INTERNATIONAL AEROSPACE ENVIRONMENTAL GROUP

TRANSITIONING TO ISO 14001:2015

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The purpose of this document is to provide IAEG members and other interested parties, with a view of areas that IAEG has identified as potentially relevant to its membership should any of them wish to transition to ISO 14001:2015.

ISO 14001:2015 requires top management to demonstrate leadership and integrate the EMS with business strategy and processes. Developing an EMS in accordance with ISO 14001: 2015 may support the improvement and innovation of products and services, place greater emphasis on opportunities rather than just risk and facilitate supply chain cooperation. Ultimately the EMS may play a greater role in securing the long term viability of aerospace organisations and the industry, as well as encouraging more sustainable business models.

This document presents information on the implementation of the changes under seven key topics, namely:

- Leadership and commitment - top management involvement in the EMS aimed at assisting the sector in achieving its challenging environmental goals through greater integration and collaboration.
- Internal and external issues - providing an overview of issues relevant to the EMS for the aerospace industry, how organisations can identify them and how they can manage their effects.
- Determining the scope of the EMS- ensuring that the EMS coverage and interactions are credible.
- Life cycle perspective - considering environmental aspects in relation to each life cycle stage to identify risks and opportunities, increase collaboration and improve the environmental performance of the sector.
- Understanding interested parties and their requirements - in a global context of increasing expectations from regulators, the public, customers and suppliers.
- Risks and opportunities - understanding and managing effects on the organisation and continually improving the performance of the EMS.
- Performance evaluation - understanding and communicating progress against an organisation's and the sector's environmental objectives and compliance obligations.

1. INTRODUCTION

1.1 Purpose of this document

The purpose of this document is to provide IAEG members and other interested parties, with a view of areas that IAEG has identified as potentially relevant to its membership should any of them wish to transition to ISO 14001:2015.

The document provides such a view by:

- Stating the importance of the changes and what is required.
- Demonstrating the applicability of the changes to aerospace.
- Providing considerations aerospace organisations can take to implement the changes.
- Giving specific examples and case studies.

1.2 ISO 14001:2015 timetable

Certified organisations have until September 2018 to transition to the revised standard. Organisations can either use their recertification audit to transition to a 2015 certificate, or use their surveillance audits to phase recertification.

Specifics of the aerospace sector

The sector produces an extensive range of products and services around the world. It includes commercial and military aircraft and engines, satellites, weapons, rockets, service and support businesses and electronic defence and launch systems.

Product safety and reliability are paramount. Aircraft require airworthiness certificates in order to fly, which in turn require parts and sub-systems to be approved. Once an aircraft has received an airworthiness certificate, changes to the aircraft design (including materials used) need to be recertified or proven not to have a negative impact on the aircraft's airworthiness. As a consequence it can be very difficult to make changes to an existing design. The supply chain is often long and extensive, with as many as 10 tiers for more complex items. As a result visibility and influence reduces with each tier.

Aircraft can be in service for over 25 years, meaning environmental impact during the in use phase is dominant. For example, the life cycle assessment for a gas turbine engine shows the in use phase to represent as much as 99% of the product's overall carbon impact. This offers manufacturers opportunities to gain competitive advantage through fuel efficient technologies but also provides different business models which maximise aftersales support.

The need to be able to produce parts over the span of several decades increases the need for stability in production methods. In particular this will include a greater consideration of how stakeholder responses to environmental impacts may change and what resulting controls, restriction or legislation may result. This may restrict the pace of implementing continual improvement opportunities for some manufacturing processes.

The restriction/banning of some chemical substances either contained in current parts or used in their manufacture and repair, is having major implications for the sector.

The sector needs to be able to produce parts for the service of aircraft. The approval process will require production processes to remain stable. However change may be needed as new legislation is brought in after the aircraft production has started, for example to implement requirements relating to hazardous substances.

Although there are significant opportunities for reuse and remanufacture that are not normally found in other product systems, the age and number of retiring aircraft may make recycling and reuse more difficult.

The aerospace sector is very well connected and often looks to work collaboratively to solve environmental issues.

The use of commercial aeroplanes contributes to three main environmental issues, aviation emissions that affect global climate, aircraft noise and aircraft emissions which affect local air quality. The goal of the aviation industry is to reduce absolute emissions by 50% from a 2005 baseline by 2050. This could be accomplished through improved fuel efficiency, improved air traffic control and use of sustainable aviation fuel. The worldwide aviation industry has further applauded a crucial climate agreement reached by governments meeting at the International Civil Aviation Organization (ICAO) to put in place the world's first carbon offsetting scheme for any global sector.

1.3 Potential benefits of ISO 14001:2015 to the aerospace industry

Traditionally, the benefit of an EMS has broadly been legal compliance, a better control of an organisation's environmental impacts and reducing costs. Basing an EMS on ISO 14001:2015 will drive greater value within organisations and the aerospace industry by:

- Engaging top management to be company and aerospace industry leaders for environmental management and performance, and integrating the EMS within business processes to improve the effectiveness and efficiency of the EMS.

- Driving improvement and innovation in products and services. This will assist the sector in meeting its environmental goals relating to climate change, air quality and noise, while reducing costs associated with the manufacture, use and disposal of aerospace products.
- Facilitating supply chain collaboration as organisations take a life cycle perspective.
- Identifying opportunities by better understanding and managing interested parties' needs and expectations.
- Improving the credibility of the industry through better communication and by supporting environmental, sustainability and corporate responsibility reporting.
- Placing greater emphasis on identifying business opportunity rather than just managing risk.
- Supporting the long term viability of organisations and the industry by mitigating the potential adverse effects of environmental conditions on the industry.

Case study: Benefits of transitioning to ISO 14001:2015

A valve manufacturer based in the UK transitioned its existing EMS, originally certified to ISO 14001:2004 in 2006, to meet the requirements of the 2015 version. The facility was recertified to ISO 14001:2015 in November 2016. The Environment Health and Safety (EHS) Manager and site leadership team agreed that the revitalised EMS has delivered a number of key improvements:

- Taking a life cycle perspective has resulted in greater top management and cross functional involvement including procurement, design, engineering, HR and sales and marketing. This has led to greater process and product innovation, increasing manufacturing efficiencies and delivering improved products.
- The EMS is no longer solely managed by the EHS Department, instead other departments such as procurement, design and sales take responsibility to identify environmental aspects, propose actions and manage their implementation. This has resulted in an increased number of initiatives and improvement in environmental and business performance.
- Context and interested party analysis were undertaken with representatives from across the organisation. This generated successful actions such as a project to allow customers to return end-of-life product for remanufacture/appropriate recycling and providing a customer carbon benefit tool as part of the sales process.
- The revised EMS provides an improved and integrated framework to improve communications on the environment.

1.4 Structure of the document

In comparison to its predecessor, ISO 14001:2015 presents a number of new and amended requirements. This document provides a view of the changes to ISO 14001 under seven key topics, namely:

- Leadership and commitment.
- Internal and external issues.
- Scope.
- Life cycle perspective.
- Needs & expectations of interested parties.
- Risks and opportunities.
- Performance evaluation.

1.5 OHSAS 18001 and ISO 9001 are also changing

ISO has defined a standard structure for all new or revised standards. A number of new or revised requirements will be common or at least comparable among management system standards, such as ISO 14001, ISO 9001 (including the aerospace specific series of standards EN 9100) and ISO 45001 (Occupational Health and Safety Management System Standard due for publication in 2017 and which will replace OHSAS 18001). Organisations could consider integrating their transition of ISO 14001:2015 with similar clauses of other management systems, for example, understanding the organisation and its context and understanding the needs and expectations of interested parties.

Figure 1.1 *ISO 14001:2015 framework* provides an overview of some of the main changes of the new version of the Standard.

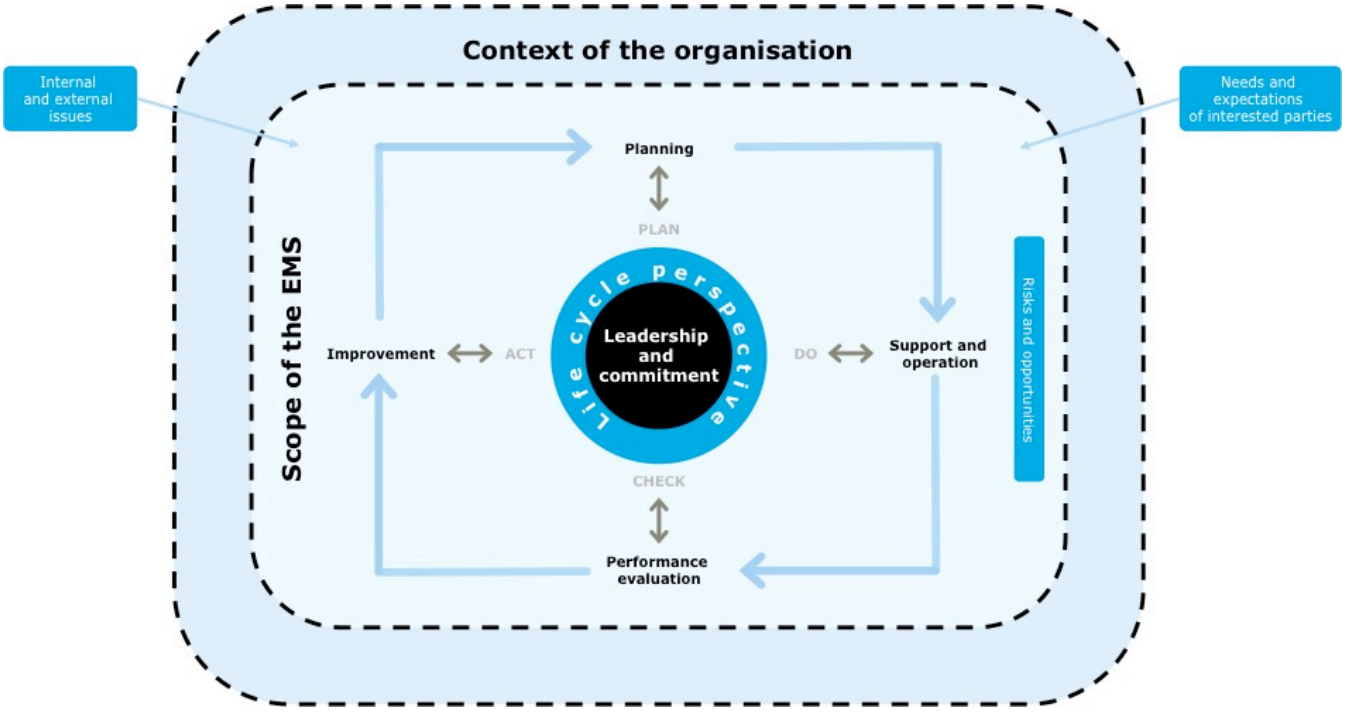

Figure 1.1: ISO 14001:2015 framework (showing some of the main changes)

1.6 Steps to implementation

Organisations starting out on their transition could consider undertaking the following:

- Complete a gap analysis between the existing EMS and the requirements of ISO 14001:2015.
- Raise top management awareness of the changes.
- Involve representatives from relevant functions (e.g. engineering, design and procurement) and consider environmental requirements within business processes.
- Demonstrate the business value of the EMS and benefits of ISO 14001:2015 additional requirements.
- Evaluate the value of accredited third-party certification vs. self-declaration.
- Consider the need for further awareness and/or competency as a result of the changes.
- Consider how the changes relate to other management systems (e.g. ISO 9001 and OHSAS 18001/ISO 45001) and where integration could be beneficial.
- Develop an implementation plan.

