avitrader.com | Edition #136 May 2025

Engine LLPs

AVIATION NEWS PUBLICATIONS

ANA ANTINA

COMPANY IN TOTAL

A balancing act between replacing LLPs and scheduled maintenance

MARE!

StandardAero

Talking to Kim Ernzen, COO

Environmental

0

Talifac

Dealing with increasing regulations

Aero Norway

A Look Behind the Scenes



Environmental Concerns Regarding Aircraft Maintenance

How do MROs deal with the strict environmental regulations surrounding products and processes?

By David Dundas

here is no question that when it comes to environmental concerns, the aviation industry is under remarkable levels of scrutiny in relation to operating methods and procedures, which very much extend to MROs and aircraft maintenance. It is easy to think of several areas where these activities present environmental challenges, including emissions from aircraft and ground vehicles, waste generation, and the use of potentially hazardous cleaning chemicals. These issues can contribute to air and water pollution, climate change, and potential health risks for both workers and surrounding communities.

MRO activities on the ground involve the use of vehicles which contribute to emissions of greenhouse gases and pollutants like NOx and ozone, impacting local air quality while burning fossil fuels in aircraft engines, both on the ground and in the upper troposphere, releases CO2 and other pollutants that contribute to climate change and local air quality issues. Then we have the power used by MRO activities which can have a carbon footprint depending on the energy source and contribute to overall energy consumption.

Beyond this we have hazardous and non-hazardous waste generation, the former including cleaning chemicals, used aircraft components, and fluids, the latter involving paper, cardboard, and other packing and protective materials which can strain landfills if not managed sustainably. Hazardous substances come in the form of cleaning chemicals which can produce hazardous waste due to the acidic nature of the products. Aromatic hydrocarbons, methyl ethyl ketone, and chlorinated solvents are examples of chemicals that need to be handled and disposed of carefully or they could pollute nearby water systems.

We then have the challenge of noise pollution as MRO activities, particularly

those involving engine testing and ground operations, can generate considerable noise, impacting residents near airports and MRO facilities. Beyond this we also have less obvious hurdles such as supply chain issues in the search for sustainable and eco-friendly materials and even the challenges that come with decommissioning older aircraft.

To give us a greater insight into the challenges being faced in the MRO sector of the industry, we discussed the problem with four leading operators who were kind enough to share their thoughts with us on a number of specific topics.

How does aircraft painting impact the environment, and what are the key areas of concern?

Here, energy consumption seems to be a recurring theme, and one shared by several companies. In answer to the



question as a whole, Andy Wheeler, DVP and Managing Director, AEM/AMETEK MRO tells us that: "Aircraft maintenance has significant environmental impacts, including the generation of hazardous waste and emissions and high energy and water consumption. Key concerns for AEM/AMETEK MRO include maintaining air quality, handling chemicals safely, and ensuring compliance with waste disposal regulations. At our Ramsgate plating operation where we apply metal finishes such as cadmium, chrome, copper, nickel, and silver, these impacts are driven by the requirements for component repair and overhaul." Yuriy Bolonny, Environmental Compliance Manager, MAAS underlines the problem about excessive energy consumption, pointing out that "As a service provider, the biggest environmental impact at MAAS comes from energy use particularly the heating and cooling required to maintain stable climate conditions in our hangars during paint stripping and application. That's why energy was the first area we focused on in our environmental strategy." However, he then goes on to explain how concerted efforts are being made to mitigate the problem. "Where we control the energy

supply— such as in Kaunas, Lithuania, and the Netherlands — we have switched to certified 100% renewable electricity contracts. In other hangars, where we don't have control over suppliers, we cannot directly influence the energy source. However, we offset a portion of our emissions. We offset around 15% of our total carbon footprint, helping to minimise our overall impact. Our new hangars are built to the highest energy efficiency standards, and our newest US facility is certified to LEED Gold level— a key milestone in reducing operational emissions," he says.

