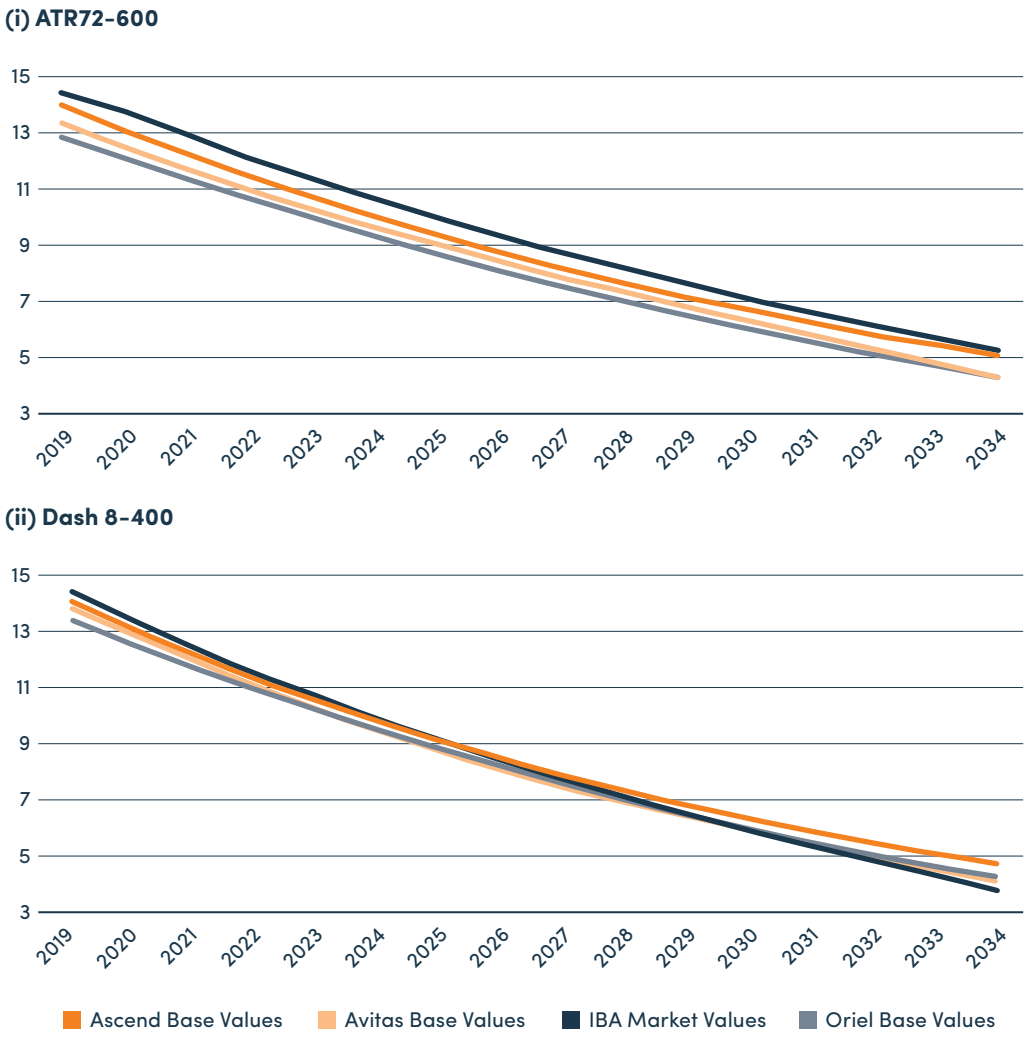
6.3 Used Large Turboprop Values

While most appraisers and market participants concur that the long-term value retention prospects remain positive, the short-term remains slightly depressed for the ATR72-600 and stable for the Dash 8-400 provided that the used examples were manufactured as NG variants since 2010. While ATR72-600s that are available are ultimately finding new operators, both the time taken to place aircraft and the values achieved are taking longer and generating lower pricing than projected at the time of original delivery. Supply of used ATRs still exceeds demand (although this is lower than a year ago) so that competition among sellers and lessors to place used aircraft remains. By contrast, the availability of recent Dash 8-400s is restricted, but older vintage pre-2010 examples are plentiful.

The depicted curves show base values and future base values, which are primarily derived from the economic utility of any aircraft and do not account for market conditions. IBA's valuations are the most positive of these for the ATR72-600 and initially for the Dash 8-400, which it then depreciates on a more accelerated profile, and is also the only appraiser that projects a future market value as opposed to base value.

There is also some divergence of views between the appraisers mainly for the ATR72-600. Values of the ATR initially diverge by over US$1.5million, but begin to converge for future values after some 10 years. The divergence for the Dash 8-400 is less and converges more quickly. This probably reflects the relative strength of recent vintage aircraft. However, over the period to 2034 the projected deprecation of the Dash 8-400 is slightly greater than for the ATR. This may reflect a perceived continued uncertainty over the long-term future of the Dash 8-400 programme.

