

AEI recently announced the launch of an RJ passenger-to-freighter conversion programme, taking on a market dominated by turboprops. An analysis of turboprop and RJ freighter fleet developments over the past 10 years offers insight into current trends and conversion options.

Regional freighter fleet developments & options

In February 2013 Aeronautical Engineers Inc (AEI) announced the launch of a passenger-to-freighter conversion programme for Bombardier's CRJ-100/-200 series of regional jets (RJs). The regional air freight market had traditionally been dominated by turboprops, due to their lower acquisition costs and lower fuel burn on short sectors.

Aircraft Commerce has compared turboprop and RJ fleet data from July 2013 to the same month in 2003 to assess how the regional freight market has developed during the past 10 years. This article will identify the current aircraft options and conversion programmes available to regional operators, and also consider if there is a demand for RJs in this niche market segment.

Regional air freight

Regional freighters are normally used on mail flights, for carrying newspapers, ad-hoc charters or express package services on behalf of large integrators like FedEx and UPS. The smaller aircraft can feed freight into an integrator's main hubs from peripheral locations. "Most of the time the integrators outsource the entire regional freight network to third-party operators," says Jacob Netz, senior analyst at the Air Cargo Management Group (ACMG), expressing his own personal opinion. "Although FedEx owns most of its feeder freighters, other integrators do not. They will usually not even dictate the type of aircraft that the sub-contractor uses. Regional aircraft flying feeder services are often bulk loaded or carry freight in non-standard unit loading devices (ULDs)," continues Netz. "Interlining does not usually exist. From an aircraft selection perspective, for large integrators as well as other regional freight operators, the most important factors for regional freighters are the

acquisition cost and operational reliability."

"The regional cargo market is characterised by short-haul flying and low utilisation," explains Russell Ladkin, sales and operations director at Gothenburg-based all-cargo carrier West Atlantic. "A regional cargo aircraft may only fly for two to three hours a day, four days a week. This low level of utilisation is a significant factor in the fleet selection process. In this market, asset cost therefore becomes significantly more important in overall economics than fuel efficiency and other direct operating costs."

"In most cases, low levels of utilisation mean that converted passenger aircraft are preferred to new production types because of the former's lower acquisition costs," explains Netz.

Europe and North America

Two of the largest geographical markets for regional freight services are Europe and North America.

There have been a number of changes among European operators over the past 10 years, including an element of consolidation. In 2003, Channel Express, Emerald Airways, BAC Express and WDL Aviation were among the largest operators of regional freighters in Europe. The first three of these airlines no longer exist, while WDL Aviation now focuses more on passenger charter operations. Two of the largest operators 10 years ago were Atlantic Airlines and West Air Sweden. In 2011 these airlines merged to form West Atlantic, which operates the largest active fleet of regional freighters in Europe (34 aircraft). The next largest are Swiftair (23), Air Contractors (16) and Farnair (13).

All four of Europe's largest regional freight carriers operate feeder services for integrators along with other ad-hoc

missions. West Atlantic, Swiftair and Air Contractors also fly mail routes.

"The demand for air mail in Europe has remained stable, with most of the growth coming from the express package industry," says Ladkin. "On more mature regional routes the level of demand even supports the use of widebodied aircraft such as the 767, but there will always be a requirement for smaller turboprop freighters as route development tools."

Along with a trend for supplementing regional fleets with larger jets, the average size of turboprop freighters in Europe has evolved since 2003. Although Channel Express and Atlantic Airlines brought the 15-ton (1t equals 2,240lbs) Lockheed Electra onto the British aircraft register, the turboprop freighter fleet was traditionally based around aircraft with gross payload capabilities in the 3.5-6t range. The most popular of these included the Shorts 360, F.27 and the HS748. Since 2003 these have been largely replaced by more modern aircraft. Some were succeeded by the ATR 42, but there has been a shift to larger 8t aircraft, such as the BAe ATP and ATR 72.

The active RJ freighter fleet in Europe has reduced by one unit from 20 to 19 aircraft since 2003. The BAe 146 is the most common type, with 16 aircraft in service. There are now also three CRJ200 Package Freighters (PF) flying in Europe.