Where Aero Norway is concerned, they have identified four key areas which are of particular importance – use of hazardous materials, emissions, waste generation and resource consumption. However, they are keen to provide a good counterbalance to these problems by demonstrating how environmentally responsible maintenance practices can make a meaningful difference and focusing on sustainability through: (1) Reuse and Recycling: By refurbishing and reusing engine components, we significantly reduce the need for new parts, which lowers the demand for raw materials and reduces industrial waste; (2) Enhanced Engine Efficiency: Our high standards of overhaul and servicing contribute to engines that perform more efficiently, reducing fuel consumption and emissions during flight, and (3) Extended Engine Lifespan: Well-maintained engines last longer, delaying the need for manufacturing new units and thereby decreasing the environmental footprint associated with production and material sourcing. As Siv Janne Aarrestad, HR & HSE Manager, Aero Norway puts it: "... while aircraft maintenance poses inherent environmental risks, innovative and sustainable practices, as demonstrated by Aero Norway, can mitigate these impacts and support greener aviation operations."

Over at IBA, the company sees both a direct and indirect impact on the environment where aircraft MRO is concerned. Kane Ray, Head of General Aviation and Aftermarket explains further: "There is the physical maintaining of the aircraft and its associated equipment as well including labour, tools, and facilities that enable the maintenance to be undertaken. For example, and respectively, the waste and recycling effort associated to a cabin refit as part of an airframe heavy check and the amount of hangar power to enable

(...while aircraft maintenance poses inherent environmental risks, innovative and sustainable practices, as demonstrated by Aero Norway, can mitigate these impacts and support greener aviation operations.))

Siv Janne Aarrestad, HR & HSE Manager, Aero Norway

a workforce to complete that refit safely and efficiently. Growth in maintenance is important, and the market has seen a surge from existing maintenance providers to implement additional maintenance capacity to both meet demand but also reduce maintenance turnaround times. Associated to this, there are some high growth and even established geographic markets that are underserved locally. Expect further growth in various geographies, particularly in Asia and Middle East. It will be important to observe how additional facilities, intended to add capacity, are being developed in different countries and regions. Are we witnessing broad installation of solar panels, energy efficient lighting, all-electric ground vehicles and power units, rainwater harvesting systems, and non-fossil fuel heating ventilation and air conditioning systems such as electrified heat pumps for example?"

What are the biggest challenges MROs face in reducing their environmental footprint?

One of the largest challenges is adherence to environmental targets and a universal commitment to them. Additionally, many MROs operate multiple facilities, and implementation of targets facility-wide is critical, but equally, takes time. In larger organisations, and particularly in Europe, dedicated teams have been established to lead the MRO in sustainable practices through initiatives such as ESG reporting to investors and internal audits to ensure best practices are happening, Kane Ray tells us. He then goes on to further advise: "Such teams are driving new initiatives with allocated capital investment to support research & development and for the continual replenishment of the latest energy efficient tooling and facility utility upgrades. Internal commitment to it varies across continents and countries within those continents. Like other industries, effective and meaningful central policy

with measures such as fiscal policy could be necessary. Although a separate industry, observe recent strategies at large conglomerates like BP who are scaling back on its green energy investment, in favour of fossil fuel exploration/extraction projects and we can easily question whether the environment topic could be construed as a marketing tick-box to an onlooker. It is therefore important to monitor attitudes to ESG in industries such as Aviation also."

Siv Janne Aarrestad touches on an area that perhaps doesn't get the attention it deserves when she talks about customer expectations and market pressures. "Airlines and clients expect quick turnaround times and low costs. Sustainability initiatives can sometimes increase lead times or costs, putting MROs at a competitive disadvantage unless customers are willing to pay a premium for green services," she says. However, there is a major problem highlighted by Andy Wheeler when he talks about legacy processes, primarily because older aircraft still require the use of more hazardous materials than, say, a next-gen Boeing 737 Max jetliner. He points out that "AEM faces several challenges, including legacy processes that rely on non-eco-friendly chemicals, the need to ensure regulatory compliance without disrupting operations, the limited availability of sustainable aviation-certified solutions, and effective waste disposal." Finally, Yuriy Bolonny touches on the relationship between regulation and safety, which he feels go hand in hand as both are non-negotiable. He then expands further: "Every product and process we use has to meet strict requirements and go through official approval before anything can be changed. That makes progress slower than in many other industries, and it's something we have to manage very carefully. An additional challenge is that we don't always operate in facilities we own. In places where we rent hangars, we've got limited control over things like infrastructure ---especially where the energy comes from or what improvements we're allowed to make.



Siv Janne Aarrestad, HR & HSE Manager, Aero Norway.

Despite this, we do what we can within those limits. Paint is another challenge. These are very specific materials designed for aircraft, and they need to follow tight technical and safety standards. Since we don't produce the coatings ourselves, we can't influence how they're made — but we still count the emissions from using them, because they're part of our total footprint."

