AeroSpace and Defence Industries Association of Europe

Guidance Document

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ASD Sectoral Guidance for Substances in Articles under REACH

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Legal Disclaimer

This document aims to assist users in complying with their obligations under the Registration Evaluation Authorisation and Restriction of Chemicals (REACH) Regulation and the later judgement by the European Court of Justice (ECJ), [Case C-106/14] in September 2015. However, users are reminded that the text of the REACH Regulation is the only authentic legal reference and that the information in this document does not constitute legal advice. Usage of the information remains under the sole responsibility of the user. ASD does not accept any liability with regard to the use that may be made of the information contained in this document.

CHANGE HISTORY

Version	Changes	Date
0.6	Initial document to provide Aerospace & Defence sectorial guidance, consistent with the conclusions of the judgement of the Court of Justice of 10 September 2015 in case C-106/14.	20.10.2017
1.0	Modifications mainly in chapters 2.1, 2.3 ("Generic Complex Object – Overview"), 2.5, Appendix 6.3 new text incorporated	25.10.2017
1.1	General removal of all comment fields and synthesis of agreed changes, uploaded on ASD sharepoint for 2nd review phase	25.10.2017
1.2	Changes implemented after SWG2 review on 30.10.2017	31.10.2017
1.3	Final draft with all comments included after SWG2 review on 6.11.2017, integration of all figures, uploaded to ASD sharepoint and distributed for review to RIWG and ENV COM	08.11.2017
1.4	Revised draft with all change proposals incorporated after 2 week review phase by ASD RIWG, ASD ENV COM and national trade associations. Decisions of ASD RIWG from 29.11.2017 are resolved and incorporated. ASD internal rev. no. only, final SiA Guide will have revision 1.	30.11.2017

1 General introduction

The AeroSpace and Defence Industries Association of Europe (ASD) represents the Aeronautics, Space, Security and Defence industries in Europe. ASD's membership today comprises 15 major European aerospace and defence (A&D) companies and 26 member associations in 19 countries: Austria, Belgium, Bulgaria, the Czech Republic, Denmark, Finland, France, Germany, Greece, Italy, the Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, Turkey and the UK.

ASD provides a single platform for the development of joint positions for the industries it represents. In this context, ASD also gives voice to the industry in matters related to REACH, i.e. Regulation (EC) No. 1907/2006 [1] which concerns the Registration, Evaluation, Authorisation and Restriction of Chemicals in the European Union. REACH aims to improve both the availability of information on chemicals and the risk management associated with those chemicals. One provision of the REACH regulation is related to substances of very high concern listed on the REACH candidate list (hereafter: CL SVHCs) when contained within articles. The duty of Article 33(1) and Article 7(2) - to report on the presence of such substances in delivered articles - has led to many questions and different interpretations across the EU, especially with respect to thresholds of reporting related to complex objects[2] (CO) (which are assemblies of multiple articles).

A judgment by the European Court of Justice (ECJ), [case C-106/14][3] in September 2015 determined that CL SVHCs are reportable for assemblies if they are present greater than 0.1% weight by weight (w/w) in any component article of that assembly. This principle is often referred to as '**O**nce **A**n **A**rticle, **A**lways **A**n **A**rticle', or O5A. Whilst the principles of the judgment are supported, there remain a number of questions as to how to fulfil the clarified obligations. The explanations proposed in the latest version of the European Chemical Agency (ECHA) Substances in Articles Guidance (ECHA-17-G-19-EN) from June 2017 does not provide sufficient guidance when highly complex assemblies comprising thousands of component articles - like aircraft, spacecraft, land or naval based platforms - are to be reported upon.

ASD has therefore developed the present sector specific guidance in order to support the A&D industry in complying with the existing obligations and with the aim to ensure that the objectives of REACH Article 33(1) and Article 7(2) are achieved in a consistent and pragmatic way.

[1] Link to the consolidated text of the REACH regulation:
http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1509457066697&uri=CELEX:02006R1907-20171010

[2] The term "complex object" is not given in the text of the REACH Regulation, but was created after the ECJ judgment to identify products that consist of several individual articles as components. ECJ uses the term "complex product" while ECHA refers to "complex object" in the updated Guidance; both speak of "articles" which are used as components in the complex object.

[3] Link to the ECJ judgment:
http://curia.europa.eu/juris/document/document.jsf;jsessionid=9ea7d2dc30d69fdf3b369364468bb338b9c279b262c5.e34KaxiLc3qMb40Rch0SaxyMbhz0?text=&docid=167286&pageIndex=0&doclang=EN&mode=lst&dir=&occ=first&part=1&cid=768173

1.1 Executive Summary

In the present sector specific guidance, ASD proposes to use the following methodology when reporting, as required by Article 33(1) and article 7(2) of the REACH regulation, the presence of Candidate List (CL) SVHCs in complex objects assembled of many articles:

- It is mandatory to communicate information on substances in complex objects (assemblies) whenever a CL SVHCs is present in a concentration greater than 0.1% w/w in any component article. However, this information can be aggregated at assembly or sub-assembly level to make the information flow manageable, provided that the presence of any CL SVHC is thereby not "hidden".

- Information on the specific location of an affected component article within a complex object or assembly should only be passed on if the manufacturer determines that such additional information is necessary in order to allow safe use of the product.

- Aerospace and defence products are produced, operated, maintained and repaired by professional or industrial users only. It is therefore appropriate to adapt the detail of information, whenever such have to be provided, to whatever pre-knowledge can be expected from the users.

- The communication of information necessary to allow safe use of products is primarily driven by sector-specific and generic product-based legislation and standards, which are more appropriate for managing product safety risks.

Furthermore, in the present sector specific guidance on **S**ubstances **i**n **A**rticles (hereafter: **SiA**) reporting, ASD gives examples of best practice common for our industry, which is characterised by very complex objects in highly complex multi-tier and global supply chains. To align with ECHA SiA Guidance terminology, a product consisting of several articles will be referred to as "complex object" within this document (esp. section 2.3).

1.2 Background and legal context

Article 33(1) of the REACH regulation establishes the duty to communicate information on CL SVHCs in articles in the supply chain:

> *"Any supplier of an article containing a substance meeting the criteria in Article 57 and identified in accordance with Article 59 (1) in a concentration above 0.1% weight by weight (w/w) shall provide the recipient of the article with sufficient information, available to the supplier, to allow safe use of the article including, as a minimum, the name of that substance."*

In parallel, Article 7(2) of the REACH Regulation obliges importers and producers of articles to notify the presence of CL SVHCs in articles to the ECHA under specific conditions:

> *"Any producer or importer of articles shall notify the Agency … if a substance meets the criteria in Article 57 and is identified in accordance with Article 59(1), if both the following conditions are met:*
>
> - *The substance is present in those articles in quantities totalling over one tonne per producer or importer per year;*
> - *The substance is present in those articles above a concentration of 0.1% weight by weight (w/w);"*

unless the substance has already been registered for that use (see Article 7(6)).

The fulfilment of these two legal obligations in respect to SiA reporting is subject to national enforcement. While the specific type and amount of the penalties may vary, the non-implementation of the duties of Article 33(1) and Article 7(2) is sanctioned in all EU member states [4]. The following examples illustrate the penalties that can apply for breaches of REACH Article 33(1) in the respective EU member state:

Germany	No criminal sanctions. A breach of the information obligation under Art. 33 REACH is subject to an administrative fine of up to 50.000 €. The exact amount of the fine is determined on a case-by-case basis and administrative fines will be recorded into the commercial central register [5].
France	Administrative sanctions, i.e. a fine up to 15.000 € and a daily penalty of 1.500 €, plus prohibition to import, produce, place on the market or obligation to withdraw

[4] See for further information the "Report on penalties applicable for infringement of the provisions of the REACH Regulation in the Member States", submitted in March 2010: http://ec.europa.eu/environment/chemicals/reach/pdf/report_reach_penalties.pdf.

[5] See § 6 (1) No. 17 ChemSanktionsV (http://www.gesetze-im-internet.de/chemsanktionsv/ChemSanktionsV.pdf) and § 26 (1) No. 11 ChemG (https://www.gesetze-im-internet.de/chemg/ChemG.pdf).

	from the market; and criminal sanctions which depend of infringement (fine up to 450 € for a natural person, up to 2.250 € for a legal person) [6].
UK	The UK REACH enforcement does not outline penalties for the breach of Article 33(1) duties specifically, but only for breaches of REACH in general. These consist of fines up to the statutory maximum and/or imprisonment (as it is a criminal offence), penalties include unlimited fines and imprisonment [7].
Spain	Set of administrative offences with fines from 6.001 € up to 85.000 €. The offender is obliged to return the altered situation to its original state and compensate damages and losses [8].
Italy	For the omission of communicating CL SVHCs in articles, administrative sanctions from 5.000 to 30.000 € apply [9].
Sweden	Is a criminal offence. For inadequate information, the responsible person can be sentenced to fines or imprisonment for a maximum of two years. The fine applies at personal level, not to the company [10].

Prior to the ECJ judgement (C-106/14), it was unclear whether the concentration of >0.1% mentioned in the Regulation should refer to the weight of an entire product as supplied, or to the weight of the individual component articles of which a product is assembled. The different interpretations in this context lead to different approaches in the application of the respective duties between the EU Member States. This created much uncertainty and inconsistency for industry. The ECJ judgement, issued on 10 September 2015, clarified that the >0.1% w/w CL SVHC declaration threshold applies for every single constituent article present in a product, where a product is made up of more than one article (and thus assembled).

Since the ECJ judgment made it clear that even ECHA had applied a now invalid methodology in its "Guidance on requirements for substances in articles", ECHA undertook to update the named Guidance in order to adapt the sections referring to Article 33(1) and Article 7(2) to reflect the ECJ judgment. This work was finalised in June 2017 with the issuing of the updated Guidance (version 4.0; reference ECHA-17-G-19-EN [11]). While the Guidance explains the basic methodology of how to report substances in articles to recipients or notify to ECHA, the ECHA Guidance cannot by nature cover all existing product types and their specificities. Therefore, a need for industry specific guidelines as for A&D companies arises since the ECHA Guidance does not give enough details especially with regard to the challenges of

[6] French Environmental Code : Articles L. 521-17 and L. 521-18, Environmental Code Part 6 Penalties; Chapter 29 Penalties provisions and forfeiture; Paragraph 6.

[7] UK REACH Enforcement Regulations 2008. http://www.legislation.gov.uk/uksi/2008/2852/pdfs/uksi_20082852_en.pdf

[8] Spain Law 8/2010

[9] According to Italian law D.Lgs 133/2009. Link

[10] According to Sweden law Link http://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/miljobalk-1998808_sfs-1998-808#K29

[11] Link to ECHA Guidance on requirements for substances in articles, version 4.0: https://echa.europa.eu/documents/10162/23036412/articles_en.pdf/cc2e3f93-8391-4944-88e4-efed5fb5112c

reporting substances present in very complex objects such as airplanes, submarines, satellites or tanks in a way that does not unnecessarily exceed the principle of proportionality.