2. LEADERSHIP AND COMMITMENT

2.1 Why is this key for the aerospace industry?

Leadership and commitment is arguably the most important enabler for a successful EMS and for implementing or transitioning to ISO 14001:2015. Top management commitment will ensure that the EMS:

- Is built on a clear and credible vision.
- Supports the aerospace industry in achieving the challenging environmental goals it has set itself.
- Is integrated and compatible with the business strategy so that it is relevant, sustainable and continually improves.
- Through integration, is more effective by being central to the business, and efficient through sharing of processes and resources.
- Is embedded and supported by all functions and levels of the business.
- Adopts a life cycle perspective and facilitates collaboration within organisations and across the aerospace industry.

2.2 What does ISO 14001:2015 require?

Top management may constitute a single person, though it is more common to comprise a cross-functional team that directs and controls the organisation at the highest level. The Standard requires top management to have accountability for the EMS and ensure that it meets its intended outcomes. At the very least, the intended outcomes of the EMS include enhancement of environmental performance, fulfilment of compliance obligations and achievement of environmental objectives. There is, however, much benefit for top management to establish additional commitments, such as supporting the organisation's business or sustainability strategy or vision, or contributing to the aerospace sector's environmental goals. To support EMS effectiveness, top management shall ensure that EMS requirements are integrated into the organisation's business processes and that the environmental policy and environmental objectives are established within the context of the organisation and its strategic direction.

Leadership is at the heart of the system.

Top management can demonstrate leadership and commitment through their awareness and engagement according to their role and responsibilities with regard to the EMS. Such action can be apparent, for example, when top managers actively support the integration of the EMS with business processes. Without their leadership, integration will be difficult to achieve.

2.3 Considerations/options for implementation

Provide a briefing to top management on their expanded role

Explain the value of improved environmental performance and why top management involvement is critical. Solicit their input on the intended outcomes of the EMS and how the intended outcomes can support the organisation's business strategy, vision and values and/or the sustainability/corporate responsibility strategy. Such additional commitments can also be included within the environmental policy. In order to gain top management engagement, it can help to review successful initiatives that have led to improving environmental and business performance.

Top management is required to demonstrate leadership, commitment and accountability.

Communicate the new environmental policy commitment of 'protection of the environment'

Ensure that top management understands how the new commitment will contribute to the sustainability of the organisation's business and society as a whole. The commitment can be applied throughout the life cycle, e.g. resource efficiency, protection of biodiversity and climate change mitigation. The commitment, alongside continual improvement, establishes principles of action which will ensure that the environmental performance of the organisation improves over time.

Ensure top management promotes continual improvement and communicates the importance of good environmental performance

Although this can be achieved through delegation, personal involvement can be more effective. Communication can take many forms including written and verbal. However, visible action, for example a site inspection by top management or attendance at a third party audit, can be more compelling.

Top management should support other relevant management roles

This is particularly important if the scope of the EMS covers multiple facilities and/or business units with their own management teams, but will also ensure that environmental responsibilities are cascaded throughout the organisation and middle managers are engaged. Top management can support environmental engagement within the management population by providing a clear and consistent vision, preferably integrated with other business objectives, and by challenging other managers to drive and report on environmental improvement in their own areas of responsibility.

Plan integration

Integration is not absolute, but will develop over time and in line with continual improvement. Top management involvement in integration is critical to ensure it is effective. The organisation should decide the level of detail and the extent of integration it adopts. Organisations should be aware of the current levels of integration and understand what integration is required to improve environmental performance. The first stage in this process could be to map business processes within each functional area to understand where integration already takes place and where it needs to be implemented. Integration can take place at a strategic, functional and departmental level. Many organisations may already have advanced levels of integration and will need to consider how this can be improved. Significant environmental aspects can indicate where further integration needs to take place. For example, a significant aspect related to the procuring of goods or services may benefit from the inclusion of environmental requirements in the sourcing process, from technical specification definition, call for tender, supplier selection and contracting to controlling supplier activities.

> EMS requirements shall be integrated with business processes.

Examples of business processes and other areas of integration are:

- Business strategy, vision, value or goals.
- Corporate/enterprise risk management.
- Communication, sustainability or corporate responsibility.
- Financial or procurement/supply chain.
- Governance and internal performance reporting.
- Employee business briefings, newsletters and other forms of communication.
- Development and design.
- H&S, security and quality management systems.
- Management of change including new build or refurbishment.
- Human resources and training.
- Commercial, sales and marketing.

Further explanation of these examples is provided in Appendix 1: *Examples of integrating EMS requirements into business processes.*

2.4 Case studies / examples

A US based aircraft part manufacturer commenced its transition to ISO 14001:2015 by engaging top management through a workshop which presented the ISO 14001 changes, reviewed the EMS value proposition, agreed the leadership team's responsibilities and defined the EMS' intended outcomes relevant to the company's strategic goals. Environment, where appropriate, was integrated with departmental goals and promoted through departmental and team meetings. The management review process is now given additional time, involves the full cross functional leadership team and performs a more critical role to the EMS.

3. INTERNAL AND EXTERNAL ISSUES

3.1 Why is this key for the aerospace industry?

Determining internal and external issues helps define the context of the organisation as well as the scope and is important because the EMS will:

- Be more intuitive, responsive and resilient as it is built on an understanding of how the organisation works and how it is influenced by internal and external and internal factors.
- Continually improve as it is able to identify and respond to opportunities and risks.
- Support the long-term viability of the organisation by understanding and managing the effect of environmental issues such as climate change and resource scarcity.

3.2 What does ISO 14001:2015 require?

Clause 4.1 of ISO 14001:2015 requires organisations to determine important internal and external issues that can help or hinder the achievement of the intended outcomes of their EMS. This determination contributes to the overall ISO 14001:2015 requirement to understand the context of the organisation. Issues will include environmental conditions that can affect the organisation, for example climate change and depletion of natural resources, but will also include other internal and external issues which, although not appearing immediately relevant to the EMS, can impact its success. Only a 'high-level, conceptual' understanding of internal and external issues is required. This knowledge provides an important input into the EMS scope, policy and objectives, risks and opportunities and fulfilment of compliance obligations.

The EMS can play an important role in an organisation's strategy, helping to ensure the long-term viability of the business.

Internal and external issues do not need to be documented. An organisation's knowledge of its issues may be sufficient, but by documenting its issues, an organisation can inform other EMS processes, e.g. risks and opportunities, or to engage others in the organisation. Determining internal and external issues should be an iterative process which is updated as changes to the EMS and context of the organisation occur. The management review process can provide a routine point at which to review internal and external issues.

3.3 Considerations/options for implementation

Consider different levels of the organisation

For multi-site/multi-business organisations, consider the need to determine internal and external issues at corporate level, before cascading this to facilities/businesses to identify internal and external issues.

Use existing methodologies to understand internal and external issues

Many organisations already have existing formal or informal methodologies for determining their internal and external issues, for example corporate or enterprise risk management systems or horizon scanning as part of strategic planning.

Gather input from different functions of the organisation

Input from internal stakeholders who can provide an understanding of different topic areas will ensure that the understanding gained covers a broad scope. This could be achieved through interviews or workshops.

Identify internal and external issues

Issues can be identified by structuring them by topic. One methodology is the political, economic, social, technological, legal and environmental (PESTLE) analysis. The help box *Context of the*

aerospace sector can be used as a starting point to this process. Table 3.1 *Examples of internal and external issues* provides examples for each of these topics.

Theme	External issues	Internal issues
Political	Change in a government. Embargoes and sanctions. Political instability. War and terrorism.	Change in top management/governance structures. New owners/ownership arrangements.
Economic	Economic upturn/downturn. Currency fluctuations. Tariffs/taxes/grants for the industry. Aerospace supply chain structure & dependencies. Increasing/fluctuating resource costs.	Internal financial processes/payback period.
Social	Population growth/demographics. Customer/consumer attitudes and opinions. Perceived environmental impact of aerospace industry. Societal knowledge of environmental issues/trends/'hot' issues. Attracting and retaining 'talent'.	Environmental culture of organisation. Levels of literacy/language Internal restructuring.
Technological	Access to strategic materials. New materials e.g. composite. Cost of renewable technologies. Product safety requirements. New technologies/advancements. Product safety requirements/authority/airworthiness.	Level of investment in research and development for environmental innovation. Design function undertaken elsewhere in corporation.
Legal	Substance and product regulations and laws (REACH, TSCA etc.). Long term environmental policy trends. Environmental legislations (e.g. industrial emissions, waste management etc.). Changes in employment law.	Corporate reporting requirements.
Environment (see also 3.2)	Climate change/extreme weather. Local air quality. Raw material scarcity, critical materials. Water risk and vulnerability. Loss of biodiversity.	Limited space on site. Proximity of sensitive receptors. Ground/groundwater contamination.

Table 3.1: Examples of internal and external issues

Consider risks and opportunities associated with issues

Although this is a requirement of ISO 14001:2015 clause 6.1.1, it can be intuitive to determine risks and opportunities as part of the same process that identifies the issues (see also Chapter 7).

4. DETERMINING THE SCOPE OF THE EMS

4.1 Why is this key for the aerospace industry?

Determining the scope of the EMS is important to aerospace sector as it includes small and medium sized organisations and large corporations with many business units and facilities spread across the globe offering a wide range of products and services with shared supply chains.