In 2003 a number of North American regional freight operators still had single-type fleets of older generation aircraft. One of these, Air Cargo Carriers, still maintains an active fleet of Shorts 330/360s, but this has fallen from 23 to 17 aircraft over the past 10 years. Elsewhere, the decline in older-generation aircraft has been more distinct. Zantop Airlines, which previously operated a fleet of Lockheed Electras, is no longer trading. There now remains only one active Lockheed Electra freighter in the world.



AirNow, operated 14 Embraer Banderanties in 2003, but ceased operations, while Kelowna Flightcraft has reduced its fleet of Convair 580s from 11 to three. Phoenix Air had 14 Gulfstream I turboprop freighters in 2003, but this has fallen to just one aircraft.

One of the biggest changes in the North American regional freighter market involved the replacement of ageing F.27s on FedEx operations. A number of the largest regional freight airlines in the US operate express services from smaller communities to FedEx hubs under the FedEx Feeder scheme.

Two of these, Empire Airlines and Mountain Air Cargo, operated a combined fleet of 32 F.27s for this purpose in 2003. Over the past 10 years the F.27s have been replaced by a combination of 20 similar-sized ATR 42s and 15 larger ATR 72s.

Mountain Air Cargo operates 11 ATR 42s and eight of the ATR 72s, with the rest in Empire Airlines' fleet.

The carriers also operate a combined 70 single-engine Cessna 208 Caravans on FedEx feeder services. The Caravan has a payload capability of just under 2t, and is popular for FedEx feeder operations. At least five other North American airlines have 25 or more Caravans in their combined fleet.

The largest regional cargo operator in North America by fleet size is Ameriflight, with about 135 active turboprops, including over 50 Beech 99s and over 40 Fairchild Metro/Merlins. Ameriflight has also increased its fleet of Embraer Brasilia freighters from three to eight aircraft since 2003.

No RJ freighters were in the North American market in 2003, and this situation has not changed in 2013.

Fleet developments

The following analysis is based on the worldwide regional freighter fleet. It is split between turboprops and RJs to provide a structured summary of the regional freighter options available.

Although there are a small number of regional aircraft operated in a combi role, this analysis will focus on full-freight and quick change (QC) options.

Turboprops: less than 2t

The number of small-payload turboprop freighters in active service has remained consistent since 2003. The Caravan is the most popular aircraft in this category with more than 350 in service. It can be ordered from Cessna as a manufactured freighter.

The next most numerous aircraft is the Beech 99 with about 100 in operation. Most of these aircraft are based in North America, with many flying integrator feeder services.

Turboprops: 2-4t

This category includes aircraft with a gross payload capability of just over 2t, such as the Metro/Merlin and Banderantie. It also includes slightly larger types, such as the Saab 340, Brasilia, Shorts 330/360 and Dash 8-100, which can all carry in excess of 3t. The number of aircraft with a payload capability of 2-4t has remained stable over the past 10 years.

At the smaller end of the scale, the Metro/Merlin remains the most popular 2t freighter, with nearly 150 in active service. Ameriflight is the largest single operator (45). The number of

The Embraer Brasilia can be converted into a bulk freighter. Along with the Saab 340A and Shorts 360 it offers a gross payload capacity of between about 3.5-4t.

Banderanties in active freight service has fallen to just 15.

The Saab 340A has become the most popular of the 3/4t freighters. In 2003 none had been converted, but 10 years later there are 37 in active freight service. IBC Airways is the largest operator (8). In contrast, the number of Shorts 360s has fallen from 35 to 29, while the number of Brasilia freighters has only increased by three from 24 to 27.

The Saab 340A, Shorts 360 and Brasilia have similar payload capabilities of 3.5-4t. The Saab and Embraer aircraft have a speed advantage over the Shorts, but this is not a defining factor for low utilisation regional operations.

The Saab 340A can be converted to a Class E cargo configuration by any Part 145 facility using an original equipment manufacturer (OEM) Service Bulletin (SB). A conversion for the Saab 340B has not yet been developed. Embraer has released an SB to convert the Brasilia.

The Brasilia has the advantage in terms of available feedstock, but has higher potential acquisition costs. There are 185 active and parked passenger-configured Brasilias, compared to 72 S340As and 31 Shorts 360s. The last S340As were manufactured in 1989.

Other similar-size aircraft that have been converted to freighters include the Dash 8-100 and Jetstream 41. Only a few Dash 8-100s have been converted, with three in active freight service in 2013. The Jetstream 41 is yet to be proven as a freighter. Airlink in South Africa initially converted two, but these are now being returned to a passenger configuration.