REACH Article 7(2) and Article 33(1) require industry to:

- manage the incoming information on CL SVHCs in articles provided by suppliers;
- generate information on CL SVHCs in own articles, if such substances are used during the production process and are present on the produced component above 0.1% w/w;
- communicate the information along the supply chain (Article 33(1));
- send a notification to ECHA (Article 7(2), when applicable); and
- provide sufficient information to the recipients of the articles to allow safe use of the product.

1.3 Objective and scope of the ASD sectorial guidance

ASD hereby provides a sector specific guidance in order to add more detailed information on the O5A interpretation than what has already been written in the ASD guide on the Implementation of REACH [12], and which complements the ECHA guidance document, especially with regard to the implementation of SiA obligations. It addresses all relevant stakeholders of the aerospace and defence industry, actors of their respective supply chains, and relevant authorities. As permitted in the ECHA SiA guidance, this ASD guidance elaborates further by providing an industry-specific perspective for SiAs in the context of very complex objects in highly complex multi-tier global supply chains.

This ASD guidance is the natural successor to the ASD Technical Paper "REACH Substances in Articles" developed in 2016 and intends to reduce uncertainty for the Aerospace and Defence industry and provides a methodology for the uniform compliance with the provisions of Article 33(1) and Article 7(2) across the industry sector covered by ASD. In order to reduce the administrative burden of substance reporting without compromising the need for meaningful information to allow safe use ASD proposes to simplify the data flow by applying the following principles:

- In a CL SVHC declaration according to Article 33(1), data can be aggregated at sub-assembly levels (i.e. very complex object level), provided that all CL SVHCs present are still reported upon, including those contained in component articles at the sub-assembly level.
- Additional information, like localisation of the CL SVHCs in the given complex object, is only given if meaningful and useful to the user, i.e. when he needs to take mitigation action in response to the presence of this CL SVHCs under normal or reasonably foreseeable conditions of use.
- Where necessary and applicable, information to allow safe use can be presented in existing documentation formats known to the user, such as in operation, maintenance or equipment manuals, which are usually governed by specific product safety laws.

The guidance focuses on the substance in article reporting obligations to recipients (Article 33(1)), and notifications to ECHA (Article 7(2)). Registration requirements for substances in articles that are intended for release are not discussed in this guidance [please refer to ECHA SiA Guide Ch. 4 "Requirements for substances intended to be released from articles"], nor are the obligations on use of restricted substances of Annex XVII in articles. Additionally, it is assumed that the reader is familiar with how to determine when a product is classed as an 'article' under REACH [please refer to ECHA SiA Guide Ch. 2 "Deciding What is an Article under REACH"]. Finally, as the ECHA SiA Guidance does describe some topics already in full depth, and that some SiA topics are not very relevant for the majority of the Aeropsace and Defence Industry, this ASD Guidance does not further elaborate on calculation methodologies for CL SVHCs in articles, nor on the intentional release of CL SVHCs.

[12] ASD guide on the Implementation of REACH

Consumer uses are not considered as normal use circumstances for Aersopace and Defence products, and are therefore not covered in this sectoral guidance. Accordingly, the best practice examples provided in this guidance are adapted in format and content to the level of knowledge and awareness that is required from industrial and professional users in normal business-to-business (B2B) or business-to-government (B2G) relationships. The relationship between REACH CL SVHC declaration and the end-of-life treatment of typical products of ASD members is briefly discussed in chapter 2.4.
The primary focus of the best practice examples provided in this ASD sectorial guidance is to allow for full compliance with the legal obligations for CL SVHCs contained in articles. Additional considerations (like risk management, product safety or obsolescence management) are not in the focus of this guidance and are only presented on some occasions to provide the full picture for further consideration by ASD members.

This guidance does not propose an obligatory methodology, nor establish a standard, nor prescribe in any way how substance reporting for REACH shall be carried out. Instead, best practice examples are provided as suggestions for voluntary implementation by the industry with the intention to enable or improve a consistent and effective reporting scheme.

In order to facilitate the reporting for ASD members and their supply chain actors, , this sectorial guidance also provides a list of CL SVHCs that are most common in our industry (see Appendix F).

This ASD sectorial guide complements the existing ASD Guide on Implementation of REACH, as well as the ECHA Guidance on SiA. It focuses on providing recommendations for the efficient and pragmatic compliance with the requirements of REACH Article 33(1) and Article 7(2) with regard to very complex objects. Illustrative examples related to professional or industrial use of A&D products (including manufacture, assembly, operation, maintenance, repair and overhaul) in activities foreseeable under normal use conditions are provided.

2 ASD Specificities in Product Complexities, Business Models & Product Life Cycles

The Aerospace, Defence and Security sector has many specific characteristics, which can cause difficulties with complying to some provisions of REACH. These characteristics are:

- Low production series and long production timelines (typically 10 - 30 years) for single platform and total production runs;
- Very low volume consumption of chemicals compared to other industry sectors and consumer use;
- The need to keep the products in operational conditions over their long life cycle (30-50 years);
- Supply chains which are both international and highly complex, holding stock for long periods of time, re-sale and re-use of refurbished assets;
- Manufacture of extremely complex objects both for platforms produced by Original Equipment Manufacturer (OEM), e.g airplane manufacturer and for high complex systems and subsystems developed and produced by specialized suppliers;
- Maintenance, repair and overhaul must only be undertaken by approved organisations in accordance with controlled and approved design data;
- Special confidentiality aspects especially in the defence sector (national eye only, classification of information as secret);
- All actors in the lifecycle phases of A&D products (production, use, maintenance, repair overhaul) are industrial and professional users. It lies in the nature of the ASD product portfolio (civil and military aircraft, helicopter, frigates, submarines, tanks, missile systems, satellites, secure telecommunication infrastructure), that this business is performed as B2B and B2G. Business to Consumers (B2C) is rarely relevant.

For further reading please refer to ASD REACH Implementation Guide.

To understand the challenges of Article 33(1) compliance for the ASD sector, it is important to recall that aeronautic, defence security and space companies are typically producers of highly complex products. Highly complex objects produced in this industry) may consist of many millions of articles whereas a single electronic component is an assembly of articles. The supply chains leading to their production are complex, multi-tier and global. The sources of systems procured are diverse (e.g. integration of various weapons onto ships and aircraft). Major A&D system integrators must deal with several tens of thousands suppliers in scope of REACH. Collection of comprehensive chemical information throughout the supply chain is very challenging due to the various levels of data that are available and because

there is no aligned standard across all sectors and companies for the delivery of substance information across the supply chain.

2.1 Product Life Cycles in relation to REACH timelines

Products in the industry sector of aeronautics, space, security and defence are designed, manufactured and maintained for use phases of several decades: for civil aircraft typically 30-40 years, for spacecraft typically 15-25 years, and in military applications (air, land, naval) for 40-50 years in a lot of cases (see Figure 2.1.a).

Time / Period in years	Civil A/C	Fighter A/C	Telecom Satellite	Tank	Frigate
Development	15 y	15 y	5 y	15 y	15 y
Production	30 y	20 y	5 y	20 y	20 y
Use Phase	30 y	50 y	20 y	50 y	40 y
Total Product Lifecycle	**75 y**	**85 y**	**30 y**	**85 y**	**75 y**

Figure 2.1.a Typical Product Life Cycles in A&D industry sector

Compared with this longevity of representative ASD products, there is a strong mismatch between the timelines of REACH processes (e.g. CL update every six months, yearly update of authorisation list, sunset dates of typically three years after Annex XIV inclusion and review periods for granted authorisations ranging from 4 to 12 years) and the very long product and equipment lifetimes in the ASD sector.

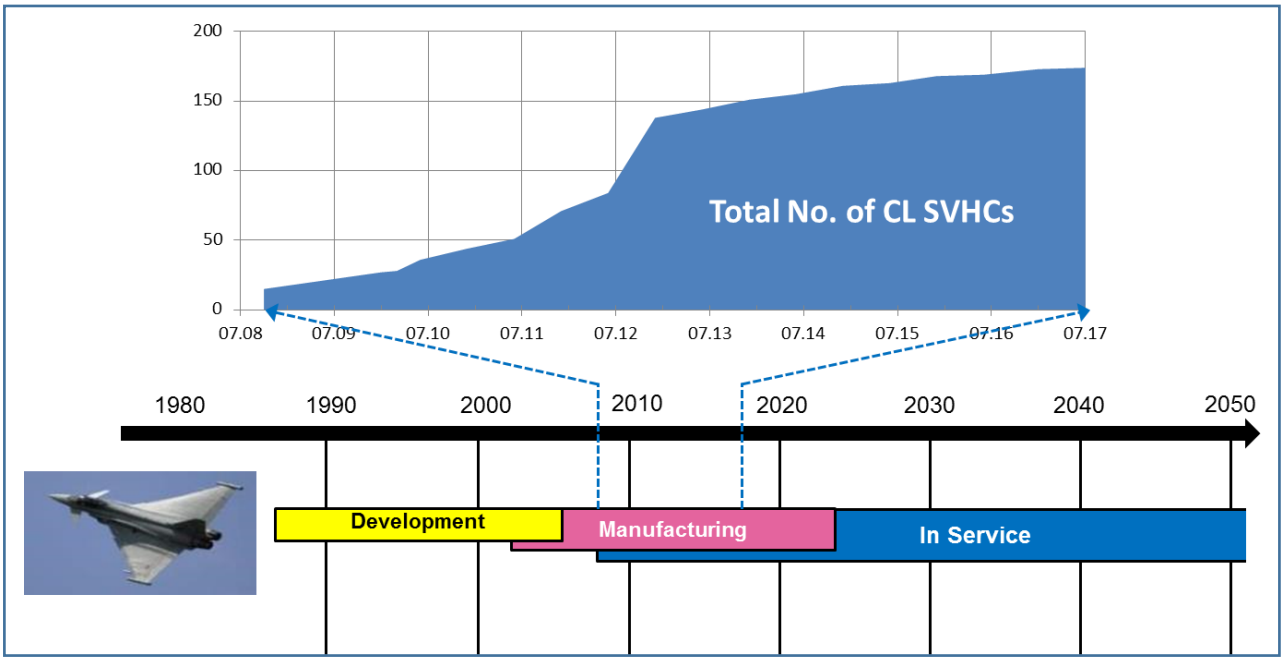


Figure 2.1.b Product Life Cycle of a Mil. Aircraft in relation to REACH CL evolution

This leads to significant compliance challenges for companies that have to continuously monitor the enormous flow of incoming REACH SiA declarations and Safety Data Sheets (SDSs) from suppliers in order to be able to declare CL SVHC`s for the final, extremely complex product.

This is especially the case for Maintenance, Repair and Overhaul (MRO) operations of so-called legacy products, i.e. for products whose production has already ceased (sometimes even before REACH was in place). Despite not being produced anymore, such legacy products still need to be maintained, often by using replacement or spare items/equipment that have been kept in stock for years. However, when such old parts are at a later moment integrated into the product, the original Article 33(1) declaration provided by the supplier is often outdated, since new Candidate List updates have taken place since stocking the item.