How can aircraft painting facilities minimise hazardous waste generation?

In respect of hazardous materials (hazmat), there are long established regulatory frameworks which address how organisations must deal with them from the identification of what waste they are through to their handling procedures and appropriate disposal. Governed by Aviation Authorities, failure to comply can result in legal action and severe penalties. Kane Ray then goes on to tell us that: "Sound practices are often the starting point; good inventory management, packaging and proper segregation of hazmat, (or segregation of hazmat and time expired hazmat); using the appropriate labelling/ signage on such materials to identify what it is and how it should be handled and stored; providing appropriate garments for handling; contingency plans such as spill response, spill kits and evacuation procedures plus the recurrent training that comes with these processes on-site; compliance audits and key performance indicators; having accountable personnel to monitor regulatory changes etc. In summary, a facility framework to used, handle and dispose of hazmat."

ENVIRONMENT

Yuriy Bolonny admits that this is not an easy task and that both commitment and investment are required to achieve the necessary results. He tells us that "At MAAS we build all our own facilities, so can ensure that they are designed to manage waste from our processes responsibly and that materials can be recycled wherever possible. An example of this is a water treatment plant at our Kaunas facility, the system processes chemical waste from our daily operations and separates the water from the contaminants, which are then turned into dry waste to enable cleaner and easier disposal. All our paint bays also have underground sump systems built below the hangar floor to ensure no waste chemicals or contaminated water ends up on the apron or local area. We continue to explore new ways to further reduce hazardous wastewater and install water filtration systems on site. While this work is ongoing, we're focused on staying efficient and not using more material than necessary — it's part of our operational culture." In terms of requiring investment, AEM confirms that is exactly what they have done. "AEM has invested more than £1 million (US\$1.34 million) in its pollution abatement project at its Ramsgate machining and plating facility for the management and treatment of hazardous waste to reduce pollutants. AEM uses a closed loop vacuum evaporation and reverse osmosis system to reuse effluent that is generated by plating processes. This zero to drain technique is managed internally. It flushes chemicals away to minimise the impact on air and water quality and keep people safe. It helps reduce hazardous waste by 192 tons and recycles over 47,000 gallons of water



Andy Wheeler, DVP and Managing Director, AEM/AMETEK MRO



© MAAS Aviation

annually. The abatement project is crucial in future proofing AEM's business to meet the demands of the aviation industry," confirms Andy Wheeler. In addition, Siv Janne Aarrestad highlights three elements to Aero Norway's waste management " ... first through segregation at the source by separating hazardous from non-hazardous waste to prevent cross-contamination and separating metal waste to maximize reuse and capture alloys. Second is appropriate storage solutions, using clearly labelled, secure containers to prevent spills or leaks and finally, compliant disposal processes, which involves working with certified waste management providers to ensure disposal follows national and international regulations." She further adds that "Aero Norway staff are trained in waste management best practices, helping to maintain high safety and environmental standards."

What eco-friendly alternatives exist for traditional cleaning agents, solvents, and degreasers used in maintenance?

When it comes to eco-friendly options, Siv Janne Aarrestad points out that: "There

are several eco-friendly alternatives to traditional cleaning agents, including: biodegradable solvents such as waterbased cleaners, natural cleaners like baking soda, white vinegar, and castile soap, and also green industrial cleaners - products specifically designed to be environmentally friendly." As many of us know, necessity is the mother of invention, and Yuriy Bolonny at MAAS tells us that is exactly what they did to deal with the problem of finding an eco-friendly alternative: "To address this, at MAAS we have developed our own unique recycling technology which allows us to recover 80% of the solvents we use. These are then redeployed for cleaning equipment such as paint guns, lines and pipes. As well as this, all the dry materials we use in the painting process, such paper, plastic sheeting and tape, are also recycled." While there are various solutions, Andy Wheeler at AEM acknowledges that the company faces restrictions in what chemicals can be used, but points out that "Eco-friendly alternatives, such as aqueousbased degreaser, bio-based solvents, and enzymatic cleaners, are available," though he adds: "...these alternatives must meet stringent aviation safety and performance standards."

AEM has invested more than £1 million in its pollution abatement project at its Ramsgate machining and plating facility for the management and treatment of hazardous waste to reduce pollutants.