Having an appropriate scope description is critical to:

- Clarify internally and externally:
  - the physical and organisational boundaries to which the EMS applies; and
  - the level at which activities are performed, e.g. corporate, facility.
- Identify areas not in scope but part of the broader life cycle that may be controlled or influenced.

4.2 What does ISO 14001:2015 require?

Organisations are expected to determine the boundaries and applicability of the EMS to establish its scope. In doing so, organisations should consider internal and external issues and compliance obligations, their organisational units, functions, physical boundaries, activities, products and services and their authority and ability to exercise control or influence.

Organisations should not define the scope in such a way that they deliberately or unintentionally omit activities, products, services or facilities which can have a significant aspect or avoid a compliance obligation.

When an organisation states it conforms to the international standard, the scope must be made available to interested parties. Communication on the scope should be accurate, for example, an organisation stating in a report that it is certified to ISO 14001 must specify which parts of the organisation are within the scope of the certification.

4.3 Considerations/options for implementation

Review applicability of current scope

The transition to the revised standard provides an opportunity to review the current scope, not only with regard to ISO 14001:2015 but also to reflect any changes to the organisation's activities, products, services or facilities.

Review information gained through the EMS

The requirement to define the scope of the EMS should consider the ISO 14001:2015 requirements covering context (ISO 14001:2015 clause 4.1) and interested parties (4.2) so that a complete understanding of the organisation is developed. For example:

- Internal and external issues and interested parties' needs and expectations provide guidance on what an organisation may decide to include in the scope. For example, an organisation may decide to include certain facilities in its scope due to expectations from an interested party, or to extend its scope to cover previously excluded products due to an external issue regarding greater environmental scrutiny of aerospace products.
- Compliance obligations: these are an important consideration as they can impose the level of control an organisation has to exert, which consequently will impact the scope. A good example of this relates to waste law, where the producer often retains responsibility for its waste until it is finally treated or disposed of.

Define and understand the scope

When developing the scope, the key components are: i) identification of the activities involved, ii) the products and services that result, and iii) the location where the activities take place. The scope of the EMS as stated on the ISO 14001 certificate will be succinct. Organisations will demonstrate their understanding of the scope through identifying aspects, establishing actions and objectives and developing operational control and influence.

Make the scope available

The scope of an organisation's EMS should be made available to interested parties either in an unrestricted manner, for example on a website, or in the reception area, or on request. The scope could be made available by, for example providing the ISO 14001 certificate.

Example

The scope of the EMS as presented on a certificate could be:

"*Manage company, marketing and sales, design and engineering, production, management of industrial partnership, assembly and delivery, procurement, after sales and in-service support of aircraft."*

5. LIFE CYCLE PERSPECTIVE

5.1 Why is this key for the aerospace industry?

Considering the life cycle perspective is important for the aerospace industry as it:

- Enables the identification of environmental and business risks and opportunities in all stages of the product lifecycle (from design to end of life).
- Fosters communication among manufacturers, airline operators, repairers, disposers and others involved in the aerospace value chain, improving the environmental performance of the industry as a whole.
- Provides renewed impetus to establish EMS primarily focused on production to a broader consideration of the product lifecycle.
- Enables the EMS to help facilitate coordination across internal functions.
- Encourages more informed and robust decision making across the value chain so that overall benefit for the environment is achieved, for example environmental performance improvement during in-use phase may justify increased environmental impacts incurred during the manufacturing phase and/or end of life.

5.2 What does ISO 14001:2015 require?

5.2.1 Life cycle perspective

The revised Standard requires organisations to consider a life cycle 'perspective' rather than a detailed Life Cycle Assessment (LCA). An understanding of an organisation's environmental impacts, even at a high level, will help concentrate efforts on where environmental performance can be improved the most.

The revised Standard requires organisations to consider a high level life cycle 'perspective' rather than a detailed Life Cycle Assessment (LCA).

The requirements of 6.1.2 and 8.1 are summarised in Figure 5.1. *Summary of additional life cycle perspective requirements*. It provides an example of a life cycle for the aerospace sector and gives an overview of what ISO 14001:2015 requires in relation to environmental aspects and operational control. Environmental requirements relating to production/service delivery are not included as they should already be considered as part of an EMS consistent with ISO 14001:2004.

The term "supply chain" is used to describe raw material acquisition, material/component production and other activities undertaken in the supply chain to procure raw materials, products and services.

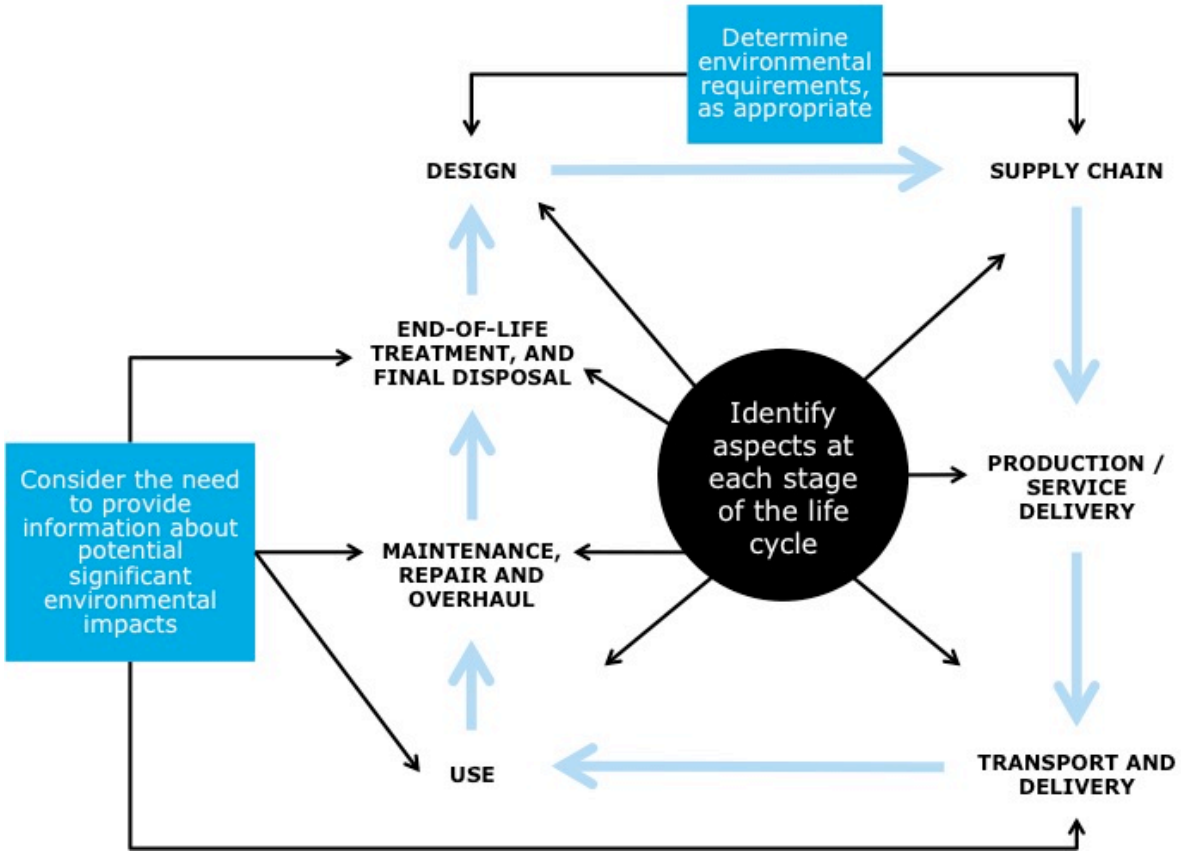

Figure 5.1: Summary of additional life cycle perspective requirements

An organisation should think about the level of control or influence it has over the environmental aspects at each stage in the life cycle. The level of control or influence will need to be taken into account when determining whether an aspect is significant and, as a consequence, whether the organisation has to take action. Control is the ability to make something happen directly, for example a manufacturer that changes a specification to restrict the use of a hazardous substance in a supplier's product. Influence is the ability to affect another interested party's thinking or actions, for example encouraging suppliers to have an EMS or providing an aircraft operator with a guidance manual on how to reduce fuel burn through regular external cleaning of the aircraft.

Significant aspects will be those that have significant environmental impact and over which the organisation has control or sufficient influence. For example, one environmental aspect of aircraft taxiing is aviation fuel use with an associated impact on local air quality. This aspect could be considered significant by an aerospace Original Equipment Manufacturer (OEM) through its influence on design, and non-significant by an aerospace parts manufacturer which is unable to influence the impact on air quality.

Influence can vary through the aerospace supply chain. Whilst influence over exactly how a supplier or an aircraft operator carries out its operations can be limited, there is significant alignment on what needs to be achieved as the aerospace sector is generally aligned to a set of requirements imposed by customers or government regulators that influence how the various actors in the value chain make decisions. These requirements are driven by operating costs, particularly fuel burn, and therefore relate to in-use air emissions. For example, an aircraft manufacturer may have influence over how its products are used by the aircraft operator, through the provision of manuals and customer training. Organisations may consider exercising influence in anticipation of aspects which are not yet regulated or driven by business benefits, but whose environmental impact is known.

The life cycle perspective will differ from one organisation to another and will depend on its context, the scope of its EMS, its position in the value chain and whether it holds design authority. In the aerospace sector the 'life cycle perspective' involves a wide range of OEMs, users and Maintenance, Repair and Overhaul (MRO) organisations, all having varying levels of control and influence on different environmental aspects and impacts. In some cases, the addition of the life cycle perspective will lead to cooperation in cross sector projects. In other cases, because of limited influence (no design authority for example), the focus will be on 'local' initiatives, for example operational efficiency and the consideration of overall costs during procurement of manufacturing equipment.

Regarding the supply chain, aerospace organisations will have the greatest opportunity to control or influence those organisations with which they have a contract, i.e. tier 1 suppliers. Aerospace organisations can have indirect influence on subsequent tiers of the supply chain through: design; production efficiency (reducing consumption and therefore the resulting impacts of acquiring raw materials); industry collaborations, such as supply chain standards; and tier 1 suppliers cascading requirements to their suppliers. Equally, an aerospace organisation will not control aspects relating to the product in use or to its maintenance and end of life, but can influence them through design, working with airlines on efficient flight procedures and industry agreed end of life processes, for example.