Turboprops: 5-7t

The number of active turboprop freighters in this size classification has fallen by 30% since 2003. This payload category has historically been dominated by the F.27, HS748 and Convair 580.

These three aircraft have a gross payload capability in the region of 6t and in 2003 made up 80% of the active fleet in their class. In 2013 their representation has fallen to 45% as operators look to replace ageing airframes. For carriers that need similar-sized replacements, the two main options are the ATR 42 and the Fokker 50.

The number of active ATR 42 freighters has more than doubled since 2003. In 2013 there are 49 in service. Mountain Air Cargo (11) and Empire

The ATR42 has replaced the F.27 on FedEx Feeder services. Companies offering conversions include Alenia Aermacchi, Aerodisa, M7 Aerospace and Erie Aviation.

Airlines (9) are the largest operators, with the ATRs replacing F.27s on FedEx Feeder services. Other large operators are Swiftair (6) and Air Contractors (5).

There are a number of potential freight configurations for the ATR 42. There are two types of freight conversions plus the option of a Quick Change configuration. ATR refers to the conversion options as 'The Tube' and 'The Tube + Large Cargo Door'. In this analysis they will be referred to as the Tube and LCD conversions.

With the Tube conversion, the standard baggage door is retained. The modified aircraft can carry freight in bulk or in bespoke ATR containers, designed to fit through the door. These each offer a volume of 99 cubic feet (cu ft).

The LCD conversion involves the installation of a large cargo door. The modified aircraft can carry standard-sized pallets or ULDs, such as the LD3, bulk freight or the ATR containers.

The first stage of the Tube and LCD cargo modifications generally involves the removal of passenger cabin fittings. Transition to a tubular, cargo compartment then requires the installation of window plugs, a reinforced floor and protective linings for the sidewalls and ceiling. Finally, the cabin is modified to meet Class E requirements. Specific to freight aircraft, Class E certification requires the installation of a smoke detection system.

There are a number of companies offering ATR 42 conversions, including Alenia Aermacchi, Aerodisa, M7 Aerospace and Erie Aviation. Not all of these companies offer an LCD conversion. The payload characteristics of the converted aircraft will vary by provider. The payload capability is also influenced by the specific aircraft series. Newer -500 series ATRs can carry slightly higher payloads than first-generation aircraft. At this time only one ATR 42-500 is flying as a freighter.

Alenia Aermacchi offers both types of freight conversion for the ATR 42. It provides the choice of a light tube lining for optimum payload operations or a structural tube lining for optimum volume requirements.

The light tube is meant for use with containers and spider nets. The lining panels are fixed with screws and Velcro fastenings to allow for fast installation and replacement. The structural tube is tailored for rough, or bulk loading



scenarios. It uses thicker sidewall lining panels reinforced by a substructure supported by longitudinal tracks attached to the frames. This protects the fuselage and provides resistance to in-flight bulk freight loads. The structural tube includes attachment points for 9g vertical nets.

With a light tube interior the gross structural payload for an ATR 42 that has undergone the Tube conversion by Alenia Aermacchi varies from 5.7t for a first-generation aircraft to 6.5t for a -500 series. The gross volume available is 1,660 cu ft. Bulk loaded with a structural tube interior, the gross structural payload varies from 5.5t for a first-generation aircraft to 6.4t for a -500 series. The available gross volume jumps to 1,978 cu ft.

The Alenia Aermacchi LCD conversion includes the same light or structural tube Class E interior. The large cargo door is situated in place of the standard baggage door on the port side. It measures 116-inches X 71-inches, and has a sill height of 3.44 feet.

It allows the same LD-3 containers or 88-inch X 108-inch pallets used by widebody freighters to be loaded on the ATR 42. This would make interlining available for integrator operators if required. The ATR 42 can accommodate five LD-3 containers, or three 88-inch X 108-inch pallets.

Other features of the LCD conversion include a 9g net at the front of the fuselage and the option of a cargo-loading system. The gross structural payload for an Alenia Aermacchi-converted LCD ATR-42, with a structural tube and loaded with containers, varies from 5.4t for a first-generation aircraft to 6.3t for a -500 series. The weight of the cargo-loading system and containers

would need to be allowed for. The highest achievable gross volume is 1,978 cu ft.