Activity	Timeline	Revision of CL	No. of SVHC`s on CL
Product produced	05/2000	n.a.	0
Spare part produced	09/2011	06/2011	51
Spares used in MRO	01/2016	12/2015	168
Product undergoing multiple MRO & Updates until EOS	12/2060	12/2060	>174

Table 2.1.c Example of MRO activities within Product Life Cycle in relation to REACH CL evolution

A&D companies face unique challenges for ensuring compliance with Article 33(1) due to the supply chain complexities and long product lifecycles, in contrast to the relatively quick timelines for addition of substances to the Candidate list. When the Candidate List of SVHCs is updated after an article has already been received by an actor in the supply chain, but prior to the onward delivery of that article (e.g. as a spare or as part of a larger assembly), then there is a potential for gaps in the Article 33(1) CL SVHC reporting, since there are no requirements on a supplier to provide a more up to date Article 33(1) declaration after articles have already been delivered to their customer. This is especially challenging in cases where manufacture of certain articles has been discontinued long before the onward supply of a product e.g. for legacy items.

All collected SiA information has to be accessible, understandable, maintainable over the due course of a product's lifecycle, i.e. for decades following all changes of manufacturing procedures, article modifications, regulatory updates and MRO activities.

2.2 A&D specific considerations for MRO activities

MRO includes the overhaul, repair, inspection or modification of an A&D product or components related to such products. Such activities are often necessary for A&D products, due to their longevity.
Maintenance of aircraft, defence and security products requires that the organization complies with specific procedures and materials described in maintenance manuals which are issued by and the responsibility of the OEMs. Maintenance (unexpected and regular) includes industrial activities using substances and mixtures (that may contain CL SVHCs e.g. for corrosion protection of airframe structures) as well as replacement of product components (e.g. electronic equipment, wheels, etc). Whereas the safe use of substances and mixtures are covered by the MRO risk assessment and management, guidance on the safe use of a product and related equipment is provided within the technical publications documents, which are provided by the OEM upon product delivery and are to be strictly followed by the MRO shop.

For example, companies (both OEM and MRO business) in the aviation industry are highly controlled and regulated by authorities. They have to comply with many standardised design requirements, manufacturing and maintenance procedures which contain a high level of stringency to ensure flight safety and airworthiness [13] :

- The OEM for aeronautic products is responsible for issuing instructions for continued airworthiness to be used by maintenance organisations.
- The ASD product operators (civil/military) must operate and maintain the product per the OEM instructions. They may choose to utilize MRO organisations to provide maintenance in accordance with approved programs, procedures and processes;
- The suppliers of parts or equipment have to provide OEMs, Aircraft operators (Airlines), Ministries of Defence (MoD) and MROs with instructions in conformity with their specifications.

Implications for REACH Article 33(1)
An MRO service provider does not place complete products on the market, in the sense of the REACH Regulation. Those products are placed on the market by the original manufacturer. Nevertheless, the MRO provider usually has an obligation to declare CL SVHCs for every new or modified article that he installs in the product or uses for its repair.

In the case that MRO activities lead to a modification of the article, (i.e. a change occurred from a product entering MRO business and being delivered after MRO), information which allows the safe use of the article has to be communicated.

Example:
A partial repainting may need a preliminary polishing. If the paint contains a CL SVHC a warning has to be mentioned in the technical documentation.

[13] common ECHA-EASA paper “An elaboration of key aspects of the authorisation process in the context of aviation industry” (April 2014)

2.3 Examples of complex product structures in aeronautics, space and defence sector

This section includes an illustrative example of the product structure of a typical aeronautic, space or defence product (a so-called complex object in the terminology of REACH/ ECHA guide) in order to demonstrate the complexities that need to be taken into account when considering REACH compliance approaches for A&D products that potentially comprise hundred thousands of individual articles at various layers of the product assembly. The different levels of complex objects and their abbreviations as defined below are only used in this guidance for the purpose of illustration.

Figure 2.3.a illustrates the different hierarchical levels of a complex product, such as an aircraft, which are (by increasing level of complexity):

- **CO - Complex Objects**:
  This lowest level of complexity already comprises assemblies of multiple articles, mixtures and substances. A typical example for a CO are Printed Board Assemblies. COs are typically shop replaceable units (SRU). They can be repaired or overhauled, but this is done by specialised suppliers only.
- **VCO - Very Complex Objects**:
  The next higher level of complexity, the VCO, is an assembly of many COs, plus (where applicable) additional articles, mixtures and substances which form part of the larger assembly. A typical example for a VCO is a Flight Computer. Usually, VCOs are Line Replaceable Units (LRU). They are normally exchanged as a whole unit with repairs usually done at the original manufacturers premises.
- **ECO - Extremely Complex Objects**:
  Above the VCO level, the ECO is an object of already very high complexity as it consists of many VCOs plus COs plus further articles, mixtures and substances which form part of the larger assembly. Notable examples for an ECO are systems like the engine, the landing gear, the solar panels in satellites and the like.
- **SCO - Super Complex Objects**:
  The final, uppermost level of an object with the highest complexity is the super complex object. An SCO is assembled from many ECOs, VCOs, COs and articles, mixtures and substances. Examples for SCOs are the “final products” typical for the Aerospace and Defence sector, such as aircraft, spacecraft, armoured fighting vehicles or space rocket launchers.

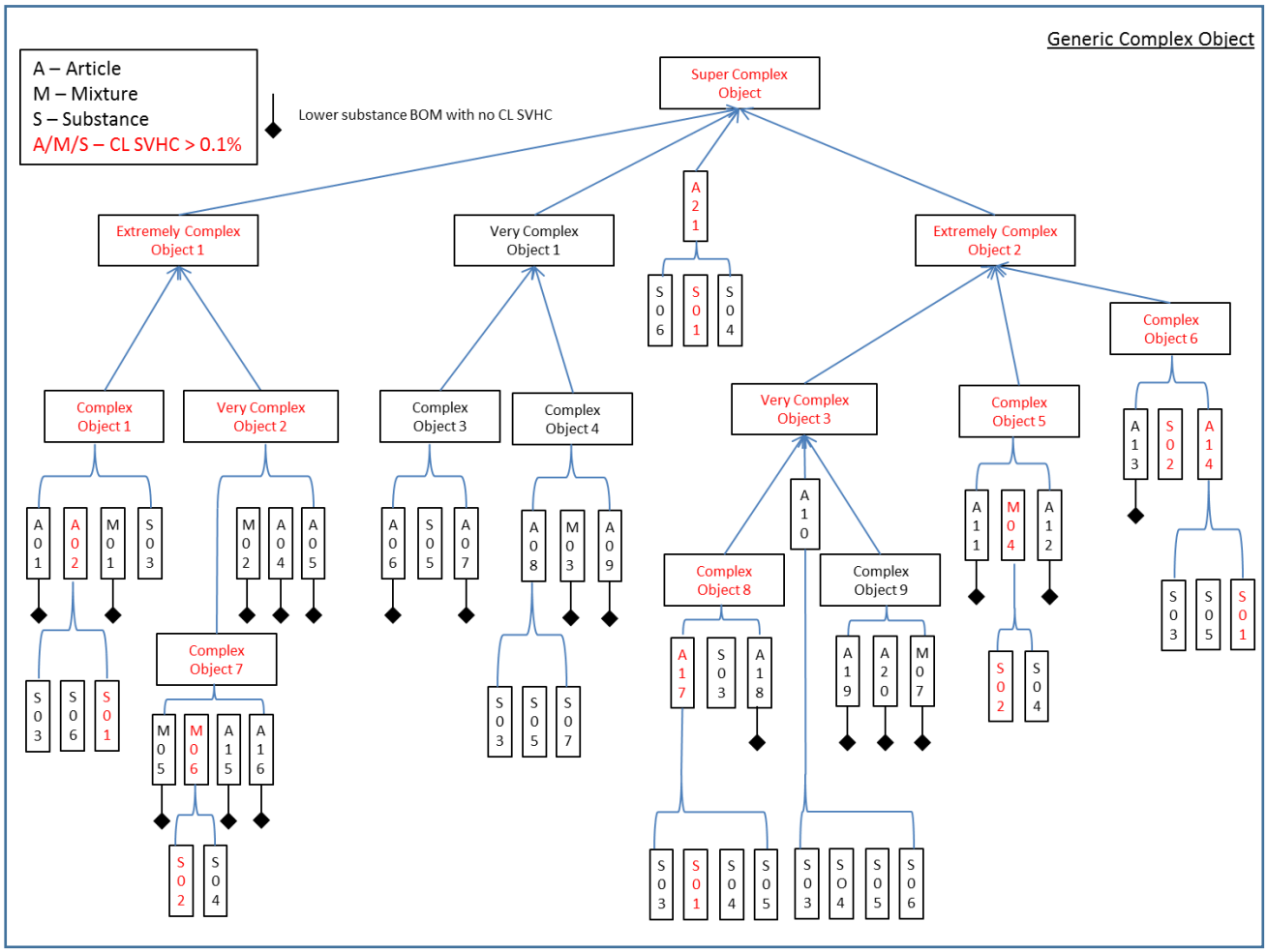


Figure 2.3.a Generic illustration of the complexity of a typical A&D product

In reality, a SCO will contain only a limited number of CL SVHC's in the articles which comprise it. Where used, CL SVHC's will be included during manufacture to provide a specific design requirement such as enhanced product safety, life, reliability, maintenance capability or performance, where there is no viable alternative. The CL SVHC would not be in a form which would generate exposure to the operator or the user of the SCO. Exposure risks would be highest during manufacture or maintenance and repair of the article containing the CL SVHC, and work processes would identify the hazards at the level the CL SVHC is used to minimise risk to workers during these operations.

While the figure 2.3.a shown in this chapter illustrates the complexity of A&D products in a generic representation that can be adapted to many product types, Appendix A of this ASD Guide contains also a number of "real-life" examples that use the same illustrative principle. They show the complex product structures of an airplane, a tank, and a satellite, highlighting the levels of complexity of the VCO, ECO and SCO described in this chapter.

In every case, the Super Complex Object (SCO) comprises multiple assemblies of Complex Objects (CO's), which are typically sourced from a complex supply chain. Although A&D products usually contain only a very limited number of CL SVHCs (if any), some CO's may include CL SHVCs (highlighted in red in the

Figure 2.3.a). Where such CO's are used to assemble the SCO, the Article 33(1) reporting duties on CL SVHCs can be triggered.

Illustrating the complexity of A&D Supply Chains

The complex structure of A&D products requiring the support of many specialist providers means that the supply chain of a typical A&D product is very complicated (see Figure 2.3.b). Some suppliers would be EU based; others could be non-EU suppliers.