5.2.2 Outsourced Processes

ISO 14001 Annex A.8.1 states that a process meets the definition of an outsourced process when all five of the following conditions are satisfied:

- It is within the scope of the EMS.
- It is integral to the organisation's functioning.
- It is needed to achieve the intended outcomes of the EMS.
- The liability for conforming to environmental requirements, including compliance obligations, is retained by the organisation.
- Interested parties perceive that the process is undertaken by the organisation.

ISO 14001 Annex A (A.8.1) also states:

> *"The organisation decides the extent of control needed within its own business processes (e.g. procurement process) to control or influence (an) outsourced process(es)…"*

The intent of this requirement is to emphasise that when an organisation outsources a process that is controlled, or perceived to be controlled, by the organisation, that it does not purposely or inadvertently exclude the outsourced process from the organisation's EMS or from its environmental responsibility.

The revised Standard requires organisations to control or influence outsourced processes which it relies on to fulfil its compliance obligations, or can affect the organisation's ability to manage its environmental aspects.

Whether a process meets this definition will depend on the organisation's activities, products and services and the specific process being undertaken by the external provider. Examples of outsourced processes can include a contractor undertaking on-site cleaning or catering or operating an on-site effluent treatment plant. However, supply chain activities are not classed as outsourced processes when, as is common in aerospace, liability for environmental requirements is assigned to the supplier or vendor in the supply contract. Another example would be a waste company employed to remove waste from the site. The contracted process would not be seen as an

outsourced process as interested parties would not perceive it is being undertaken by the organisation.

Control or influence can be exerted through operational controls such as clear and agreed instructions, documented procedures, contracts, supplier agreements and other Quality Management System (QMS) requirements. The organisation will not be expected to control or influence all of the activities of the outsourced process, but only those where the organisation has the responsibility for conforming to an environmental requirement.

5.3 Considerations/options for implementation

Map out a high level life cycle for the organisation's product (s)/service (s)
This could use Figure 5.1 *Summary of additional life cycle perspective requirements* as its basis and could follow a cycle or linear flow diagram. In doing so, the organisation may wish to consider existing life cycle thinking and activity. For example:

- The previous identification of aspects relating to non-production stages of the life cycle, such as purchase of raw materials or product disposal.
- Existing LCA for a specific product, programme or service.
- Operational controls or influences relating to non-production stages of the life cycle, which may have been developed as part of, or separate to the EMS.

Identify activities at each stage of the life cycle
Examples of common activities in the life cycle include:

- Raw material extraction and/or harvesting processes.
- Mechanical or chemical processing of raw materials.
- Supply chain manufacturing/assembly of components, parts and sub systems.
- Transportation of materials or components.
- Flight test.
- Collection, treatment and final disposal of supply chain waste.
- Transportation of organisation's product to distribution centres or customer facility.
- Transport of spares.
- Use of product (aircraft in flight, ground operations including taxiing, docking and parking).
- Treatment and final disposal of aircraft and other product related waste.
- Installation of organisation's product in the aircraft.
- Maintenance, repair and overhaul of the aircraft.
- End of life, dismantling and final disposal.

To assist with the identification of activities related to the supply chain, the organisation could use procurement/supply chain information, for example records of products/materials purchased. The activity of 'supply chain', could be further subdivided by contract type, for example build to print, standard parts etc. or grouped according to criteria such as categories of highest spend and/or risk. Organisations should consider whether any of these activities meet the definition of 'outsourced processes'. Appendix 2: *Applying a life cycle perspective* provides examples of aspects, impacts, risks and opportunities and actions for each stage of the life cycle.

Identify aspects for each activity
Existing aspects processes and registers can be adapted to also consider the life cycle perspective. Aspects can be grouped. For example aspects relating to ground operations could include aspect groups such as the use of 'ground support equipment', rather than naming each piece of equipment,

and ‘disposal of waste’ rather than identifying each waste stream. Aspects can be identified for outsourced processes, especially aspects that relate to where the organisation retains the liability for the conformity with an environmental requirement. Although environmental aspects may not be directly attributable to the design stage, environmental aspects at other stages of the life cycle will be influenced through actions taken at the design stage.

Identify environmental impacts and risks and opportunities for each aspect

The organisation should use existing information, where available, to identify impacts at different levels of granularity, for different stages of the life cycle. This could include using knowledge of specific impacts relating to a particular product, service or supplier, for example water vulnerability or resource scarcity. Consideration should be given to compliance obligations from interested parties relating to environmental aspects, for example a compliance obligation associated with an airline operator’s need to reduce fuel burn from taxiing activities. While it is not necessary to undertake detailed research or have dialogue with interested parties, doing so may result in a more robust list of environmental impacts and risks, and opportunities for each aspect.

Evaluate significance taking account of control or influence

Organisations can supplement their existing aspect evaluation methodologies by adopting criteria that allow the level and scope of control or influence to be considered.

Plan action for significant aspects

Action can include operational control or influence such as the organisation integrating environmental requirements in the design and development process and in the procurement process of goods and services. Action can also include the provision of guidance and training on potential significant environmental impacts associated with transportation or delivery, use, end-of-life treatment and final disposal. To ensure control or influence of outsourced processes operational controls or influence should be planned and implemented, particularly where they relate to significant aspects.

5.4 Case studies / examples

Table 5.1 *Case studies of applying a life cycle perspective* provides examples of actions, including operational control or influence in the aerospace industry to address significant environmental aspects across the life cycle.

Life cycle stage	Case study examples of life cycle actions including operational control or influence
Supply chain: acquisition of raw materials. Production and assembly in supply chain.	IAEG Supply Chain Sustainability Survey project. Supplier self-assessment initiative to provide accurate view of suppliers' maturity level in terms of regulation and substances of concern management.
Design	New airplanes are already 70 percent more fuel efficient and 90 percent quieter than the first jets. Designing individual aircraft components increases fuel efficiency e.g. redesigning a winglet resulted in an additional 1.8 percent fuel efficiency.
Production	3D printing offers a completely new approach to production. Instead of obtaining a part by cutting away a solid block of material and the resultant waste and energy, it works from the inside-out, building the part layer by layer. Using water based primers reduced Volatile Organic Compound (VOC) emissions by around 3 tonnes each year.
Logistics/delivery	o Usage of re-usable packaging instead of single use cardboard, plastic or wood reduced resource use and environmental impacts associated with recycling. o Reverse logistics, returning reusable packaging and parts to be repaired, reduced carbon emissions. o Improved logistics strategies, for example efficient routing & scheduling of vehicles allowed truck loads to be optimised.
In use	Sustainable aviation fuel reduces carbon dioxide emissions by 50 to 80 percent on a life cycle basis compared to fossil fuel. An aerospace organisation and an airline cooperated in testing a flight that resulted in the aircraft emitting half the (Carbon Dioxide) CO_2 of a regular flight.
Maintenance	Redesigning spray guns reduced paint wastage for spot repairs by around 90 per cent. Repair and overhaul keeps the product working for longer. Parting out – trying to avoid useable parts becoming waste prematurely.
Remanufacture, recovery, disposal	Initiative to track and reclaim rhenium-rich turbine blades which have reached the end of their contracted life-cycle. Up to 90 per cent of the aircraft is reused or recycled.

Table 5.1: Case studies of applying a life cycle perspective

6. UNDERSTANDING THE NEEDS AND EXPECTATIONS OF INTERESTED PARTIES

6.1 Why is this key for the aerospace industry?

It is increasingly important for organisations to understand, prioritise and respond to the environmental requirements of those individuals and groups they rely on to be successful. Given its role in supporting a sustainable economy, the aerospace sector needs to ensure that it manages its interested parties and is able to provide reliable information on its environmental performance.

The new requirement of ISO 14001:2015 will also assist aerospace organisations by providing a mechanism, which will support their own sustainability or corporate responsibility strategies.

6.2 What does ISO 14001:2015 require?

ISO 14001:2015 requires organisations to identify relevant interested parties (the term stakeholder can be used) and determine their expressed and relevant needs and expectations. An 'interested party' is a person or organisation that can affect, be affected by, or perceive itself to be affected by a decision or activity of the organisation. A 'relevant interested party' is one that the organisation considers to have needs and expectations which can affect or be affected by its EMS. For example, a financial regulator may not be a relevant interested party as it has no needs and expectations relevant to the EMS. A health and safety regulator may be a relevant interested party as it expects compliance with chemical regulations which include environmental requirements. However, not all the health and safety regulator's needs and expectations will be relevant, for example those relating to machinery guarding.

Only the interested parties' needs and expectations an organisation has to or chooses to adopt become compliance obligations.

The organisation should consider what the interested party needs are and what it expects from the organisation. Neighbours for example may need clean air but they may also expect regular meetings with the organisation. A supplier would need to understand the organisation's requirements on materials of concern and would expect them to be communicated as they are updated.

Once needs and expectations are identified, the organisation should determine which of these become compliance obligations. Compliance obligations include requirements that are mandatory, such as laws and regulations, or that the organisation has voluntarily chosen to adopt, for example a contractual agreement regarding the exclusion of certain hazardous substances or involvement in a local community environmental initiative.

6.3 Considerations/options for implementation

Identify and use existing interested party processes

These include stakeholder processes as part of sustainability strategy, communication planning, risk management or government affairs or for the purposes of another certified management system e.g. ISO 9001, EN9100 or ISO 27001. If a process already exists, it may not be necessary to develop a new one for the purpose of ISO 14001:2015 or the process output. For example, a list of interested parties could be used as the starting point to meet this requirement.

Identify interested parties relevant to environmental management/performance

Interested parties can be identified at the broad group level. A list of interested parties relevant to the aerospace sector is provided on the next page. Further detail is provided in Appendix 3: *Examples of aerospace interested parties, their needs and expectations and compliance obligations*.

- Governments and governmental bodies.
- Environmental, health and safety agencies/regulators.
- Suppliers and contractors.
- Certification Authorities.
- Commercial trade associations.
- Aerospace industry associations.
- International bodies.
- Customers.
- Consumers.
- Airports.
- Community and neighbours including neighbouring industries.
- Society.
- Academic institutions and employment agencies.
- Employees.
- Owners and investors.
- Research bodies.
- Non-governmental organisations (NGOs), non-profit organisations, campaign groups and charities.
- 'Internal' interested parties, for example corporate head office, control design or procurement function.
- Media.
- Certification bodies for ISO 14001 (and other standards).
- Insurance providers.
- Emergency responders.

The number and type of interested parties identified will depend on the scope of the EMS, the organisation and its context including its place in the aerospace value chain. For example, a large aerospace organisation may consider a government department for trade and industry as an interested party relevant to its EMS whereas a small aerospace supplier may not.