The final freight configuration option for the ATR 42 is the QC. This requires the overhead luggage bins, galley and lavatory to be retained for passenger services. Lateral guides and roller trays are installed in the cabin. These allow passenger seats or the specially designed ATR freight containers to be loaded and unloaded quickly without the risk of damaging the interior sidewall panels.

For QC operations the cabin floor is reinforced, and the cabin has to meet Class E requirements. The ATR 42QC can accommodate nine of ATR's 99 cu ft containers. The typical net structural payload for an ATR 42QC modified by Alenia Aermacchi would be 4.5t when carrying a combination of containerised and bulk freight. Its net structural payload for full bulk freight operations would be 5.3t.

Alenia Aermacchi has carried out one LCD and two Tube conversions on ATR 42s. Aerodisa offers Tube conversions and has converted six aircraft. M7 Aerospace also offers Tube conversions and has modified ATR 42s for FedEx Feeder operations.

The Fokker 50 is the only contemporary competitor to the ATR 42 in this size category. There are 14 active Fokker 50s flying as freighters in 2013. Amapola Flyg of Sweden (12) is the largest operator.

Four of the 14 Fokker 50 freighters were converted by Fokker Services, not including installation of cargo doors.

The only conversion programme currently being marketed for the Fokker 50 is that by Aircraft Conversions B.V. in the Netherlands. Aircraft Conversions has already modified 10 aircraft, plus

WORLDWIDE ACTIVE REGIONAL FREIGHTER FLEET 2003 - 2013

| Aircraft type | 2003 | 2008 | 2013 |
|-------------------|------|------|------|
| TURBOPROPS | | | |
| Under 2t | 555 | 545 | 544 |
| 2-4t | 277 | 293 | 286 |
| 5-7t | 189 | 158 | 132 |
| 8t | 16 | 62 | 82 |
| RJs | 23 | 29 | 28 |
| RUSSIAN | 422 | 348 | 276 |

another airframe as a static test bed. It offers two FAA-certified and EASA-validated main conversion options, the FOKKER50FREIGHTER and the FOKKER50XPRESS. The

FOKKER50FREIGHTER conversion has also just received validation from the Indonesian airworthiness authorities.

Both conversions result in a seven cargo zone, E-Class cabin with a gross volume of about 2,120 cu ft. They can fly up to 590nm with a gross structural payload of 7.3t; or up to 1,600nm, with a gross structural payload of 4.9t. Average conversion times depend on customer requirements, and can take 7-10 weeks for the FOKKER50XPRESS, and 12-16 weeks for the FOKKER50FREIGHTER.

The FOKKER50FREIGHTER conversion involves installing a forward large cargo door (FLCD) on the forward, port side. The FLCD measures 92.1-inches X 69.7-inches, and allows the aircraft to accommodate containers, pallets and oversize cargo. An optimum configuration would see the aircraft carry six LD-3 containers. Aircraft Conversions has completed five conversions to date.

The FOKKER50XPRESS configuration uses the standard integral passenger door and starboard side rear dispatch door, which can accommodate Euro pallets. It is suitable as a bulk freighter. Its converted cabin consists of six 9-G freight-carrying zones. Aircraft Conversions has completed six FOKKER50XPRESS conversions so far, with options on a further five.

Depending on the configuration, the Fokker 50 can demonstrate a higher gross payload capability than the ATR 42 freighter. The Fokker 50 has lower potential acquisition costs than the similar vintage ATR 42, but a smaller potential feedstock for conversions.

There are 162 active and parked first-generation ATR 42s in a passenger configuration, plus another 116 -500 series aircraft. This compares to 137 active and parked Fokker 50s.

The pace of ATR 42 conversions may

increase when the value of more -500 series aircraft depreciates to suitable feedstock levels.

Turboprops: 8t

The largest growth in the regional freighter fleet since 2003 has come from turboprops with a gross payload capability of about 8t. The number of active aircraft in this category has increased from 16 in 2003 to 82 in 2013, a result of operators opting to replace ageing E.27s and HS748s with larger aircraft. The most popular 8t turboprops are the ATR 72 (48) and the BAe ATP (32). A few Q400s have also been bulk converted.

There are two ATP freighter conversion options. The first is an E-Class bulk version, which retains its standard cabin doors and offers a usable freight volume of 2,754 cu ft.