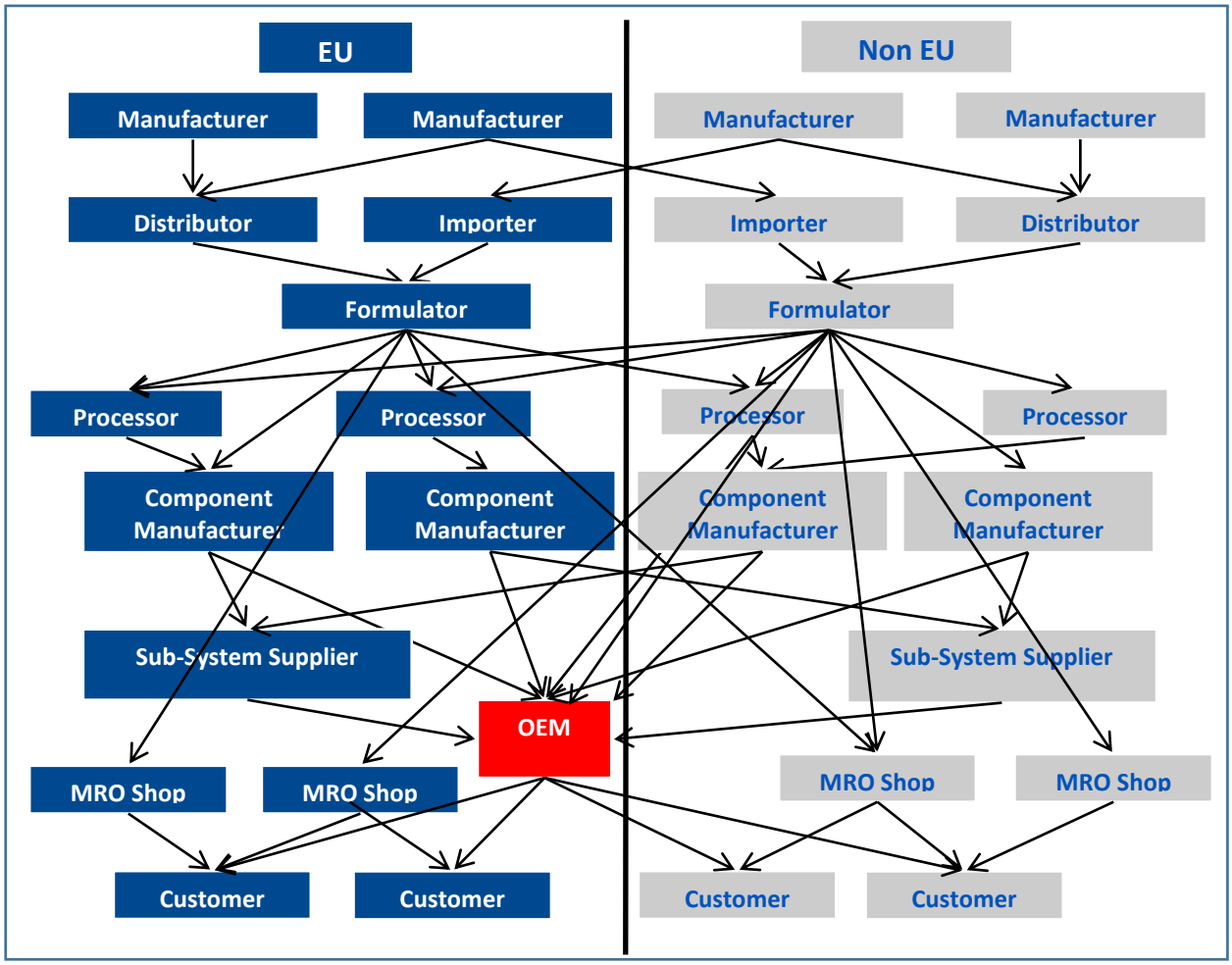


Figure 2.3.b Typical supply chain in the A&D sector

When applied to a generic product structure like in Figure 2.3.c, different parts of the super complex object are produced by different suppliers (S1 to S5, illustrated by different colours) and ultimately assembled together into the final product.

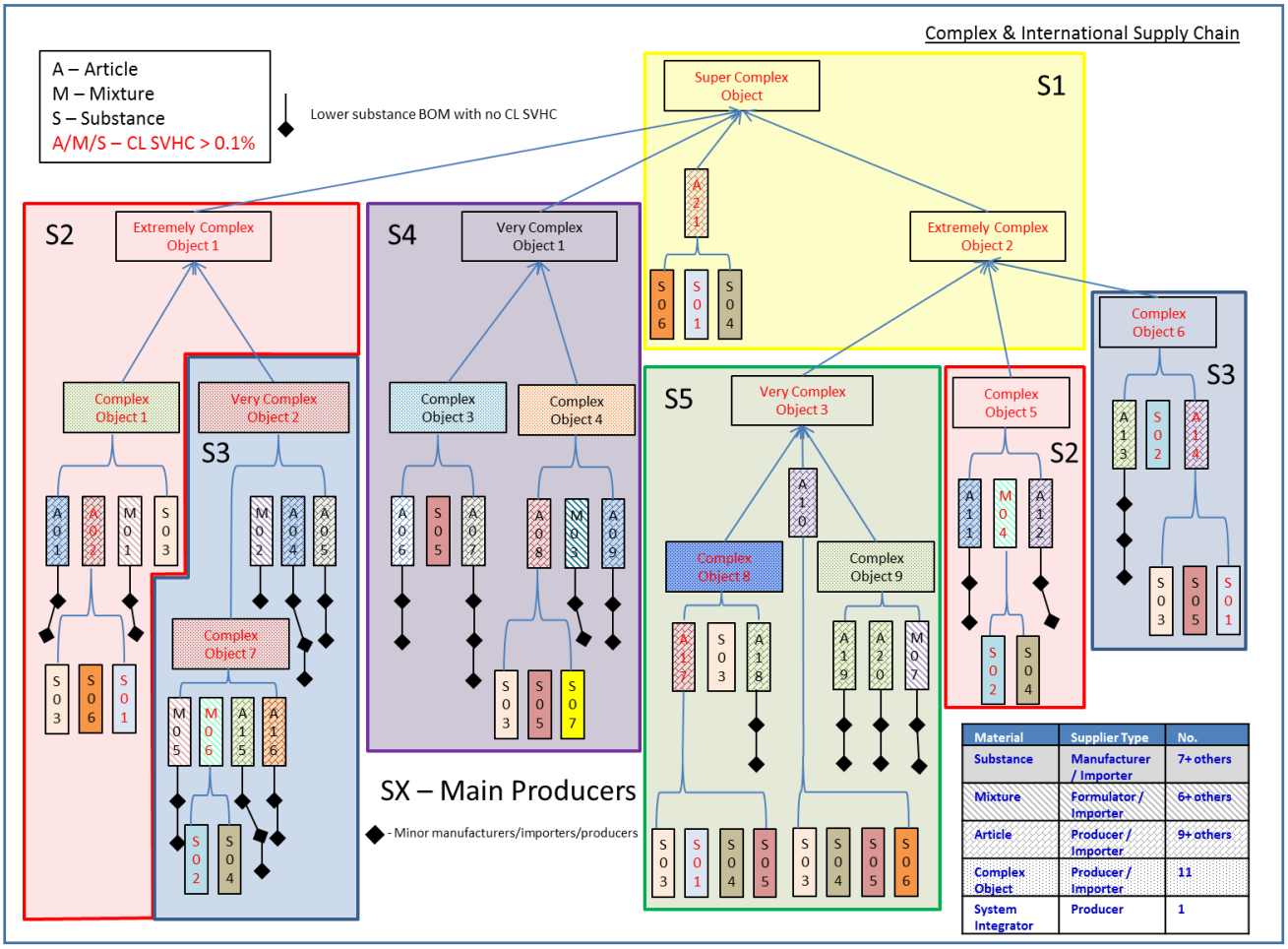


Figure 2.3.c Supply chain for Super Complex Objects

The example shown is much simplified and includes only five main CO suppliers. The large number of additional article producers, formulators and substance manufacturers supporting these five CO suppliers is not represented in the example for clarity reasons.

Impact on ability to effectively comply with REACH Article 33(1)

In order to be able to understand whether obligations arise due to Article 33(1), the producer of the final product (like an airplane, armoured fighting vehicle or satellite) needs to understand if this Super complex object (SCO) contains any articles with >0.1% w/w CL SVHC, at any layer of the product assembly. Given that the CL SVHC that triggers the Article 33(1) information duty can be buried several layers deep within the product tree, and considering that in practice, there are usually a multitude of suppliers involved in the production of the A&D product, the challenges of how to manage Article 33(1) information in very complex objects and across very complex supply chains become apparent.

2.4 High Level Description of dismantling and disposal conditions

Whilst waste is clearly out of scope of the REACH regulation according to Article 2(2), it can nevertheless be necessary to consider risks of exposure during dismantling and disposal activities of A&D products.

Reporting obligations through the supply chain, such as Article 33(1) REACH, are unlikely to be a practical solution to give recyclers the necessary information and resolve the issue of substances of concern in recycled materials. Throughout a long life cycle of A&D products (typically up to 60 years) reporting obligations as well as design and manufacturing processes will change. The complex A&D supply chain holds more than 10 tiers and many thousands of enterprises which come and go over time.

Substances of concern are being tracked within regulations such as REACH throughout a very complex supply chain. Also, existing regulations demand that A&D products, which are out-of-service, can be traced at all times.

The aeronautic industry has built up its own dismantling facilities and is developing reuse and recycling approaches appropriate to our product context to accommodate best practice for end-of-life aircraft at the International Civil Aviation Organization (ICAO) level[14]. Due to aeronautical regulations, a specific certification is required in order to replace on the market used components and parts. Deconstruction facilities are therefore certified sites, with the same skills as maintenance shops and are well trained in particular in using technical documentation available for any component and part of an aircraft.

For defence products, dismantling and disposal are also strictly controlled. For example, in Europe, there is only one company certified by NATO for dismantling and recycling of tanks. In a first step, oils and greases are removed, then all components are stripped from the tank until only the metal "shell" is left. This shell is cut into small metal pieces in order to make sure that the pieces cannot be reassembled. Each remnant of every piece must be thoroughly tracked and demonstrated by extensive paperwork.

For ammunition, old ammunition is often either refurbished (by replacing parts subject to ageing with new components so that the ammunition is again safe to use for up to another decade), or destroyed by wilful explosion. Both activities must take place at facilities specifically qualified and certified for handling explosives, or directly at the training ranges a of the military customer.

Professional, low volume, long life cycle products with particular recycling needs can more easily be handled in a sector-specific way.

[14] https://www.icao.int/Newsroom/Pages/ICAO-and-AFRA-Enhance-Cooperation-on-Aircraft-Recycling-and-Lifecycle-Management.aspx

2.5 Technical product documentation

It is common practice for many OEMs in the A&D Industry to incorporate hazardous materials data within the technical documentation that is produced during the design of complex objects and support solutions for complex objects, and also within the Technical Publications provided for users and maintainers (e.g. see example in Appendix A, Figure A.a) indicating various technical publications that may be provided for equipment). As CL SVHC data is a sub-set of hazardous materials data, OEMs may choose to include it within the aforementioned technical documentation and to communicate information to allow safe use to users and maintainers within the Technical Publications, in order to achieve compliance with the requirements of REACH Article 33(1). Furthermore, it may not be appropriate in case of super complex objects and extremely complex objects to simply forward all of the information that was provided with the individual articles which make up the equipment. Instead, it is often necessary that such information to allow safe use is first analysed and consolidated in the context of the equipment.

Standards are available which contain methodologies that may be helpful in managing hazardous materials data, including CL SVHC data, for complex objects. The standards, or the principles within them, may be followed voluntarily, or they may be agreed in contract, and in some instances, by regulation.