Identify relevant needs and expectations

Whilst needs and expectations can be identified at a broad category level, more detail identified at this stage will assist in deciding whether a need or expectation becomes a compliance obligation.
ISO 14001:2015 does not require organisations to engage directly with interested parties specifically to identify needs and expectations; existing knowledge through previous interactions may be sufficient. However, organisations can consider using existing interactions with interested parties to improve their knowledge, for example in customer or supplier project review meetings or meetings with facility neighbours and use this to improve their knowledge of interested parties' needs and expectations. Where appropriate, input from different business functions should be obtained, for example the commercial or sales function may be more aware of customer needs and expectations.

Determine compliance obligations

Compliance obligations include legal requirements, for example to obtain permits, and those the organisation has voluntarily adopted. The latter may include expectations which have been established without being formalised, for example regular meetings or correspondence with a neighbour or community group. The organisation can choose to adopt further needs and expectations as and when they are identified. This decision should be based on risks and opportunities (see also Chapter 7). For example, an organisation is free not to adopt a community environmental project as a compliance obligation if it considers the cost and/or time (risks) involved outweigh any opportunities such as an improved relationship with the community. The process of determining compliance obligations may be informal, for example the organisation's representatives coming to a consensus on which needs and expectations become compliance obligations, or more formal using qualitative/quantitative processes

such as evaluating and prioritising interested parties and their needs and expectations based on the level of influence the interested party has over the organisation.

Document and implement compliance obligations
The organisation should create a compliance obligations register or update an existing legal and other requirements register, where available to take into account the additional compliance obligations.

Consider communication requirements in relation to compliance obligations
Clause 7.4 of ISO 14001:2015 requires organisations to establish a process for communication. This process will be closely linked to the organisation's compliance obligations. At a minimum, the communication process or plan should outline for each interested party what is being communicated, the frequency of the communication, the communication methods and the individual or department within the organisation responsible for the communication. In addition to the communication process or plan, the organisation may need to communicate on one-off events which may not be linked directly to compliance obligations. To ensure environmental information communicated is reliable and consistent with information generated from within the EMS, robust monitoring and measuring processes should be adopted. Wherever possible, organisations should document communications although some, particularly internal communications, may not be in a format that can be documented, e.g. a departmental briefing.

6.4 Case studies / examples

When assessing its EMS' readiness for transition, a defence aerospace company discovered that a number of mechanisms were already in place that would assist in achieving ISO 14001:2015 certification. These included:

- A stakeholder map owned by the communications department, which highlighted who it was communicating with and the existing methods in place to help with communication.
- An analysis performed by its parent company to understand the requirements of its stakeholders as part of its corporate responsibility strategy. This was relevant, as some interested parties were shared with its parent company, e.g. government departments and some suppliers and customers.
- A number of existing environmental initiatives unknown to the environmental, health and safety department. In particular, they included regular meetings in at least one facility with local community groups on environmental issues (noise and potential developments at the site). The company identified the meetings as a local community expectation, which the company had adopted and were therefore to be considered as a compliance obligation.

Following the assessment of its EMS, the organisation held a workshop with relevant functions to review the findings and to consolidate the list of interested parties, their known needs and expectations and compliance obligations. A number of departments then undertook further research before an interested party table was completed and compliance obligations transferred to the compliance obligations register. The organisation intends to update the interested party table when new knowledge is made available and as part of the management review process.

7. RISKS AND OPPORTUNITIES

7.6 Why is this key for the aerospace industry?

Determining risks and opportunities allows the EMS to:

- Support the long-term viability of the organisation through identifying positive and adverse effects to the organisation in addition to the impact on the environment.
- Become more integrated with the overall business strategy and increase engagement with other functions.
- Move beyond compliance and focus on the opportunities to the organisation and the environment (including cost reduction).
- Address barriers so that continual improvement can be achieved.

The aerospace industry and organisations within it will benefit from this new requirement in particular as it will help manage the internal and external issues which were discussed in Chapter 3.

7.7 What does ISO 14001:2015 require?

Clause 6.1.1 of ISO 14001:2015 requires an organisation to take the information collected by the EMS including internal and external issues, environmental aspects and compliance obligations and to identify associated risks and opportunities. These risks and opportunities are then prioritised to those that need to be addressed in order for the EMS to meet its intended outcomes, prevent or reduce undesired effects and achieve continual improvement. Risks and opportunities are defined as potential adverse effects (threats) and potential beneficial effects (opportunities). The term 'effect' is used in ISO 14001:2015 to describe the result of a change to the organisation (the term 'environmental impact' refers specifically to the result of a change to the environment), for example cost, revenue, sales, reputation and business continuity. Organisations are not expected to document all risks and opportunities, only those that need to be addressed. Figure 7.1 *Addressing risks and opportunities* illustrates the general flow of requirements within ISO 14001:2015 clause 6.1.1.

An EMS should take into account the impacts the organisation has on the environment and vice versa.

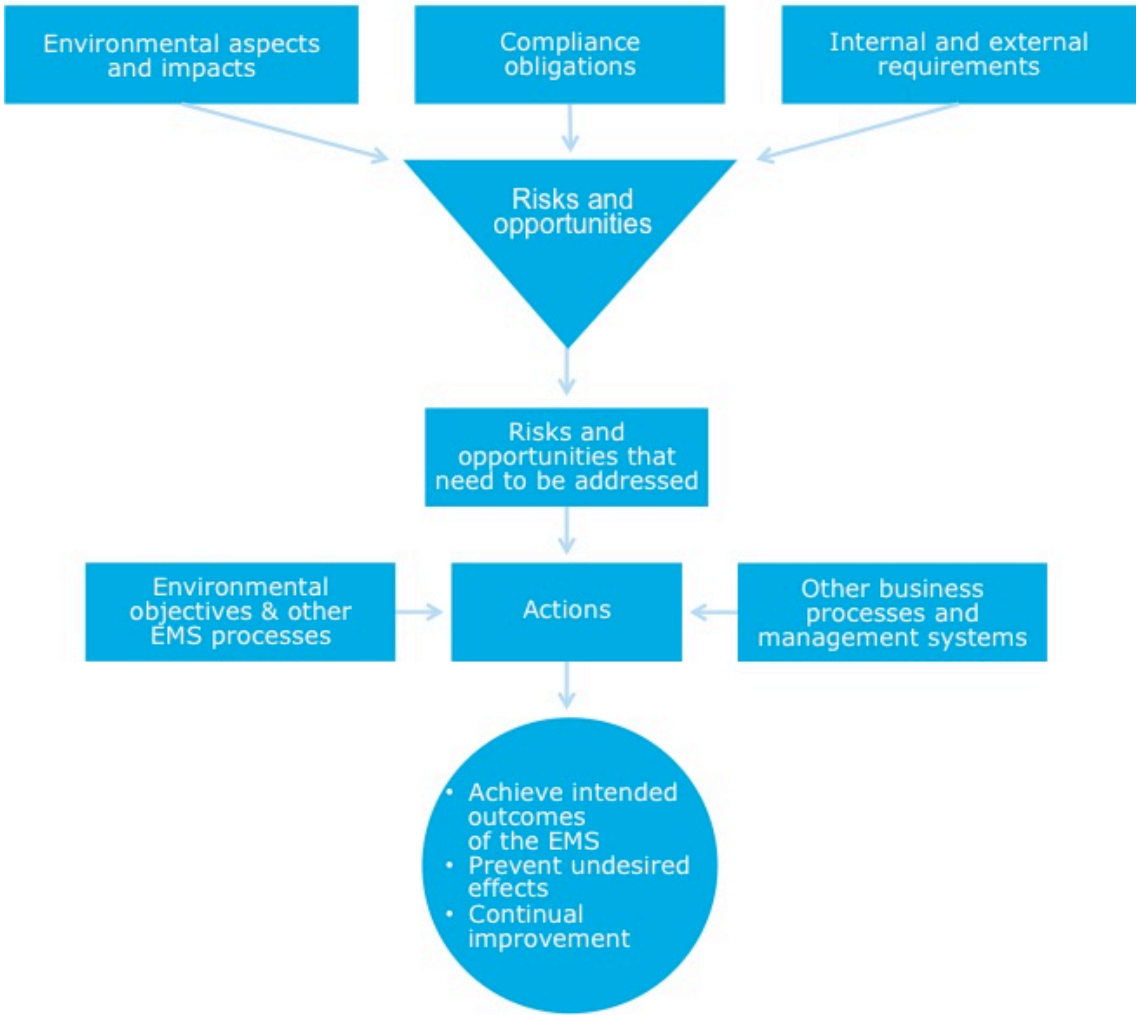

Figure 7.1: Addressing risks and opportunities

Clause 6.1.4 of ISO 14001:2015 requires organisations to take actions to address its significant aspects, compliance obligations and risks and opportunities. Action can be taken in a variety of ways such as using EMS processes, for example objective setting, operational control or emergency preparedness, or through other business processes, for example procurement, finance or design.

7.8 Considerations/options for implementation

An organisation has the freedom to choose its approach when determining the risks and opportunities that need to be addressed. The exact approach taken will depend on a number of factors relating to the organisation's existing EMS but also the availability and appropriateness of other business processes, for example corporate risk management.

For some organisations this requirement will be nothing new as risks and opportunities may already be incorporated in processes that manage aspects and compliance obligations. Furthermore, there may be an existing approach, whether formal or informal, to understanding the adverse and beneficial effects a changing environment has on the organisation. For others, it may require amendments to existing processes and/or the development of new processes.

ISO 14001:2015 requires organisations to consider risks and opportunities in relation to internal and external issues, environmental aspects and compliance obligations. To consider these sources an organisation may consider the following approach:

- Review existing environmental aspects evaluation processes so that an identification of risks and opportunities is undertaken for each **environmental aspect** and related **compliance obligation.**
- Ensure the process for determining which interested party needs and expectations become **compliance obligations** (see Chapter 6) is based on risks and opportunities.
- Identify risks and opportunities that need to be addressed in relation to **internal and external issues** (see Chapter 3).

Each of these processes is described in more detail below.

Review and amend existing aspects evaluation process

Those organisations with an existing EMS will already have a process in place to identify and evaluate environmental aspects which will be linked to their compliance obligations. The process should be reviewed to include, if required, a description of the effects on the organisation, for example adding a 'risks and opportunities' column to the aspects register.