The second is a large freight door (LFD) conversion. The LFD is installed on the rear port side. It is rearward-sliding and manually operated, and so does not require a hydraulic or electric operating system. The LFD is 104-inches wide and has a 67.75-inch high aperture. It allows the aircraft to be loaded with containers and pallets.

One potential loading arrangement sees the aircraft accommodate eight LD-3 containers. An ATP that has undergone a LFD conversion can also be bulk loaded. The maximum gross structural payload of an ATP freighter is about 8.1t.

There are currently 42 active and parked ATPs in a freight configuration, of which 22 have received the LFD conversion. The remainder are bulk freighters. West Atlantic is the largest operator of ATPs in the world. It has an active fleet of 31 ATP freighters and another seven parked aircraft, one of which is in a passenger configuration. The aircraft first entered the fleet when West Air Sweden chose it to replace the HS748. West Atlantic believes the ATP is the best option in the 8t class. "It has the

lowest cost per kilogram in the marketplace," claims Ladkin. "Its maintenance costs have remained stable as it ages, unlike our experience with the first-generation ATR 72s which do not sustain corrosion as well," continues Ladkin. "It also continues to meet industry noise and emissions requirements. With no economically viable replacement on the horizon, we have chosen to invest close on \$0.5 million in each member of our ATP fleet to sustain their service life for another 25 years. This includes a full avionics upgrade to flat-panel LCD screens and 35 other modifications to the aircraft and its systems."

Despite the ATP's suitability as a freighter, only 61 aircraft were ever built. Only 11 active and parked aircraft remain in a passenger configuration. The prospective market for further conversions is therefore small. This leaves the ATR 72 and Q400 as the main options for future freight conversion in the 8t class. The main ATR 72 operators are Air Contractors (11), Farnair (11), Mountain Air Cargo (8), Empire Airlines (7) and Swiftair (6).

Like the ATR 42, the ATR 72 can undergo Tube and LCD conversions. It can also be modified to a QC configuration. A Tube-converted ATR 72 can carry freight arranged in bulk or the ATR bespoke containers. An LCD converted ATR 72 can carry bulk freight, ATR containers, or standard pallets and ULDs, such as the LD-3. Alenia Aermacchi, Aerodisa, M7 Aerospace and Erie Aviation are among the ATR 72 conversion providers, but not all offer the LCD modification. The Tube freight conversion is the most popular.

With a light tube interior, an ATR 72 that has undergone a Tube conversion by Alenia Aermacchi would provide a gross volume of 2,260 cu ft. The maximum gross structural payload for an ATR 72 so configured varies from 8.5t for a first-generation aircraft, to 8.8t for a -500 series. The structural tube option offers a gross volume of 2,666 cu ft. The maximum gross structural payload for an ATR 72 so configured is 8.3t for first-generation, and 8.6t for -500 series.

An ATR 72 freighter converted to the LCD configuration by Alenia Aermacchi can accommodate seven LD3 containers or five 88-inch X 108-inch pallets in addition to other bulk cargo. The maximum gross volume with the structural tube interior is 2,666 cu ft. The maximum gross structural payload in this configuration is 8.2t for a first-generation ATR 72, and 8.5t for a -500 series aircraft. The cargo door has the same dimensions as that used on the ATR 42.

An ATR 72QC modified by Alenia Aermacchi could accommodate 13 of ATR's 99 cu ft containers. Its maximum

The Fokker 50 freighter can carry a gross payload of up to 7.3t. Aircraft Conversions offers two conversion options, the FOKKER50FREIGHTER and the FOKKER50XPRESS.

net structural payload would be about 7.8t when bulk loaded, and 6.2t when carrying a combination of containerised and bulk freight.

Alenia Aermacchi has carried out six Tube and six LCD ATR 72 conversions. Aerodisa offers Tube conversions and has converted six aircraft. M7 Aerospace also offers Tube conversions, and modified ATR 72s for FedEx Feeder operations.

Cascade Aerospace offers the only freight conversion option for the Q400. It can provide package freight (PF) kits, which turn the aircraft into a Class E bulk freighter. The kits include cargo flooring, restraining nets, and a protective fuselage liner system with window plugs, along with installation instructions and the necessary airworthiness certification.

A typical converted Q400PF has a usable volume of 2,730 cu ft and a gross payload capability of about 8.8t. Cascade has supplied five Q400PF kits so far, of which four have been installed.