Principles of systems engineering for complex object(s)

It is helpful for the reader of this sectorial guidance to understand the principles of systems engineering for complex objects.

Multiple specific domains and analyses are required to develop, produce and operate complex objects. These tasks are normally performed by dedicated specialists. Analysis outcomes may influence the functional as well as logical design and it is consequently recommended to initiate these analyses early in the system lifecycle and perform them iteratively in order to quickly detect unsuitable design solutions and mitigate risks for the end-user.

The following analyses can be considered during design phase for complex objects:

- System safety analysis.
- Environmental Analysis to evaluate and influence the identified design solution.
- Integrated Logistics Support (ILS) analysis, considering Reliability, Maintainability and Testability.
- Producability analysis.

The purpose of these analyses is to identify hazards, and to analyse and mitigate risks (including risks to health and the environment) for complex systems. Systems engineering outputs include technical publications and manuals for operator and maintenance personnel.

Available methodologies and standards with further details are provided within Appendix D, E.

3 Implementation of Art. 33(1): Reporting on Substances in articles

After having outlined the specificities of the A&D industry in chapter 2, chapter 3 gives more detailed information on how to comply with the provisions of Article 33(1), i.e. the communication between suppliers and recipients, in a way that is manageable in practice for the A&D industry.
What information is necessary to allow for safe use depends on the respective use scenario and recipient and is therefore discussed in more depth in subchapter 3.2. In contrast, chapter 3.1 focuses primarily on the minimum reporting requirements on substances in articles in cases where no additional information iis necessary to satisfy safe use needs.

3.1 Substance reporting down the supply chain

3.1.1 When to report substances

Suppliers of articles must pass on information on the ingredient substances if the following conditions are met:

- The substance is identified as a substance of very high concern (SVHC) and included in the Candidate List. (The Candidate List is available on the ECHA website [15] and will normally be updated twice a year, typically in June and December).
- The substance is present in any component article of the complex object in a concentration above 0.1 % weight by weight.

This obligation comes into force without any delay on the date a new substance is included on the candidate list. It applies to articles placed on the market after an update to the Candidate list is published. It is the responsibility of the supplier to pass on the Article 33(1) information to the recipient of the article; there is no need for proactive requests.

CL SVHCs must in all cases be declared if they are present above 0.1 % w/w in the article. Companies may use calculation, testing or other means for determining this concentration threshold (see the extensive explanation of possible means in the ECHA SiA Guidance).

Since the concentration limit for the CL SVHCs applies to the individual article, there is no need to calculate or test CL SVHC concentrations at higher-level assemblies or the final complex object. If a CL SVHC exceeds 0.1% w/w in any component article, then the CL SVHC must be reported for any complex object containing it, irrespective of the complex object's weight. This simplifies the process of SiA reporting for each actor in the supply chain.

Companies should be careful not to forget that Article 33(1) does not only apply to the product, but also to the packaging (if such is present). The communication duty applies only once per legal entity and

[15] https://echa.europa.eu/candidate-list-table

delivery of the affected article. Between production facilities of the same legal entity, there is no need to provide Article 33(1) information.

While many companies deal with the REACH communication duties by themselves, especially larger companies may rely on professional content providers which offer CL SVHC information in own data bases. Although professional content providers may have a very vast information basis, such services are typically not free of charge and do not replace substance reporting by the supplier.

3.1.2 Content of the Article 33(1) information

In cases where there is no need to give additional information to allow safe use, the provision of Article 33(1) REACH only requires that the substance name is communicated to the recipient, together with a specification of the context, i.e. that the information is given because the substance is listed in the REACH candidate list. However, as trade names of chemicals vary, the substance name is often not ideal for clear identification of the substance present in the article. Therefore, ASD strongly recommends providing at least one numerical identifier of the substance, such as the CAS number or EC number. EC numbers are specific to the European Union; therefore CAS numbers may be more commonly understood also by non-EU suppliers. To further facilitate the correct identification of the substance, it is often useful to indicate the substance name such as listed on the REACH candidate list.

Any information going beyond this, like concentration or localisation of the CL SVHC, is not required by REACH (unless necessary to allow safe use of the supplied article).

Finally, REACH does not require nor prevent the submission of negative certifications (i.e. a declaration that there are no SHVCs above 0.1 % w/w threshold present in the supplied product). Appendix B shows an illustrative template of a REACH Article 33(1) declaration which can be used by companies on a purely voluntary basis.

3.1.3 Aggregation of information

When reporting substance information on products that contain several hundred thousands of component articles, it may become impossible to present the information in a meaningful and manageable way if the individual component articles are reported individually. ASD therefore recommends aggregating the substance reporting on the level of the very complex object (VCO) or extremely complex object (ECO, see chapter 2.3 for explanation) by the following three ways:

- To be consistent with the law, the presence of a CL SVHC must always be reported if present in a concentration above 0.1% in any component article. However, REACH does not necessarily ask for the respective article to be named or identified; and naming the respective component article in a meaningful way may be difficult as they often have cryptic product designations that are not necessarily understood by the recipient. In such cases, ASD recommends to declare to the recipient not the name of the component article(s), but the name of the sub-assembly in which this article is integrated.
- Equally, if the same REACH candidate list substance is present in multiple component articles (either of the same kind, or of different kinds) within the same sub-assembly, ASD deems it sufficient to only indicate that this substance is present in the sub-assembly, but not in how

many different articles or in which component article types specifically, unless provision of further information is necessary to allow safe use.

- Furthermore, if one component article contains several REACH candidate substances at the same time, ASD proposes to inform the recipient about their presence in one data-set for the sub-assembly instead of one separate report per substance.
- Finally, in order to further reduce the number of REACH declarations that need to be managed, it may be useful to report several products in just one REACH declaration.

Of course, the presence of a substance of very high concern must never be hidden by these means of aggregation. This method of aggregation is illustrated in an example shown in Appendix C.

3.1.4 Transmission modes and formatting of Article 33(1) information

Since REACH Article 33(1) does not specify how the information on substances in articles should be communicated to a recipient, several formats,document types and transmission routes can be used :

Formats	Transmission modes
• PDF • Word • Excel spreadsheet • Hard-copy print-out • Technical documentation of product	• Mail (letter) • E-Mail • Link to web-page • Third-party (IT) solution

In order to facilitate the management of incoming Article 33(1) information and the onward transmission of REACH declarations, suppliers and their customers may find it helpful to agree on a common format and method of providing such information, which takes into account the capabilities of all actors in the supply chain, and the ease of extracting the required data for onward transmission by the recipients. For example, hard-copy transmissions can be difficult to manage as the content needs to be manually re-typed by the recipient, but can be a solution for supply chains with limited IT infrastructures or for products which are affected by REACH only to a limited degree.

The examples below illustrate Article 33(1) reporting via letter, E-Mail, and via a direct link to product specific content on company webpage.

1
2

REACH Declaration – Déclaration REACH

English	*French*
In accordance with the REACH regulation EC 1907/2006 article 33 and with respect to the candidate list (SVHC 155), updated as of June 16th 2014. We declare that our electrolytics aluminium capacitors do contain boric acid CAS No. 10043-35-3 with a concentration higher than 0.1% (w/w).	Conformément au règlement REACH EC 1907/2006 article 33 et en reference à la liste de substances candidates (SVHC 155), mise à jour le 16 Juin 2014. Nous déclarons que nos condensateurs électrolytiques aluminium contiennent de l'acide borique N° CAS 10043-35-3 avec une concentration supérieure à 0.1 % (masse /masse).
For any information related to our product utilization, please consult our technical documentation or contact the Sales Department or the REACH interlocutor.	Pour toute information relative à l'utilisation de nos produits, veuillez-vous référer à la documentation technique ou contacter le Département Commercial ou l'interlocuteur REACH.

Figure 3.1.a Illustrative example of transmission by letter

REACH information Art. 33
An: REACH

Dear Sir or Madam,

we hereby send you information related to REACH regulation (Regulation (EC) No. 1907/2006);
applicable to object SAMPLE, type ABCDE, materialnumber 1234567890
The object in question is an article. In accordance with Article 33 (1) of the REACH regulation, we hereby inform that the objecht does, to our knowledge , contain at least one REACH candidate substance* in a concentration > 0.1% weight by weight.

The REACH candidate substance(s) in question is/are:

Substance name	CAS-Number	EC-Number
4,4'-isopropylidenediphenol	80-05-7	
Lead titanium zirconium oxide	12626-81-2	

* REACH candidate substance meeting the criteria in Article 57 and identified in accordance with Article 59(1) of the REACH regulation.

Please do not hesitate to ask for further information.

Yours Sincerely,

xx yyyyyyyy

Figure 3.1.b Illustrative example of transmission by E-Mail

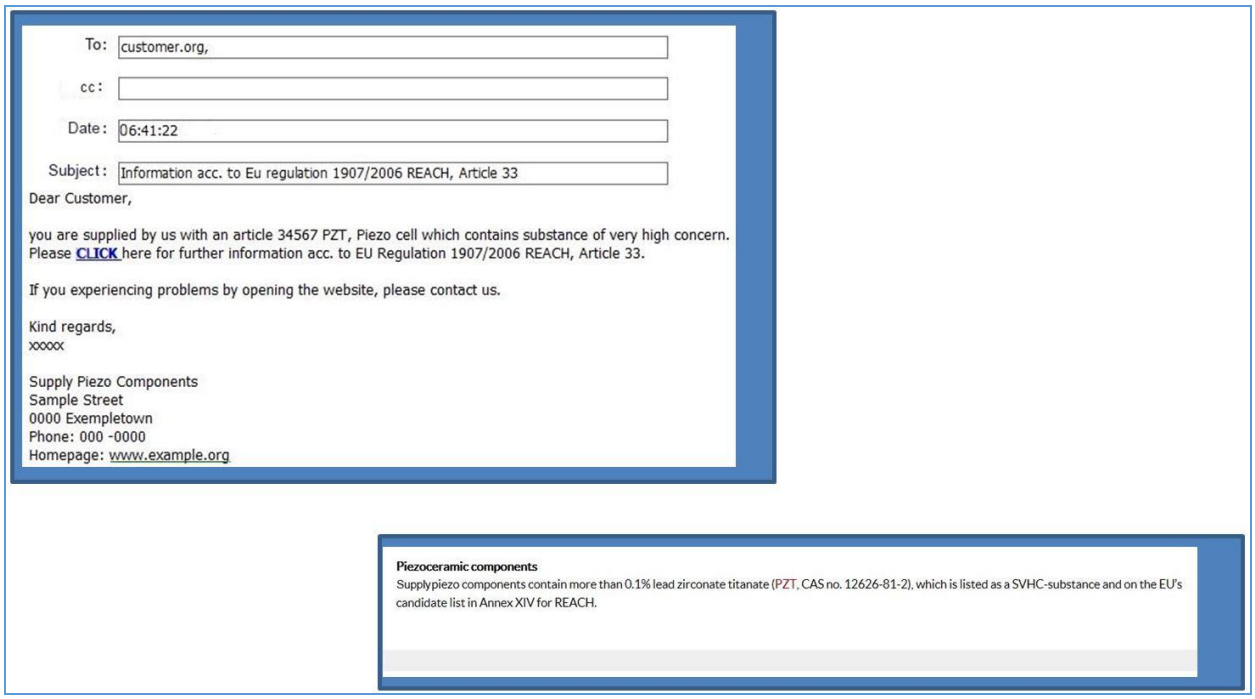


Figure 3.1.c Illustrative example of transmission by company webpage

In contrast, exchanging REACH information in XML (Extensible Markup Language) format, via dedicated online data exchange platforms, or via end-to-end IT solution often enables the recipient to quickly process the information as the content is directly readable for the recipient's IT system. However, dedicated tools may be expensive and require that all participants of the supply chain use a comparable IT infrastructure in order to work efficiently. One cannot expect all companies to have such IT tools in place that go beyond standard IT applications. Having in mind the very complex objects typical for our sector, some A&D companies may however consider it helpful to use such electronic means for SiA communication.

