(photo: AerFin)

Wheels down, brakes on

Wheel and brake maintenance is generally relatively simple, high-volume work, based on overhaul rather than repair. Overhaul is also critical to companies offering components harvested from retired airframes, while the wider industry has grown to offer a variety of wheel and brake availability and overhaul programmes, as **Paul E Eden** finds

Wheels and brakes, along with lubricants, are among the most predictable of an airline's maintenance items. Brakes, ironically, tend not to break, but they do wear, and the majority of brake maintenance is overhaul and the associated replacement of components that wear naturally every time braking is employed. Confusingly, while a maintenance provider might replace an individual part within a brake unit during overhaul, the unit itself is generally considered as a single component.

Wheels are likely to suffer corrosion or damage from FOD. They should not be confused with tyres, although there is a necessary degree of overlap. Like brakes, tyres wear naturally in use and a wheel may be removed and its tyre replaced a few times – typically between four and six,

depending on aircraft type – before the wheel requires overhaul, assuming no issues are identified during the basic inspection that accompanies an intermediate tyre change.

Phil Randell, owner and Accountable Manager of World Aero, a UK-based specialist wheel and brake MRO provider, described the business. "Wheel and brake maintenance is always on an on-condition basis, there's generally never any scheduled maintenance. Many people outside the business assume we're busier during the winter when more aircraft are in heavy maintenance, but in fact the opposite is true, because if an aircraft's tyres and brakes have life left, they won't be disturbed during heavy checks. But when an aircraft is operating, if the tyres or brakes are worn out, they'll be removed. Our work is therefore driven by aircraft utilisation."

Brake and tyre inspection fall under the regular tasks included in line maintenance and, Randell says, once a unit becomes worn sufficient to require replacement, "The brake unit or wheel is removed and a replacement fitted. The worn component then comes to us for refurbishment – wheel and brake maintenance is done off-wing (except for the 787, where on-wing maintenance of the aircraft's electrical brake system is possible), and our main facility is not at an airport.

"On a modern, carbon brake we'd replace all the discs. They come as a 'heat-pack assembly' that replaces all the worn material. We also deal with leaks – brakes occasionally leak in service, and we also sometimes see leaks when we test units that come in for replacement worn heat-packs. With testing complete, we issue the unit with a release certificate, returning it to serviceable condition."

World Aero's airline clients typically pass wheel and brake units through the company on a regular rotation, while maintaining their stocks so that sufficient components are also available to service the fleet and provide airworthy spares. But it also works heavily with brokers managing maintenance on behalf of airlines and also with spares dealers, selling surplus or reclaimed stock. "We're an MRO; our primary role is to repair and overhaul other people's wheels and brakes. We're not about buying wheels and brakes and overhauling them as cheaply as possible for us to resell. Also, we respect that our dealer/broker customers are sending us units to overhaul for their sales stock and don't then want to have to compete with us in the sales market. Consequently, end-users purchasing a unit with World Aero certification know it has been overhauled to a standard, rather than to a price.

While World Aero works high volumes for large airlines, Randell is also proud of its capability to accommodate ad hoc requirements. "Our ability to do that is inherent in our workshop layout and the processes involved; we're able to provide the same standards and speed of service to our one-off customers as we do to our regulars." He declines to elaborate on the key processes and working arrangements, but notes: "Although we have a large customer spread, it's important not to turn away single jobs – they're something other MROs often struggle with."

Brake harvest

Specialising in aircraft end of life services, Caerphilly, Wales-based AerFin considers overhauled brakes among the most common assets harvested from any relatively young airframe it breaks down. Richard Jowett, Vice President Purchasing and Programs, explains: "Wheels and brakes are rotable parts, meaning they can be rebuilt, overhauled, returned to inventory and used to maintain aircraft. From an aircraft tear-down perspective, it's crucial to know the history of the wheel and brake so the work scope, usage and value of the components can be determined. This will influence the decision to remove the unit from the aircraft 'on condition' or to route it to a workshop for refurbishment.

"As part of the evaluation process of a brake, we measure the unit's remaining life, which helps establish its value. It will then either be removed and sold in AR [as removed] condition, or go to a workshop for OH [overhaul]. In both instances, we retain the remaining carbon heat-pack [most brakes use carbon, not steel], as this also helps determine its sale value.

"Customers are most interested in the remaining life, since this can be used to calculate and predict the expected number of landings they can achieve from a unit before having to remove it and install a full life heat-pack. We may decide, depending on the remaining life, to install a 100% heat-pack in the unit there and then, or to sell or exchange it in an OH condition. ▶

Richard Jowett, Vice President Purchasing and Programs, AerFin *(photo: AerFin)*

By holding significant wheel and brake inventory, AerFin can guarantee them availability and stock, while reducing turnaround time and unexpected high repair costs for wheels and brakes *(photo: AerFin)*

"When it comes to wheels, in most cases we remove the wheel from the aircraft and send it straight to an MRO shop for overhaul, before trading it without the tyre. This is popular with airlines, since it offers them the opportunity to select their tyre of choice, to be fitted by AerFin or their appointed workshop. Surplus tyres hold their value too; we keep them in our inventory for resale once they're been overhauled and retreaded."

Since complete records for the wheel and brake components AerFin takes in are seldom available, Jowett says quality and safety are guaranteed by other means. "We usually route the wheel and brake unit to an MRO for overhaul. We then resell the component in a serviceable condition, but it must be complete with trace documentation back to its last operator/owner and a non-incident statement [NIS]. Overhaul generates a history and a workshop report to add to the trace documentation and NIS received with the components." A full trail, from original delivery, is 'nice to have, but certainly not essential', he says.

Programmes and packages

Headquartered in Copenhagen, TP Aerospace is a global supplier of wheels and brakes, offering exchange and cost-per-landing programmes, and bespoke support packages. It maintains and services wheels and brakes through its own facilities, a network of subsidiaries and wholly owned subsidiaries of those organisations. It's a challenging business that's carefully controlled to ensure parts are always available while simultaneously avoiding overstock.

Frank Rott, TP Aerospace Global COO and Accountable Manager EASA Part 145, describes the company's exchange and cost-per-landing programmes: "In general, alongside working on their wheel and brake assets, we offer a complete package, including collection of unserviceable units from their locations, tyre changes, repair or overhaul at our facility, and redelivery, directly into customer storage if they prefer. Our programmes include a predefined pool-size, agreed on both sides and ensuring the customer always has sufficient wheels and brakes for their fleet.

"Maintaining stock at suitable levels is a challenge, but we work hard to ensure our provision matches customer requirements. We support more than 200 wheel and brake part numbers around the world, as well as tyres. We've established our own database that helps us purchase tyres and spare parts at the right time so that we never run our stock down to zero. We also have contracts with global suppliers, strengthening our position in the market and winning the best prices for our customers. So, we always have sufficient spares in stock, and we're always happy to support ad hoc customers too."

TP Aerospace assigns dedicated programme managers to its regular customers. They liaise closely with the client, keeping a detailed watch on their operation to ensure TP's stocks and service availability keep pace. Where service is offered by a subsidiary, or even the subsidiary of a subsidiary, it is essential for TP Aerospace that its high service standards are guaranteed, and that assurance is a responsibility that falls to Rott.

"We have global customers who expect to receive the same service worldwide. Our management set up is therefore also global, and I work to ensure we all have the same standards, the same tools, processes and procedures, training, and access to the same information, at all times. Taking care of our customers comes down to a great team effort across the organisation."

Taking stock

While TP Aerospace carefully manages and optimises its wheel and brake stocks, AerFin aims to keep stock at ▶