There are currently only two active Q400PFs, both operating for Blue Bird Aviation in Kenya. The lack of demand for Q400PFs, or for a large cargo door conversion, is probably due to the lack of suitable feedstock when compared to the ATR 72. "In general the high hull value of secondary Q400 aircraft is not attractive for conversion", explains Delio Petohleb, director of sales in the asset management group at Bombardier Commercial Aircraft. "While continuing to be popular as a passenger aircraft, and much younger than some of the first generation ATR 72s, it will be five to 10 years before early-vintage Q400 aircraft reach the appropriate value threshold for freight conversion."

When larger numbers of Q400s become suitable for conversion they may be at a disadvantage when compared to the ATR 72. The Q400 has a faster cruise speed, but this is of little advantage in low-utilisation freight operations. "The Q400 has higher fuel burn characteristics, and therefore slightly higher operating costs, than the ATR 72," claims Rob Morris, head of advisory at aviation consultancy Ascend.

The continuing popularity of ATR 72-500s and Q400s as second-hand passenger aircraft leaves the first-generation ATR 72 as the most likely near-term candidates for conversion in the 8t market. There are 113 active and parked ATR 72-200 series aircraft in a passenger configuration. According to



Avitas, the current market value of the youngest ATR 72-200 series, manufactured in 1998, is \$5.1 million. This compares to \$6.4 million for an ATR 72-500 and \$6.3 million for a Q400 manufactured in 1999.

RJ Freighters

The number of active RJ freighters increased slightly, from 23 to 28 from 2003 to 2013. The main type currently in service is the BAe 146 (22). There are also a small number of CRJ200s and a single F.28 in a freight configuration.

Active 146 freighter numbers have remained fairly constant over the last 10 years, with the aircraft seeing more service in this role than any other RJ type. Originally, 29 146s were manufactured as cargo aircraft. These were taken from the main production line to have a large freight door (LFD) fitted by Pemco in the US. There were two main derivatives: the dedicated freighter, also known as the quiet trader (QT); and the QC variant. In total 23 QTs and 5 QCs were produced. The QTs were a mix of 13 -200 and 10 -300 series airframes. The QCs were all -200 series aircraft.

A sole -100 series airframe was converted for military use before being reconfigured as a commercial freighter and remains in service.

"All 23 of the new-build series -200/-300 146 QTs went to TNT or other airlines in the then TNT/Ansett group," says David Dorman, public relations consultant to BAe Systems Regional Aircraft. Most active 146 freighters are factory-built QTs which remain in service for TNT Express in Europe. They are operated by TNT Airways (8) and Spanish subsidiary Pan Air (8). The total

fleet of 16 aircraft is split evenly between -200 and -300 series airframes.

In 2007 BAe Systems launched a passenger-to-freighter conversion programme for the 146. "The thinking was that the 146 could fill the gap between the largest 8t turboprop freighters and the smallest narrowbody jets, such as the 737," explains Dorman.

A full freighter conversion programme for -200 and -300 series aircraft was established by Aerostar. The conversion replicated the new-build freighters with installation of a 131-inch wide X 76-inch high LFD on the port rear-side, an E-Class cabin, reinforced floor, and freight-handling system.

The 146 freighter can accommodate 88-inch X 108-inch containers or pallets. In typical containerised operations, a converted 146-200QT can carry a gross structural payload of about 11.2t or a net structural payload of 10t. It has a maximum volume, including upper deck containers, bulk and lower deck cargo, of 2,810 cu ft. In the same scenario a 146-300QT can carry a gross structural payload of about 12.2t and a net structural payload of 10.9t. It has a maximum volume of 3,310 cu ft.

Since the programme was launched there has been next to no demand for 146 freight conversions. "BAe launched the conversion programme just as the regional air freight market collapsed in 2007/2008," says Nigel Benson, vice president of sales and marketing at Falko Regional Aircraft. "Only two aircraft have been converted. Of those, one -300 is currently in service with Cobham Aviation in Australia. The other is a -200, which, along with a -200QC, is currently in Falko's portfolio awaiting placement."

The main RJ candidate for



conversions in the near term is the CRJ-100/-200 series. There are five CRJ-200s flying in a freight role, with West Atlantic (3) being the largest operator. These aircraft have all received a PF conversion.