The REACH regulation does not specify whether Article 33(1) declarations must be signed.

3.1.5 Addressees of the REACH declaration

REACH Article 33(1) does not specify to whom the REACH information should be sent. Accordingly, REACH information can in practice be addressed to various possible recipients, such as the purchasing agent, to the quality department, the CEO of the company, or the department of incoming goods. However, as SiA information do not have a fixed format or content, the individual recipient may have difficulties recognising the information as related to REACH, misinterpret its content or simply not know what to do with the information.

Besides providing dedicated information to the staff members of those internal departments most likely to receive REACH information, it may therefore help to install a dedicated address (such as REACH@companyname.org) within the company and to specify this address to the suppliers, e.g. on the website, in the company's general terms and conditions of purchase, or in the contract agreements. When doing this, the preferred format for receiving the data could be specified, too.

Thereby, it is not only easier to ensure that no relevant information is missed, but it also eases the process for suppliers as they can be confident that their information is received by competent personnel. This streamlining of the information flow also eases the administrative burden.

REACH requires the provision of information to recipients situated within the European Union (plus Norway, Liechtenstein and Iceland). However, it may be useful to provide REACH information also to non-EU recipients; especially in multi-national complex supply chains, such as typical for the A&D industry, as the articles will possibly be re-imported into the EU at a later stage and the non-EU supplier should then be in a position to communicate the REACH information, too. In addition, it may be easier for the system to not distinguish between EU and non-EU customers but to send the REACH information in every case.

3.2 Article 33(1) information on safe use

Article 33(1) aims to provide *the recipient of the article with sufficient information, available to the supplier, to allow safe use of the article* throughout the entire supply chain. Where CL SVHC's are present in a product, they may in many cases pose no exposure risk to the user (e.g. because it is not accessible), depending on the specific use situation. In such cases, no further information on safe use is needed other than identifying the substance name.

Additional information, such as the location of the affected component article within the product, and possibly instructions on risk management measures that need to be applied in order to safely handle the product, are only required in very limited cases where the presence of the CL SVHC creates an additional risk that can and must be mitigated by additional measures that would otherwise not be taken. So, in order to assess what additional risk information to provide, one needs to assess

1. the risks related to the use scenarios of the product; and
2. the already existing technical documentation that supports these uses.

For A&D products, safe use requirements caused by REACH mostly **complement** what is already covered by existing safe product legislation (see chapter 2.5). If the presence of a CL SVHC in a complex A&D object poses a risk to the users, necessary information to allow safe use can and will already have been in many cases integrated into existing documents. The main concern of ASD members is therefore to provide meaningful information to allow safe use for very complex objects without it becoming diluted by excessive detail.

3.2.1 Assessing the potential for exposure risks related to CL SVHCs in A&D products

In the limited cases where a CL SVHC is present in an A&D product, the CL SVHC has varying potential to indeed cause exposure during the SCO's (see chapter 2.1 for explanation) life cycle that would require the provision of further information (in addition to the mandatory CL SHVC's name).

Manufacture, production and assembly

Usually, exposure to CL SHVCs is most likely to occur at the time of their inclusion into or onto the respective article, i.e. during manufacture and production where the CL SVHC is used as a substance or mixture, e.g. galvanic plating, surface treatment, formulation of pyrotechnic mixtures et al.. However, exposure to CL SVHCs as a *substance or mixture* is not in the scope of Article 33(1) or Article 7 REACH duties (on the declaration of substances in *articles*), and therefore not relevant for this guide.

Exposure to CL SVHCs during production or manufacturing processes can also occur where an article that contains a CL SVHC is treated and thereby releases the CL SVHC, e.g. machining, grinding, drilling, or other mechanical working of the article. However, the risks related to such exposure are usually well-known to the respective company and addressed by risk management measures prescribed by existing workplace safety regulations other of REACH. Manufacturing processes therefore do usually not trigger the need to provide additional REACH information to allow safe use .

Operation

A&D products are designed to perform a particular task. Due to product safety regulations other than REACH, A&D products do not normally release CL SVHCs that cause an exposure risk to the operator of the product (i.e. soldier, pilot or other professional user). Accordingly, exposure risks do usually not exist at this stage of the product's life-cycle, because the CL SVHCs are usually bound in the matrix or on the surface of the affected article, which is usually not accessible to the user or does not release the CL SVHC (see Figure 3.2.a for a generic illustration of the limited exposure). In the rare cases where there is a risk during operation of the A&D product due to exposure to CL SVHCs, such risks will already be covered by existing documents and operation manuals, so that additional REACH information to allow safe use would be a duplication.

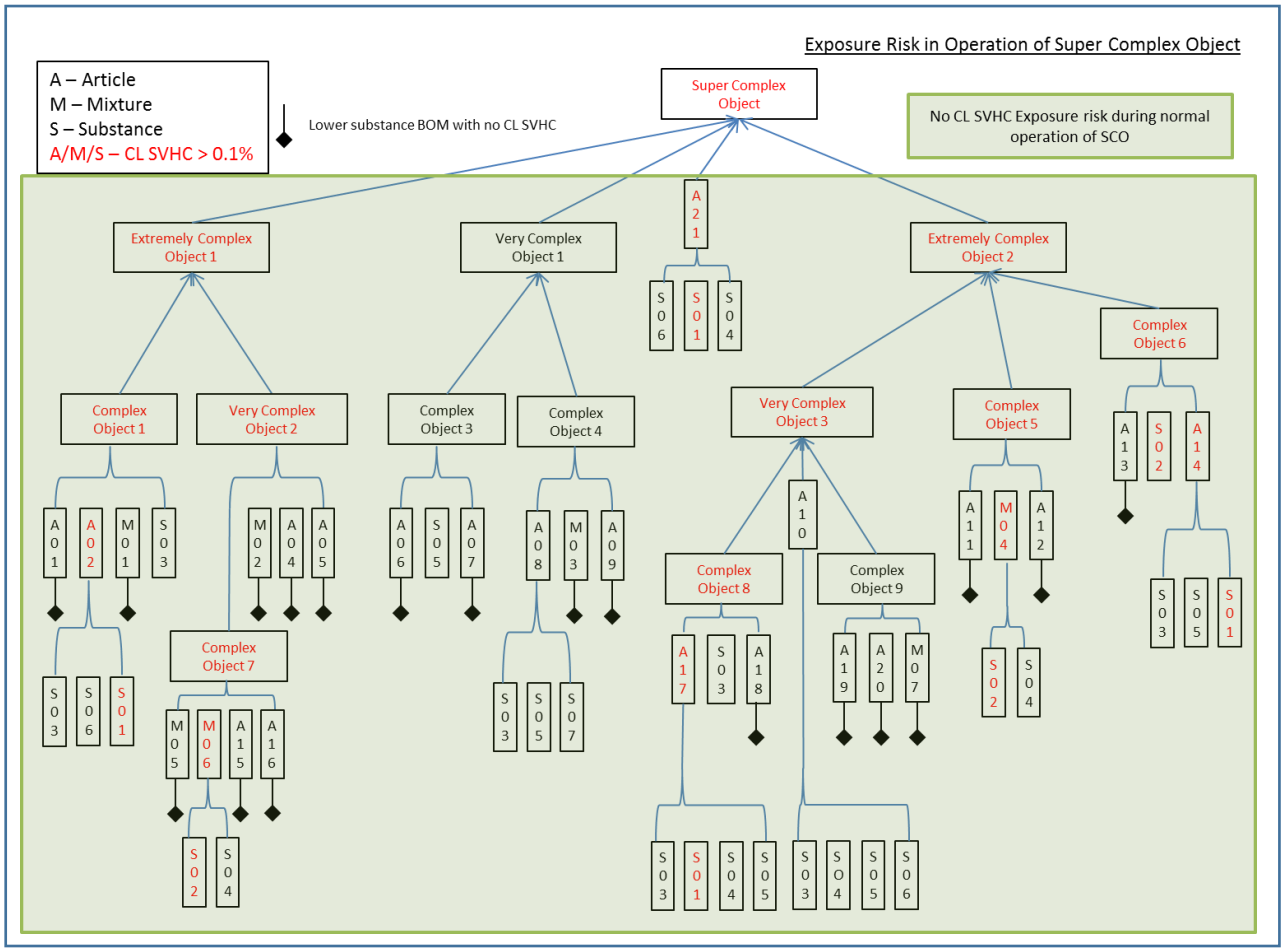


Figure 3.2.a SCO without exposures under normal conditions of operation

Maintenance, Repair and Overhaul (MRO)

If an A&D product is subject to MRO activities (which is typically the case for the large majority of A&D products that have very long life-cycles), CL SVHCs present in the articles may in some cases cause risks to the staff undertaking the work, such as grinding of surfaces, because articles which are usually not accessible during normal operation of the product are "brought to light" and exceptionally handled during MRO activities so that releases of CL SVHCs may occur. To adequately address such exceptional

risks, the producer or design authority holder of the SCO will normally provide a set of technical documents specifically detailing the risk management measures necessary during maintenance and repair of the SCO and its component parts (i.e. Maintenance Manuals).

Figure 3.2.b illustrates the potential for higher CL SVHC exposure during MRO activities (in comparison to the low probability of exposure during operation of the product illustrated in Figure 3.2.a).