When evaluating aspects for significance, an organisation should not only consider environmental impact and environmental legislation, but also the effect on the organisation itself. This may require the addition of criteria such as cost, revenue, reputation and business continuity. Although environmental impact will be the overriding criterion when evaluating significance, an aspect could be significant due to the effect on the organisation even if the impact on the environment is not considered significant. For example, a corporate concern on water scarcity may result in an aspect being significant at a facility where the environmental impact of water use is minimal or a particular chemical, although not having a significant environmental impact at the facility, can pose a significant risk to business continuity if the substance becomes restricted by legislation.

Consider risks and opportunities when determining compliance obligations

An organisation will intuitively consider risks and opportunities when deciding which interested party's needs and expectations become compliance obligations (see Chapter 6). ISO 14001:2015 does not require this process to be formalised. For example, when deciding whether to participate in an aerospace sector environmental initiative, the organisation would consider the risks and opportunities that participating in the initiative would bring, such as increased resource requirements, reputation and increased benefit through collaboration.

The EMS should focus on opportunity as well as risk.

Determine risks and opportunities related to internal and external issues

An organisation has the freedom to choose the process it uses to identify risks and opportunities associated with internal and external issues (Chapter 3). It is recommended that organisations do not see identification of internal and external issues and risks and opportunities as distinct processes but adopt an approach that identifies both together. The approach chosen to determine those risks and opportunities that need to be addressed can include gaining a consensus of opinion from cross functional representatives on which need to be addressed, for example in a meeting or workshop, or applying criteria in a matrix, for example using an existing business risk management process.

Taking action

Once the risks and opportunities that need to be addressed are identified, the organisation can then plan actions to mitigate risk or act on the opportunities. Given that risks and opportunities are the

effect on the organisation, it is likely that these actions may need to be managed in different functions of the organisation.

Examples of risks and opportunities and actions relating to:

- Aspects are provided in Appendix 2: *Applying a life cycle perspective.*
- Compliance obligations and requirements in Appendix 4: Examples of *risks and opportunities and actions relating to compliance obligations and other requirements.*
- Internal and external issues Appendix 5: Examples of *risks and opportunities and actions relating to internal and external issues.*

8. PERFORMANCE EVALUATION

8.6 Why is this key for the aerospace industry?

Performance evaluation is important because it:

- Allows aerospace organisations to assess and demonstrate progress against 'enhancement of environmental performance' and 'continual improvement'.
- Supports the collection of reliable data and information and communication to interested parties. This includes the contribution to environmental, sustainability or corporate responsibility reporting.
- Provides top management with the information they need to fulfil their environmental and business management responsibilities.
- Provides the aerospace industry with reliable data for cross industry reporting, for example greenhouse gas (GHG) reporting.
- Assists in the external verification and assurance of sustainability/corporate responsibility data and reporting, particularly where frameworks are used that present standardised metrics or principles based disclosure such as the Global Reporting Initiative (GRI), Carbon Disclosure Project (CDP), Accountability Assurance Standards (AA1000), or verification against benchmarking frameworks, such as CDP or Dow Jones Sustainability Indices (DJSI).

8.7 What does ISO 14001:2015 require?

ISO 14001:2015 places greater emphasis on evaluating environmental performance rather than simply monitoring and measuring. Evaluation requires the organisation to define its environmental performance criteria. Criteria are defined to set the performance expectations and serve as a basis against which performance will be measured. Examples of criteria include environmental policy commitments, environmental objectives or compliance obligations. Measuring performance against criteria can be undertaken using performance indicators. i.e. what needs to be measured. Examples of indicators that relate to the EMS are electricity consumption, scrappage, production units, GHG emissions, product fuel use and number of complaints or incidents. Analysis of information should consider the data quality, validity, adequacy and completeness and assist the organisation in its communication of reliable information.

ISO 14001:2015 places greater emphasis on evaluating environmental performance rather than simply monitoring and measuring.

An organisation in addition to evaluating the fulfilment of its compliance obligations, is also expected to maintain a knowledge and understanding of its compliance status.

The management review now needs to include top management's consideration of changes in external and internal issues (see Chapter 3), the needs and expectations of interested parties (see Chapter 6) including compliance obligations and risks and opportunities (see Chapter 7). The output from the management review should include opportunities for further integration of the EMS with other business processes and any implications for the strategic direction of the organisation (see Chapter 2).

8.8 Considerations/options for implementation

Plan what needs to be monitored and measured

The organisation should identify criteria against which it will measure and monitor its performance. Particular attention should be given to any criteria that needs to be communicated and where it

relates to compliance obligations. For example, a criterion could be compliance with an effluent permit consent or compliance with chemical substance legislation.

Identify appropriate indicators

Indicators help to convert relevant quantitative or qualitative information into a concise, more understandable and useful form for evaluating performance. Indicators can comprise operational performance indicators (for example energy consumed, waste generated) and environmental condition indicators (for example concentration of specific pollutant in surrounding air). An example of an indicator relevant to the permit could be pH or parts per million (ppm) of heavy metal. For the chemical substance legislation criterion, the indicator could be the number of suppliers responding to a questionnaire. Examples of criteria and indicators are provided in Table 8.1 *Examples of criteria and relevant indicators.*

Performance Criteria	Indicator
Effluent permit consent	pH, PPM heavy metals
Product specification – fuel burn	Litres/km
Compliance with legislation	VOC consumption per xx
Recycling target	% of waste recycled
Production	Number of units produced
Complaints	Number of complaints resolved
Competency	% of employees received relevant training
Chemical consumption	L, Kg

Table 8.1: Examples of criteria and relevant indicators

Monitoring and measuring

Monitoring and measuring should take into account the need for reliability of data/information reliability. This depends on factors such as availability, adequacy, scientific and statistical validity and verifiability. Monitoring and measurement should be supported by processes that ensure the data obtained are of the type, amount and quality needed for effectively evaluating performance. For monitoring and measuring an effluent permit consent, it would be expected that a process, appropriate competency and internal audits would be in place. For chemical substance legislation, it would be expected that appropriate quality control is in place to manage records.

Analysing data

Data analyses should include consideration of the quality, validity, adequacy and completeness of information to deem it reliable. As such, the data/information collected through monitoring and measurement should constitute objective verifiable evidence (OVE). OVE allows an independent body or person to determine if a claim made by the organisation can be substantiated. For example, an aerospace organisation claiming that it has reduced its GHG emissions may have to provide data as evidence of this claim to an interested party, if requested. Environmental auditing is a method that can be used to check the reliability of data. Organisations are required by ISO 14001:2015 to retain appropriate documented information (records, spreadsheets, reports) as evidence of the monitoring, measurement, analysis and evaluation of results.

Evaluating performance

When data analysis is complete, the organisation can evaluate its performance against the criteria. The indicators will present progress made over the reporting period and whether or not performance criteria have been met. Evaluating performance includes evaluating the fulfilment of compliance obligations. For evaluating performance relevant to the effluent permit consent, pH and heavy metal results would be compared to the permit consent's emission limit values. Chemical substance legislation would require a comparison of the number of questionnaires received against the target the organisation had set itself.

Communicating performance

Organisations should ensure that data and information which is consistent with that derived from the EMS are used in communications. Communication includes internal communication, for example reporting on progress against objectives to top management. The organisation should have a process to convey knowledge and understanding of its compliance status. This should include a mechanism for regular reporting to top management on compliance status, ensuring that immediate reporting to relevant parties takes place when a non-conformance arises.

APPENDIX 1
EXAMPLES OF INTEGRATING EMS REQUIREMENTS INTO BUSINESS PROCESSES AT A STRATEGIC, FUNCTIONAL AND DEPARTMENTAL LEVEL

Strategic integration

- Understanding and communicating how the EMS can contribute to the organisation's overall business goals, for example how it can support specific vision terms such as 'responsibility', 'efficient' and 'innovative'.
- Including environmental risks and opportunities as part of the corporate/enterprise risk management process and using such systems to understand the context of the organisation.
- Using communication, sustainability or corporate social responsibility strategies to support the process of identifying interested parties and their needs and expectations.
- Reporting environmental performance alongside financial reporting and considering environment in financial processes e.g. CAPEX approval.
- Developing and reviewing environmental indicators as part of the business performance process e.g. in business meetings and included within departmental and employee goals.
- Understanding the environmental implications of other business performance indicators such as scrappage rates and cost of energy.

Functional integration

- Environmental performance and environmental initiatives being included in employee business briefings, newsletters and other forms of communication.
- Top management being involved in external and internal audits and ensuring corrective action is implemented. Top management and other managers including environment in process confirmations or site inspections.
- Full integration of the EMS with quality, H&S or security management systems or integration of specific processes, for example context, interested parties and the audit programme.
- Considering environment when developing new facilities or refurbishment.
- Including environmental criteria when selecting suppliers, vendors or vetting contractors or including environmental requirements in contracts.
- Including environmental criteria and/or requirements in design processes.
- Including environment in commercial activities such as tender responses and marketing/sales meetings.
- Directing human resources to include environmental criteria in new hire postings, job descriptions, training needs analysis/competency matrix, employee appraisal processes, etc.

Departmental integration

- Environment being included as part of shift start up or departmental meetings.
- Environmental indicators being monitored alongside other business indicators at a departmental level.
- Each department having its own environmental representative.

APPENDIX 2
APPLYING A LIFE CYCLE PERSPECTIVE: EXAMPLES OF ACTIVITIES, ASPECTS, IMPACTS, LEVEL OF CONTROL OR INFLUENCE, RISKS AND OPPORTUNITIES AND ACTIONS

Life cycle stage	Example activity	Example aspect(s)	Example impact(s)	Possible considerations for control or influence?	Example risks to the organisation	Example opportunities for the organsiation	Examples of actions including operational control or influence
Supply chain: raw material extraction/harvesting.	Underground or open pit mineral/metal mining, drilling and pumping oil and gas.	Discharge of mining tailings, fuel combustion, and fertiliser runoff.	Resource depletion, surface and ground water quality, climate change, air quality.	Control type of material used Limited influence of suppliers' processes.	Unavailability of raw materials and parts due to depletion of natural resources.	Securing a source of strategically important materials to ensure business continuity.	Establish environmental requirements in the design process, e.g. relating to material use.
Supply chain: material/component processing.	Oil refining, ethylene cracking, smelting, grinding, washing, pelletising.	Filtration of heavy metals, fuel combustion, waste generation.	Human toxicity, landfill use, climate change, air quality.	Control type of material used. Limited influence of suppliers' processes.	Unavailability of raw materials and parts due to depletion of natural resources.	Securing a source of strategically important materials to ensure business continuity.	Review resource scarcity vulnerability of supply chain. Suppliers/contractors to be ISO 14001 certified.
Supply chain: material/component processing.	Build to print contracts Supply of component x.	Material waste, energy consumption, air emissions, water emissions, water consumption.	Resource depletion, landfill use, air quality, water quality, climate change.	Control design. Influence supplier's manufacturing methods.	Detrimental publicity from supplier causing environmental incident.	Lower supply chain costs. Improved relationship with supply chain.	Investigate model that allows manufacturer to retain and reuse scarce materials. Redesign product to optimise manufacturing efficiency. Provide awareness to suppliers on manufacturing efficiencies and chemical substance legislation compliance.