Andy Wheeler, DVP and Managing Director, AEM/AMETEK MRO

G Full digitisation appears likely to occur beyond the 2020s although there is a realisation amongst entities that a greater adoption of the digital systems of today, which are seen as more reliable comparative to earlier offerings, is needed.

Kane Ray, Head of General Aviation and Aftermarket, IBA

What role does digitalisation play in reducing paper waste and improving efficiency in maintenance records?

If we consider an entity like AAR, in its latest ESG report, it claimed that it had completed its first paperless maintenance check using a proprietary digital MRO tool. This was implemented at its Airframe MRO Rockford, Illinois facility and was due to transition to other facilities. Records have long been digitised; it is just that a proportion of these digitised records have been scanned from physical paper and therefore paper trails and digitised records often complement the other. Kane Ray is keen to point out that beyond this, "One bottleneck that is often cited is the adoption of software that enables digital record keeping. Further still, the structure of how aircraft are owned often requires a paper trail. Full digitisation appears likely to occur beyond the 2020s although there is a realisation amongst entities that a greater adoption of the digital systems of today, which are seen as more reliable comparative to earlier offerings, is needed. In practice, it seems likely that MROs will digitise certain facets in a gradual move rather than a complete digital switch."

Yuriy Bolonny is quick to point out that despite the drive to digitalisation and digitisation, "...some things need to be on paper — especially when it's required by clients or for compliance reasons. So, while we haven't fully eliminated it, we avoid it whenever we can. From an emissions standpoint, paper use isn't a significant contributor to our overall footprint. But we still see value in reducing it. Small details matter - because if you're not paying attention to the small things, it's hard to take the big commitments seriously. So even if the climate impact is minor, minimising paper use is part of a wider mindset we've built into the culture at MAAS." Andy Wheeler chooses to focus solely on what can be digitalised, telling us that: "AEM has transitioned

from hard copy component maintenance manuals to electronic versions. Digital asset management systems are now used for part traceability. Work orders, certificates, and other documents that form the job pack are stored electronically. As well as reducing paper waste and improving efficiency, it provides AEM with accessibility and cost saving benefits."

What innovations are shaping the future of environmentally friendly aircraft maintenance?

The biggest innovations are in the paint systems being developed, which are much more environmentally friendly and deliver great advances in drying times. These more sustainable, and often waterborne, solutions are fast replacing the older chromated products. In the automotive sector, water-based products and UV technology to aid drying times have been established for a long time, but the additional testing and approvals needed in the aviation sector means it takes a lot longer to break through. But many have been introduced now. In terms of the next big jump, it's likely to be the introduction of water-based and dual-cure technologies to further enhance processes, Yuriy Bolonny tells us, before explaining how he implements such innovation. "We work closely with all of our partners and especially the major aircraft paint manufacturers to ensure we are using the latest technology coatings and techniques. The high-performance aerospace coatings we use not only look superb but also reduce aircraft weight to improve fuel efficiency, thereby lowering carbon emissions during the lifetime of the aircraft. Our aim is to foster the best combination of performance and sustainability across our multi-site operations," he explains.

At Aero Norway, Siv Janne Aarrestad has kindly provided several examples where aircraft maintenance practices are evolving to reduce environmental impact.



Kane Ray, Head of General Aviation and Aftermarket, IBA

For example: "When testing engines, Aero Norway uses Sustainable Aviation Fuels (SAF): SAF refers to fuels derived from renewable resources, such as plant oils, agricultural waste, and even algae, that can replace or supplement traditional jet fuel and reduces carbon emissions." When it comes to recycling and reusing parts and extending the life cycle of components, she further explains that: "Instead of discarding used aircraft parts, the Aero Norway maintenance teams are increasingly adopting practices to inspect, refurbish, and reuse components. This not only saves costs but significantly reduces waste and demand for raw materials." The result? "Environmental benefits that include cutting down on landfill waste from old parts, reduction in the carbon footprint associated with manufacturing new components, and encouragement of a circular economy within the aviation industry," she suggests. And to round things off, Andy Wheeler touches on one key element that every British environmentally friendly organisation strives for, and that is a particular ISO number as he tells us that "From AEM's perspective where possible, utilising electric equipment to reduce emissions, employing Teams meetings to minimise the carbon footprint by reducing travel and reworking components to reduce waste and conserve materials are some of the initiatives undertaken. Another key factor for AEM is the integration of its environmental management systems in alignment with ISO 14001 to ensure systematic environmental management."