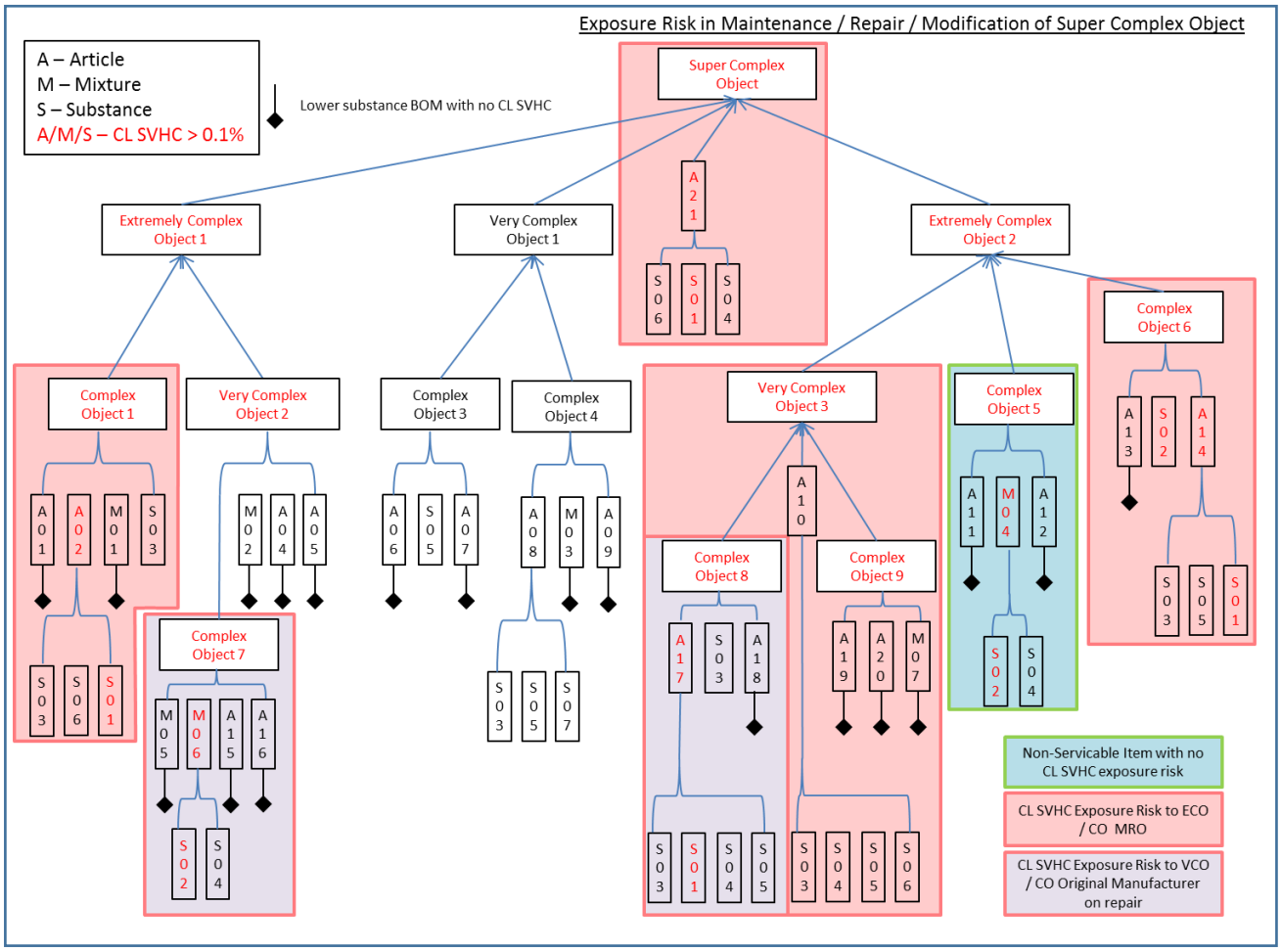


Figure 3.2.b Generic Complex Object exposure risk during MRO

Repair and high level maintenance will tend to require the same levels of protection and SVHC information as would be required to support manufacturing operations. Indeed, additional information relating to the SVHC content of articles and CO's at a lower level in the overall SCO build may be required to support the maintenance or repair operation. The relative differences between information requirements for production and those for maintenance and repair are shown in Figure 3.2.c.

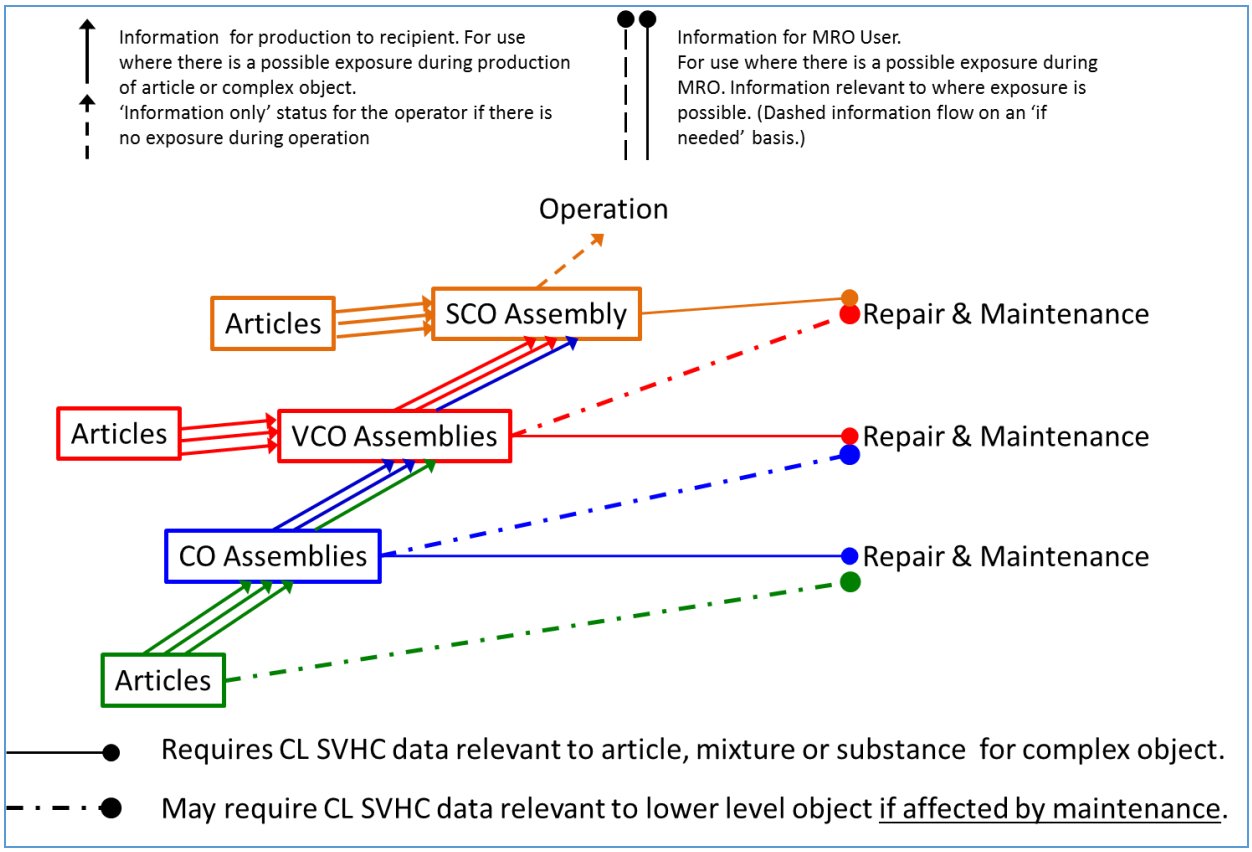
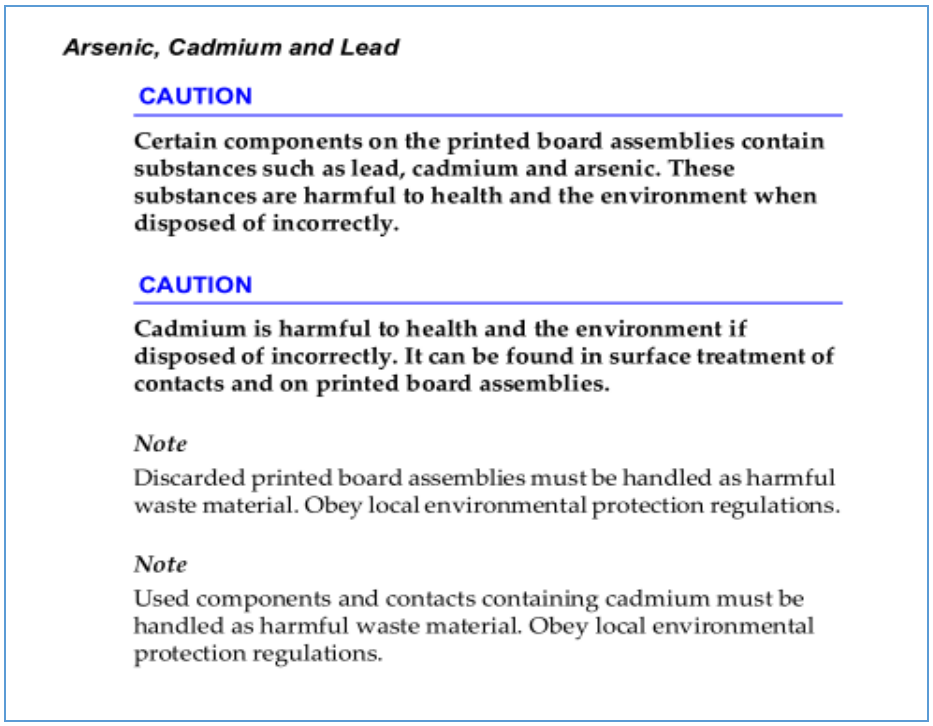


Figure 3.2.c Information to allow safe use flows for MRO

3.2.2 Providing meaningful information to allow safe use

As it was just outlined with help of generic examples, additional REACH information to allow safe use are usually not required during the operation of the product, but rather during maintenance, repair and overhaul activities. The REACH information to allow safe use should therefore be adjusted to the level of pre-knowledge and expertise of the professional and industrial personnel engaged in such activities. Since MRO personnel are familiar with existing health and safety warnings in maintenance instructions, it may be sufficient to limit the information to allow safe use to highlighting the presence of the specific SVHC in the product and detailing its intrinsic properties. This information can also be used by the process safety experts and health and safety experts to adapt the risk management measures at the respective local workplace.

Figure 3.2.d illustrates an example for information to allow safe use related to a CL SVHC present in a complex object (herein Arsenic, Cadmium and Lead in "Printed Board Assemblies") and Figure 3.2.e illustrate the information to allow safe use related to a Hazmat present in a CO (herein: Cadmium on fasteners).



Arsenic, Cadmium and Lead

CAUTION

Certain components on the printed board assemblies contain substances such as lead, cadmium and arsenic. These substances are harmful to health and the environment when disposed of incorrectly.

CAUTION

Cadmium is harmful to health and the environment if disposed of incorrectly. It can be found in surface treatment of contacts and on printed board assemblies.

Note

Discarded printed board assemblies must be handled as harmful waste material. Obey local environmental protection regulations.

Note

Used components and contacts containing cadmium must be handled as harmful waste material. Obey local environmental protection regulations.

Figure 3.2.d Example for information on safe use (Arsenic, Cadmium, Lead inside components on Printed Board Assemblies")

Cadmium on fasteners:

- Any cadmium plated fastener contains cadmium (CAS: 7440-43-9) above 0.1% w/w.
- Potential health effects.

When used as intended, cadmium plated fasteners should not pose any health hazard. The health effects listed below should not occur unless improper processing or installation of the fastener generates dust or fumes.

The fastener shall not shaved, sanded, ground, welded or otherwise altered.

The following statements summarize the health effects generally expected in cases of over-exposures:

- Eyes Dust and fumes from processing:
  - Can cause irritation.
- Skin Dust and fumes from processing:
  - Can cause irritation.
- Inhalation Dust and fumes from processing:
  - cause irritation of the respiratory tract.
  - Acute overexposures: Can cause shortness of breath and inflammation of the lung tissues.
  - Chronic overexposures: Can cause central nervous system damage, liver damage, lung damage, reproductive harm and lung cancer.
  - Medical conditions aggravated by exposure to dust and fumes from processing: Asthma, chronic lung disease, secondary Parkinson's disease and skin rashes.