Figure 25: Apparised Valuation Profile of 2014 Vintage Large Turboprops (Oct 2019)



Source: IBA, Avitas, Ascend by Cirium, Oriel

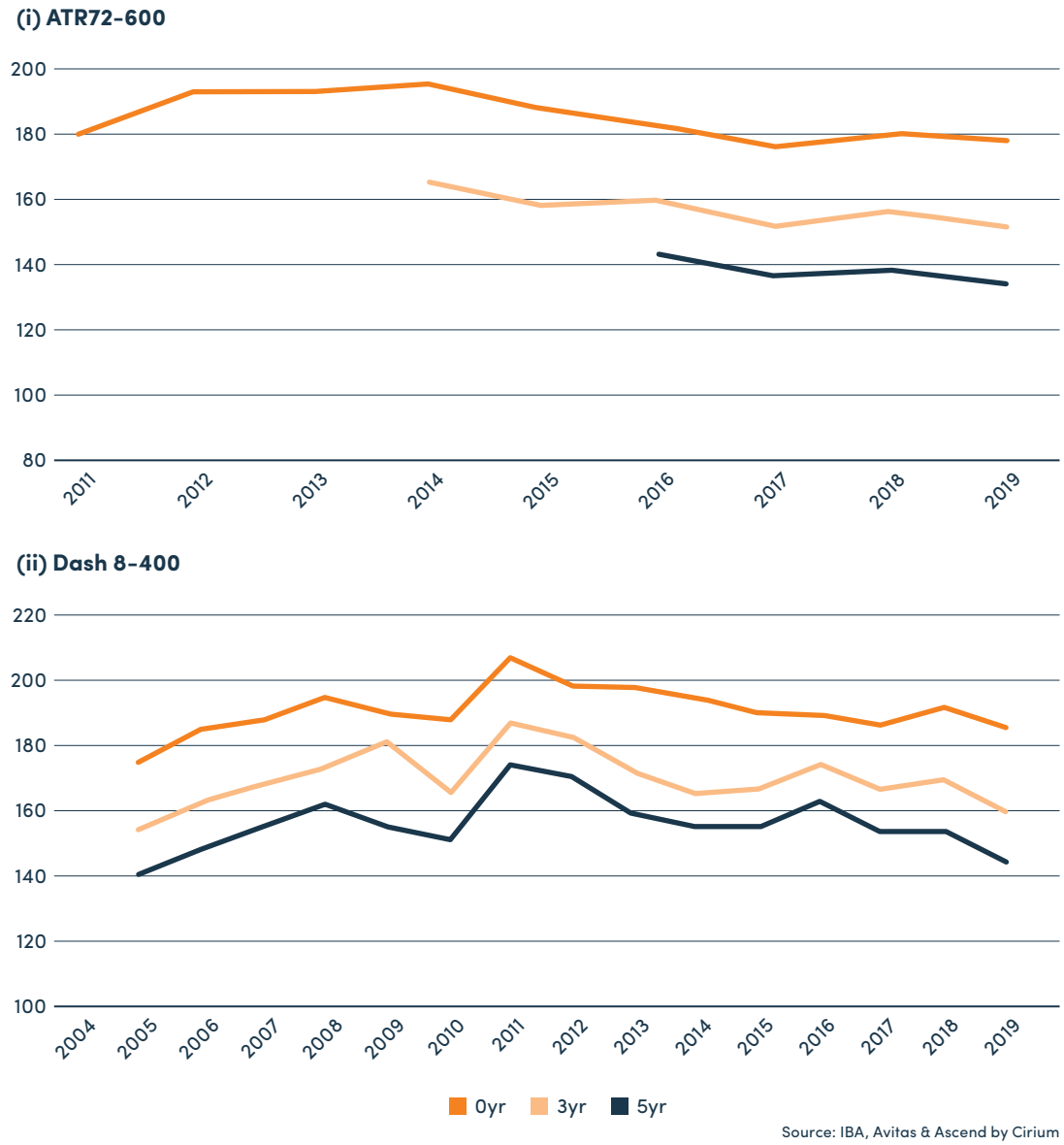
6.4 Lease Rate Trends in Market

According to most appraisers, new aircraft lease rates are at around US$180-190,000 per month with the Dash 8-400 commanding a modest premium over the ATR72-600 as shown in Figure 26 below. For new aircraft delivered from the manufacturer, these rates are broadly consistent with levels achieved in the market except for some ATRs that were speculatively ordered by some lessors several years ago with no end user, where several were placed below these levels.

Figure 26 also tracks three and five year constant age Dash 8-400s and ATR72-600 lease rates since inception of this variant in 2011. For the ATR, this shows that used aircraft leases followed a similar pattern to new rates after 2014 with a more recent stabilisation at current rates. This reflects the excess supply of new aircraft delivered since 2014, which naturally impacted used values. In practice some used ATR72-600s have been placed at levels significantly below the appraised lease rates, but the more recent plateau suggests that this supply may now have been largely absorbed.

Dash 8-400 lease rates for recent vintage three and five year used aircraft peaked in 2011 and have declined by 12-15% since that time, but this has largely returned rates to those prevalent before the 2011 peak. Since the supply of recent new aircraft is limited there is no reason to expect any additional decline in the near-term.

Figure 26: Large Turboprop Constant Age Lease Rates Over Time



Source: IBA, Avitas & Ascend by Cirium

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