Life cycle stage	Example activity	Example aspect(s)	Example impact(s)	Possible considerations for control or influence?	Example risks to the organisation	Example opportunities for the organsiation	Examples of actions including operational control or influence
Supply chain: material/component processing.	Engine Manufacturing (design-build).	Material waste, energy consumption, air emissions, water emissions, water consumption.	Resource depletion, landfill use, air quality, water quality, climate change.	Control over specification. Influence design. Limited influence on supplier's manufacturing methods.	Organisation and engine manufacturer lose out to competitors who are partnering with a more efficient engine manufacturer.	Organisation and engine manufacturer increase sales due to more efficient engine design. Organisation and engine manufacturer benefit from lower production costs.	Specification from buyer to meet certain standards relating to fuel burn and product weight.
Supply chain: part supplier.	Fastener manufacturing.	Material waste, energy consumption, air emissions, water emissions, water consumption.	Resource depletion, landfill use, air quality, water quality, climate change.	No control or influence over design or supplier's manufacturing methods. Can influence through supplier selection.	Cost of part increases. Product unavailable due to non-compliance with chemical substance legislation.	Reduced cost of part due to more efficient logistics/manufacturing methods.	Improved stock control and ordering (reduce occurrence of redundant stock). Reduce quantity of fasteners required through design. R&D into alternative fastening methods.
Supply chain: part supplier.	Outsourced process: coating activity.	Use of hazardous substances.	Air quality.	Control use of hazardous substance in coating.	Process unavailable due to non-compliance with chemical substance legislation.	Improve corporate responsibility through improving health and safety and environment in supply chain.	Restrict hazardous substances in specification. Cooperate to reduce supplier's use of hazardous substances and to implement safe working procedures.

Life cycle stage	Example activity	Example aspect(s)	Example impact(s)	Possible considerations for control or influence?	Example risks to the organisation	Example opportunities for the organsiation	Examples of actions including operational control or influence
Production and service delivery.	Metal turning.	Waste metal. Energy use.	Use of resources. Climate change.	Design control will be dependent on ownership of design authority. Control manufacturing methods.	Inefficiencies make organisation's product uncompetitive.	Reduce resource costs. Improve production efficiencies.	Cast parts/use of composites. R&D into 3D printing Reduce errors and scrappage.
Production and service delivery.	Software development.	Electricity use.	Climate change.	Control quantity of electricity consumed. Control selection of energy supplier.	Increased utility costs.	Reduce utility costs. Improved working conditions. Positive publicity from using innovative approach to reducing energy.	Installing LED lighting. Environmental objective and management programme to reduce electricity use.
Transport and delivery.	Shipping by sea, train, truck, or plane.	Combustion of fuel in vehicle, energy use at warehouses/distribution centers, and disposal of packaging required for shipping.	Air quality, climate change, landfill use.	Control shipment method through operational controls, contracts with transport contractor, design of supply chain network.	Disruption from extreme weather. Increased transport costs from rising fuel costs.	Reduce transport costs through efficient ordering. Positive publicity associated with innovative approach.	Work with customers to invest in mutually beneficial reusable packaging. Specify the use of more efficient vehicles and plan for energy efficient routing. Undertake climate change adaptation assessment.

Life cycle stage	Example activity	Example aspect(s)	Example impact(s)	Possible considerations for control or influence?	Example risks to the organisation	Example opportunities for the organsiation	Examples of actions including operational control or influence
In-use.	Aircraft in flight.	Aviation fuel use. Noise.	Climate change. Use of finite resources. Noise.	No control in use. Influence through design and collaboration.	New constraining requirements for design Additional costs Delays for development Competitive disadvantage leading to business loss Cut-off of in-production. Loss of asset value of already delivered products.	Increased revenue through alternative business models e.g. leasing aircraft and increasing after sales contracts.	Fuel efficiency techniques in user manual. Review business models. R&D into reducing fuel burn and noise. Pilot simulation training. Partnerships with airlines, air traffic control and airports to develop efficient flight scenarios.
In-use.	Taxiing Refuelling, de-icing aircraft.	Aviation fuel use. Waste disposal. Emergency spill.	Climate change. Use of finite resources. Noise nuisance. Local air quality. Ground/Water Pollution.	No control in use. Influence through design and cooperation.	Local air quality legislation or airports requiring more efficient taxiing.	Increased sales for alternative taxiing solution or system to manage waste from aircraft.	R&D into alternative propulsion when taxiing. R&D into reduce noise and particulates from engines. Provide guidance on appropriate aircraft de-icing.

Life cycle stage	Example activity	Example aspect(s)	Example impact(s)	Possible considerations for control or influence?	Example risks to the organisation	Example opportunities for the organsiation	Examples of actions including operational control or influence
In-use.	Use of munitions.	Munition testing/training.	Use of finite resources. Ground contamination.	No control in use. Influence through design and collaboration.	Chemical substance legislation restricting supply of raw materials.	Increased opportunities in simulation techniques.	Review supply chain's compliance with chemical substance legislation. R&D into simulation techniques.
Maintenance, repair and overhaul.	Maintenance of aircraft.	Disposal of hazardous material (indirect by waste contractor).	Land pollution. Air quality.	No control. Influence through design and information.	Change in substance legislation resulting in increased cost of waste disposal and safety requirements.	Increased revenue from being able to manage and dispose of substances safely.	Phase out hazardous substances from new products. R&D into non-hazardous retrofit materials. Use of technology to optimise maintenance schedules. Availability of Safety Data Sheet (SDS) information on safe disposal.
Maintenance, repair and overhaul.	Remanufacture and overhaul.	Remanufacture of parts.	Reduction in virgin resource use and contribution to climate change.	No control (unless undertaking activity). Influence through design and information.	Increase in substance legislation stops certain remanufacture and overhaul activities.	Increased revenue from remanufacturing opportunities. Positive publicity from innovative approach	Cooperation within industry to identify remanufacture and overhaul opportunities. R&D into remanufacture/overhaul opportunities.

Life cycle stage	Example activity	Example aspect(s)	Example impact(s)	Possible considerations for control or influence?	Example risks to the organisation	Example opportunities for the organsiation	Examples of actions including operational control or influence
End-of-life treatment and final disposal.	Disassembly of plane.	Recycling of metal.	Reduction in virgin resource use and contribution to climate change	No control (unless undertaking activity). Influence through design and information.	Difficult to recycle composite materials.	Increased revenue from being able to offer innovative recycling approach.	Redesign aircraft/parts to allow separation of materials.
End-of-life treatment and final disposal.	Disposal of parts.	Landfill of plastic/rubber.	Loss of finite resources. Impacts from landfill - water pollution, climate change.	Influence through design, take back programs, and information. Influence through design and information.	Increased costs associated with landfill. Restrictions on waste that can be sent to landfill.	Increased revenue from being able to offer innovative waste recovery and recycling approaches.	Research into recyclable materials Participate in industry initiative to increase recyclability of planes. Implement take-back program to reuse or recycle individual parts.

APPENDIX 3
EXAMPLES OF AEROSPACE INTERESTED PARTIES, THEIR NEEDS AND EXPECTATIONS AND COMPLIANCE OBLIGATIONS

Aerospace organisations can use this table to help understand their own interested parties. The interested party groups, although not exhaustive, are representative of the aerospace industry.

Interested party group	Examples of interested parties	Examples of environmental needs and expectations	Examples of compliance obligations
Environmental, health and safety agencies/regulators.	ECHA – European Chemical Agency (chemical regulations only). EPA – Environment Protection Agency. IBAMA - Environmental Brazilian Institute.	Compliance with regulations. Accurate and timely reporting. Technical data and expertise. Analysis of business impacts. Input into consultations.	Specific legislation/regulations. Licence/permit compliance and reporting. Compliance with emission limits.
Governments and governmental bodies.	EU, US, European member states, federal states, local authorities, etc. Specific departments within Government. For example, Ministry of Environment, Department/Ministry of Defence.	Industry to behave with Corporate Social Responsibility (balanced approach: economic reasonableness, technical feasibility, environmental benefit).	Participation in a government working group.
Certification authorities.	EASA – European Aviation Safety Agency. FAA – Federal Aviation Administration.	Compliance to aircraft, engine emission and noise requirements. Industry to provide technical data and expertise.	Engines design meeting limits for engine exhaust smoke, hydrocarbons, carbon monoxide and oxides of nitrogen. Aircraft design compliant with CO_2 emission standard.
Suppliers and contractors. Suppliers include those that: Design and Build. Design, support & build. Build to print. Provide standard parts or raw materials.	Specific suppliers of sub-systems, parts and equipment, raw materials and in service-support.	Individual suppliers and contractors will require clear specifications on what is expected of them relating to environment, including consideration of supplier's constraints and support with environmental improvement (sharing best practice, etc.).	Product specification stating environmental requirements. Environmental rules for contractors working at a facility.

Interested party group	Examples of interested parties	Examples of environmental needs and expectations	Examples of compliance obligations
Aerospace industry associations.	ICCAIA - International Coordinating Council of Aerospace Industries Associations, coordinates regional member organisations. IAEG - International Aerospace Environmental Group. ATAG - Air Transport Action Group is an independent coalition of member organisations and companies throughout the commercial aviation industry.	Require contributions to reports, tools and other initiatives.	Attendance at working groups. Provision of data and information.
Commercial trade associations.	Chambers of Commerce. Federation of German Industry.	Require contributions to reports, tools and other initiatives.	Attendance at working groups. Provision of data and information.
Customers. The ultimate customer for the aerospace industry will include airlines and organisations responsible for defence and space. Each organisation in the aerospace industry supply chain will have its own set of customers who will be represented by the same organisations as provided under suppliers and contractors.	IATA - International Air Transport Association, a trade association globally representing and serving the airlines. Military customers. ATAG - Air Transport Action Group, is an independent coalition of member organisations and companies throughout the commercial aviation industry.	Products and services that comply with environmental regulations and market expectations. Product specifications (characteristics), for example relating to emissions, noise, hazardous substances, recyclability, disposal etc. Advice and support on operating aircraft to improve environmental performance. Data reporting, for example CO_2, hazardous substances, packaging etc. Partnership. Management requirements, including certification to ISO 14001, provision of an environmental policy or objectives etc. Access to undertake an inspection or audit.	Compliance obligations will include requirements established in contract and product specifications but also those requirements voluntarily adopted by the supplier, e.g. agreement to meet a packaging target to participate in an environmental project or programme.