Cascade Aerospace is the only provider of CRJ-100/-200PF kits. Like its Q400 product, the CRJ kits include the parts, modification instructions and certification required for conversion to E-Class bulk freighter status. Excluding the time taken for removal of passenger cabin materials, such as the overhead bins, Cascade estimates that its PF modification can be completed in 2,500 man-hours (MH). Freight is loaded through the standard passenger entry door and rear cargo door.

The CRJ-100/-200PF can carry gross payloads of up to 6.7t, and offers a volume of 1,765 cu ft. So far Cascade Aerospace has delivered seven CRJ-100/-200PF kits; six have been installed.

“West Atlantic was the launch customer for the CRJ-100/-200PF,” says Ladkin. “We chose it for some of the long, thin mail routes we operate in Scandinavia. It is the perfect aircraft for routes in excess of 500nm with 5/6t payloads. On sector lengths beyond 500nm, the CRJ-100/-200 freighter allows customers to benefit from jet-service speed and Category III landing capability, but at turboprop economics.

In early 2013, AEI announced a full special freighter (SF) Class E conversion programme for the CRJ-100/-200, including the installation of a 94-inch X 77-inch cargo door. This would allow the aircraft to accommodate eight pallets measuring 88 inches wide by 61.5 inches or 62 inches long. There are no custom containers currently available with these base dimensions.

The CRJ-100/-200SF would have a maximum gross structural payload capability of about 6.6t.

AEI estimates that the average conversion will take 75 days and cost \$1.6-1.8 million. It expects to receive supplemental type certificate (STC) for CRJ-100/-200SF conversion by July 2015.

Avitas lists market value for a 1998 vintage CRJ-100/-200 at \$2.8 million. To purchase and convert a 15-year-old CRJ-100/-200 to SF status would therefore cost \$4.4-4.6 million.

There is some debate about the level of demand for RJ freighters and the suitability of CRJ-100/-200 cargo operations. “The fact that only two BAE 146s and five CRJ-100/-200s have been converted in the past five years illustrates the lack of demand,” says Morris. “The installation of a large cargo door in the CRJ-100/-200 might be considered too much of a risk by some operators, since it adds additional expenditure to an aircraft that already has high operating costs in a yield-challenged environment.”

Bombardier sees a future for converted CRJ-100/-200s where freight feeder routes have longer stage lengths. “Geography is a big driver,” says Petohleb. “We see potential for the CRJ-100/-200 freighter in Africa, Russia and Latin America where the population is spread out over large distances, separated by challenging terrain.”

“Although the CRJ-100/-200PF freighter has a niche application, the SF variant could prove popular in emerging markets,” says Ladkin. “These markets often have long stage lengths and require large equipment to be transported for the oil, gas and mineral industries that often drive emerging economies,” continues

The first-generation ATR 72-200S is the main candidate for future conversion among the 8t payload turboprops. The aircraft has greater available feedstock than the ATP and a lower acquisition cost than the Q400.

Ladkin. “The CRJ-100/-200SF’s range capability and large cargo door make it suited to these operations.”

So far 24 CRJ-100/-200SF conversions have been ordered, suggesting that there is growing demand for RJ freighters that can operate on long thin routes. AEI believes there is potential to convert 75-100 in total. The CRJ-700 could be the next RJ freighter when its hull price comes down to more acceptable conversion levels. “With a payload of about 8t the CRJ-700 could replace under-utilised narrowbody feed freighters,” says Petohleb.

Russian aircraft

The number of active, Russian-built regional freighters has declined by 35% over the past 10 years. The two main types are the AN-26 and AN-32 turboprops. Carriers with large Western-built turboprops previously saw low-cost AN-26 operators as competition for integrator contracts. Since 2003 the number of active AN-26s has fallen by 35%.

Summary

The pressures of the global economic downturn have led to some consolidation among regional freight operators. Despite this, there remains a demand for regional aircraft to operate mail and express feeder services. The active fleet of western-built regional freighters remained stable from 2003 to 2013, reducing by just 0.83%.

The main turboprop candidates for future conversion are the Saab 340 and Brasilia in the 2-4t category, the ATR 42 and Fokker 50 in the 5-7t class and the ATR 72 in the 8t classification.

Previously, the concept of the RJ freighter has never fully taken off. Only the BAE 146 has served in a cargo role in significant numbers, and most of those aircraft were factory-built rather than conversions. Now, the number of orders for the CRJ-100/-200SF conversion suggests that there may be a future for RJ freighters in markets characterised by long sectors and thin demand. **AC**

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