Interested party group	Examples of interested parties	Examples of environmental needs and expectations	Examples of compliance obligations
International bodies.	ICAO – International Civil Aviation Organisation . UNEP - United Nations Environment Program.	Contribution to reports, tools and other initiatives to assist the interested party to achieve the goal of improving the environmental performance of the aviation sector. Industry to provide global insights of aviation business.	Providing data and case studies, e.g. on alternative fuels, emissions etc.
Airports.	ACI - Airports Council International is the global trade representative of the world's airport authorities.	Aircraft which are in compliance with local and national legislation and community expectations.	Specific requirements of the aircraft dependent on the airport's context but could include more stringent noise or emission limits.
Consumers. Passengers.	Aircraft passengers.	Industry to be innovative to address environmental issues. Assurance of green claims made by aerospace industry or individual organisations. Environmentally progressive technologies.	Unlikely to be any direct compliance obligations on the aerospace industry. Related compliance obligations will come via the airlines.
Society.	Society at large, individual citizens.	Industry to consider societal needs (e.g. climate 2°C target). Industry to be innovative to address environmental issues.	Corporate responsibility/sustainability reporting.

Interested party group	Examples of interested parties	Examples of environmental needs and expectations	Examples of compliance obligations
Community and neighbours. Including neighbouring industries. Neighbours are those adjacent to or in close proximity to an aerospace facility. The community includes neighbours but also those who may be subject to associated socioeconomic factors.	The community and neighbours can organise themselves into a group to represent their views, for example an action group or non-governmental organisation (NGO) (see entry below). To some extent the community and neighbours' requirements are enforced by local agencies and regulators (see entry above).	The community and neighbours will have requirements related to their own context and that of the facility but could relate to noise, emissions, odour and parking. The community and neighbours may require financial support, assistance or expertise with an environmental project.	Agreement to hold an annual community meeting. Regular reporting of emissions. Regular reporting of noise monitoring data. Providing a dedicated telephone line or email account for enquiries or complaints. Participation in an annual environmental project.
Employees of aerospace companies. Employees may be represented by a workers union.	Individual employees. Groups of employees (informal). Workers union (formal).	Integrity and honesty. Safe and healthy working environment. Communication on environmental performance.	Monthly reporting. Substitution of hazardous substances.
Academic institutions and employment agencies.	Universities, schools and colleges. Commercial and governmental employment agencies.	Employer expectations relating to environmental qualifications, skills and knowledge. Job role requirements relating to environment. Internships and work experience. Support in teaching.	Job descriptions. Internship/work experience agreements. Provision of lectures/presentations.

Interested party group	Examples of interested parties	Examples of environmental needs and expectations	Examples of compliance obligations
Research bodies. Partner with aerospace organisations to improve design of products.	NASA – National Aeronautics and Space Administration. ESA - European Space Agency. Aerospace Research centres e.g. DLR – Germany Aerospace Center. IFAR – International Forum for Aviation Research. ONERA – French Aerospace Research Center. IAE – Institute of Aeronautics and Space. Research entities within aerospace organisations. Laboratories and universities.	Research project opportunities. Funding and grants. Industry to express research needs. Industry to provide data.	Environmental research project. Annual funding commitment for environmental research projects.
Owners and investors. Individuals and organisations who own an aerospace organisation or provide funding or hold shares in an aerospace organisation. Rating agencies/analysts.	Funders, lenders, shareholders and fund managers.	Risk management. Reporting of data. Efficiency. Achievement of objectives. ESG (Environmental, Social and Governance) information.	Annual carbon reporting. Identification and management of environmental risks. Participation in sustainability indices e.g. DJSI and FTSE4Good Index and carbon disclosure programmes e.g. CDP.
'Internal' interested parties. Other business, division, function or entity that although owned by the same parent company or part of the same corporation/group, are outside of the scope of the EMS.	Corporate or group head office. Other division or business. Procurement function. Sales function. Design function.	Reporting of data. Achievement of objectives.	Reporting carbon data. Providing environmental information for commercial proposals.

Interested party group	Examples of interested parties	Examples of environmental needs and expectations	Examples of compliance obligations
Non-governmental organisations (NGOs) / non-profit organisations / campaign groups and charities. Groups established to campaign on behalf of the environment. Can be international, regional or local.	General environmental NGOs, for example Greenpeace and Friends of the Earth International and those with a specific environmental issue or sector for example Aviation Environment Federation (AEF). Local action groups. ICSA - International Coalition for Sustainable Aviation representing NGOs at ICAO level.	Problem-solving engagement. Partnership and co-operation. Transparency information on environmental performance.	Annual sustainability/corporate responsibility reporting. Specific data reporting. Regular meetings.
Certification bodies for ISO 14001 (and other standards).	Various 3rd party certification auditors.	Assistance with planning and undertaking audits. Integrity and transparency.	Participation at audits.
Media.	Newspapers. Television and radio. Trade journals. Online media organisations. Social media and bloggers.	Information, case studies and news.	Annual sustainability/corporate responsibility reporting. Press releases on environmental projects.
Insurance providers.	Providers of environmental related insurance.	Specific requirements to reduce environmental risk.	Storage of hazardous materials. Access to undertake audits.
Emergency response providers.	Fire services. Local emergency response agencies.	Information on hazardous materials on site. Information on internal emergency response capabilities relating to environment.	Storage locations of hazardous materials. Data regarding composition of fuels, oils and other hazardous materials. Access to undertake inspections.

APPENDIX 4
EXAMPLES OF RISKS AND OPPORTUNITIES AND ACTIONS RELATING TO COMPLIANCE OBLIGATIONS AND OTHER REQUIREMENTS

Compliance obligations and other requirements	Risks	Opportunities	Actions
Chemical substance legislation registration requirements changing.	Substance required for manufacture becomes unavailable or more expensive. Suppliers unaware of change and unable to continue manufacturing.	Opportunity to secure supply (possibly through supporting supplier) when competitors have not.	Procurement to contact suppliers to understand which substances at risk. Quality department to raise awareness during supplier quality audits.
Increasing investor demand for participation in carbon benchmarking scheme (e.g. CDP).	Resources required to participate. Participation may publicise poor carbon performance.	Improve rating agency/analyst score therefore opening up more investment/protect current investment.	Investor relations department to undertake a cost benefit analysis of participating in scheme. Undertake pilot project to understand what carbon benchmark performance would be before going public.

APPENDIX 5
EXAMPLES OF RISKS AND OPPORTUNITIES AND ACTIONS RELATING TO INTERNAL AND EXTERNAL ISSUES

Internal and external issues	Risks	Opportunities	Actions
Company restructure/merger with other organisation.	EMS suffers from a lack of focus. Time will need to be taken to combine EMS. Morale of employees makes it difficult to obtain engagement on environmental management. Financial resources may not be available during restructure/merger.	Opportunity to influence restructure to optimise environmental management. Opportunity to take the 'best of both' from the two merging organisations.	Ensure that employees/or the department overseeing divestiture and integration consider arrangements for environmental management in their brief.
Internal financial procedures require short term payback on environmental projects.	Environmental projects with a medium to long term payback not agreed to.	Not applicable.	Engage Finance Department. Promote other non-financial benefits such as positive publicity. Investigate alternative funding models.
Change in government/trade agreements.	Uncertainty on future environmental policy.	Opportunity to consult/lobby on new legislation so that it is appropriate for industry.	Request relevant department to monitor changes in environmental policy. Participate in aerospace or manufacturing trade body.
Lack of space on site.	Difficulty to achieve recycling target as not possible to increase segregation as lack of space for additional bins.	Not applicable.	Facilities Department to research alternative approaches such as off-site segregation.
Environmental awareness of employees. Literacy levels.	Difficult to engage employees or train them on environmental procedures. Difficult to implement culture or behavioural change.	If environmental training and communication is enhanced then could result in substantial environmental improvement and cost saving.	Training department to advise on how to train and communicate to different audiences on environment. Apprentice training to include environmental awareness.
Climate change.	Increased likelihood of flooding at production sites. Disruption to supply chains from increased instances of extreme weather. Design of aircraft will need to change to operate in a changing climate.	Increased sales in products adapted to a changing climate.	Ensure corporate risk, procurement, material planning, business continuity functions consider impact of a changing climate.

LIST OF ACRONYMS

AA1000 – Accountability Assurance Standards.

ACI - Airports Council International.

AEF - Aviation Environment Federation.

ATAG - Air Transport Action Group.

CDP – Carbon Disclosure Project.

CO_2 - Carbon Dioxide.

DJSI – Dow Jones Sustainability Indices.

DLR – Germany Aerospace Center.

EASA – European Aviation Safety Agency.

ECHA – European Chemical Agency.

EMS – Environmental Management System.

EPA – Environment Protection Agency.

ESA - European Space Agency.

ESG - Environmental, Social and Governance.

FAA – Federal Aviation Administration.

GHG – Greenhouse Gas.

GRI – Global Reporting Initiative.

IAE – Institute of Aeronautics and Space.

IAEG - International Aerospace Environmental Group.

IATA - International Air Transport Association.

IBAMA - Environmental Brazilian Institute.

ICAO – International Civil Aviation Organisation.

ICCAIA - International Coordinating Council of Aerospace Industries Associations.

ICSA - International Coalition for Sustainable Aviation.

IFAR – International Forum for Aviation Research.

MRO – Maintenance, Repair and Overhaul.

NASA – National Aeronautics and Space Administration.

NGO - Non-Governmental Organisation**.**

OEM – Original Equipment Manufacturer.

ONERA – French Aerospace Research Center.

OVE – Objective Verifiable Evidence.

PESTLE - Political, Economic, Social, Technological, Legal and Environmental.

PPM – Parts Per Million.

REACH - Registration, Evaluation Authorisation and restriction of Chemicals (European Union Regulation).

TSCA - Toxic Substances Control Act (US Regulation).

UNEP - United Nations Environment Program.