Figure 3.2.e Example for information on safe use (Cadmium on fasteners)

Most products in the A&D sector are regulated by product specific legislation or sector specific requirements (see chapter 2.5). Such product specific legislation often imposes the duty to pass along information on the safe handling of the products delivered, including on hazardous substances present in the product (whose scope is usually far broader than REACH) and on adequate risk management during operation or MRO activities. It may therefore be possible to either integrate the information to allow safe use by REACH into existing product documentation, or all necessary information may already be included in the named documents on the basis of other obligations. In such cases, creating additional documentation to provide information to allow safe use to the recipients of the products will be unnecessary.

Example 3.2.f illustrates information to allow safe use as already included in existing documentation for an A&D product.

SUBTASK 52-71-50-140-001-A01

(1) CLEANING OF THE PIEZO CERAMIC CELL

WARNING: **THE PIEZO CERAMIC CELL CONTAINS LEAD TITANIUM ZIRCONIUM OXIDE.**
CLEANING THIS PRODUCT CAN EXPOSE YOU TO CHEMICALS.
LEAD TITANIUM ZIRCONIUM OXIDE IS KNOWN TO CAUSE CANCER OR BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

WARNING: **FOLLOW ALL SAFETY REGULATIONS GIVEN WITH CAS NUMBER(S):**
12626-81-2.

FOR MORE INFORMATION, GO TO HTTP:\\WWW.ECHA.EU
AND FOLLOW THE GIVEN INFORMATION ON SAFE USE FOR THE SUBSTANCES MENTIONED ABOVE.
OBSERVE YOUR REQUIRED LOCAL AND NATIONAL REGULATIONS.

(a) Clean the piezo ceramic cell with a brush and CLEANING AGENT (ISOPROPYL ALCOHOL).

(b) Dry the piezo ceramic cell with low-pressure dry compressed air.

Figure 3.2.f Example for information on safe use (Lead Titanium Zirconium Oxide in Piezoceramics)

Integrating information to allow safe use into existing documentation has the advantage that, while REACH does not further specify the content and format of the information to allow safe use , the product specific legislation often does, which makes their handling and administration easier. Furthermore, the users (e.g. maintenance staff) are often already familiar with the existing documentation, e.g. maintenance or operational manuals, which increases the likelihood that the information is meaningful and indeed accessible to the persons with probable exposure.

While integrating information to allow safe use into existing documentation (if it is not already included on basis of other requirements than REACH) may be a viable option for some A&D products, there are also cases where such is:

- not practical, for example because updating the user or MRO manuals may require long-lasting adaptation procedures within the company or with the customer, or
- not feasible, (e.g. for consumables, standard parts and piece parts).

In such cases, the company might decide to rather create dedicated formats for the information to allow safe use, or include the information to allow safe use in the CL SVHC declaration. In the latter case, the recipient's REACH organisation should ensure that the relevant information is effectively passed on to the operational and maintenance personnel likely to be exposed.

3.2.3 Localisation of affected component articles in the context of safe use

REACH does not ask for the SVHC-containing component article to be specifically identified by providing details on its localisation within the complex object. However, such localisation information may be necessary in some cases where this information is needed for ensuring the safe use of the product, e.g. when the SVHC's presence may pose a risk if the respective component article is handled during maintenance. If several similar component articles are present in the same product, it may in many cases be best to aggregate the information on the level where the exposure for the user can indeed occur, in order to prevent excessive duplicate information.

When providing localisation information, suppliers should be aware that detailed information on the localisation of a component article within a complex object may, especially in the context of defence equipment, create concern with regard to confidentiality needs or export control restrictions, e.g. the International Traffic in Arms Regulation (ITAR), it may therefore be useful to provide localisation information in a (separate) document with restricted circulation.

4 Implementation of Art. 7(2): Notification to ECHA

4.1 When is Art. 7(2) notification required?

A notification to ECHA under article 7(2) must be made within six months of an SVHC being added to the REACH candidate list. This notification to ECHA regarding the presence of an CL substance in articles is required when all four of the following criteria are met:

1	CL substance is in the articles above 0.1% w/w
2	Total tonnage of the CL substance in the articles is > 1 tonne per year
3	The use of the CL substance in the articles has not already been included in the registration dossier
4	Exposure of the CL SVHC within the articles to humans and the environment, under normal and reasonably foreseeable conditions of use (which includes disposal) (REACH Art. 7(3), cannot be excluded

Table 4.1.a Criteria that must all be met for triggering a notification to ECHA under article 7(2)

Since A&D uses of SVHCs are typically expected to be low volume, it is anticipated that many companies dealing with products comprising articles that contain >0.1% w/w CL SVHC will not meet the 1 tonne per year threshold, and may therefore not have products falling into scope of the article 7(2) notification requirements.

For imported (complex) objects that are not manufactured with EEA sourced CL substances, it may be difficult to meet criteria 3 of table 4.1.a. In order to ensure a substance is already registered for a use, it first needs to be confirmed that the substance is indeed the 'same' as that already registered. According to ECHA guidance, 'Sameness[16] ' of a substance can only be confirmed by appropriate analysis and identification of the substance, as is the requirement when submitting a dossier for a joint registration. Conversely there is no requirement, when making a 7(2) notification, to ensure that the substance being notified for the particular use in articles has been identified with the same rigour required for a registration. It follows that for articles (presumed to fulfil criteria 1 and 2 of table 4.1.a) with an unclear or unknown registration status for the incorporated CLs, the easiest way to demonstrate compliance will be to complete a 7(2) notification with ECHA. *This is expected to be the case for the majority of articles imported into the EEA.*

[16] see ECHA Guidance in a Nutshell – Identification and naming of substances under REACH and CLP. Sections 4 & 5.

A simplification is to treat all imports of articles where a CL substance is estimated >1t p.a. as "notification required" because the test of non-applicability on grounds of registered use is too difficult on which to demonstrate compliance.

The flow chart in figure 4.1.b illustrates the scenarios when a notification to ECHA under article 7(2) should be made and when alternative measures are indicated (e.g. substance registration or communication of uses upstream for inclusion in an existing registration dossier). The flow chart assumes that the article in question contains a CL substance above 0.1% w/w and that the total tonnage of the CL SVHC within the article is 1 tonne per year or more. Where the status is 'unknown' then 'N' should be assumed.

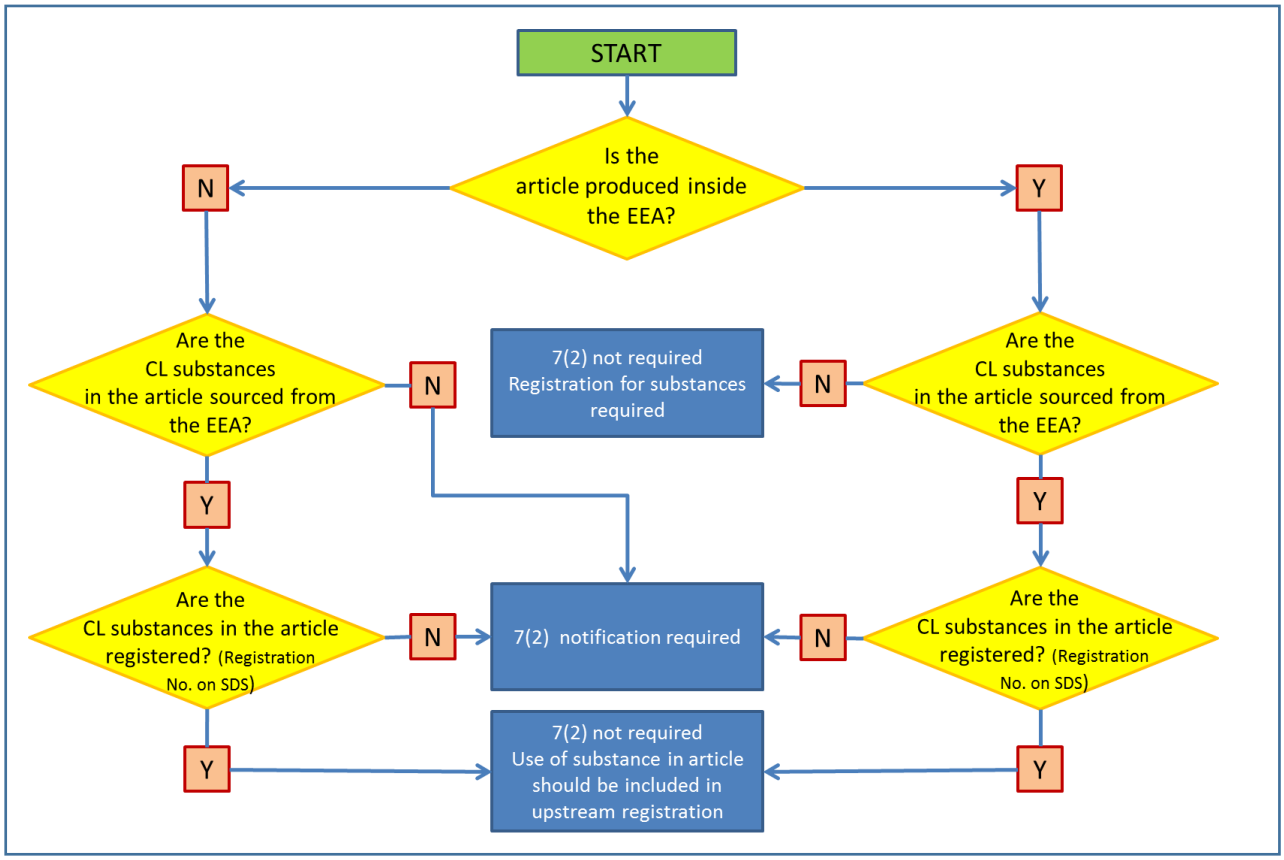


Figure 4.1.b Decision flow for determining notification obligations under REACH 7(2) (for articles containing 0.1% CL SVHC with total CL SiA quantity at 1 tonne per year or more)

For articles that are produced in the EEA, using substances and mixtures that are sourced within the EEA, there should not be any obligation under REACH 7(2). Any uses of CL substances in articles above 1 tonne per year should already be captured in the registration. If they are not, the use can be communicated back upstream for such inclusion in the registration dossier.

By the latest registration deadline (May 2018), it can be expected that all substances above 1 to p.a. are registered.

4.2 What information is required to be submitted in a 7(2) notification to ECHA?

The required data points on the presence of a CL substance in articles, that are to be submitted to ECHA[17] under REACH article 7(2), via online submission, are summarised in Table 4.2.a. Suggested content is provided where they may be value in a consistent approach to the provision of information by ASD members.

Information required	Detail/Recommendation
Article Name	Free text field
Article category (AC)	For complex objects where it is not known where the CL substance resides in (location), it is advisable to select "Article Category" AC 0 and enter 'Aerospace & Defence'
Technical Function of the substance	The technical function of the substance within the article, or component article should be entered. For example, if a CL substance is present in a coating to prevent corrosion, the function 'Corrosion inhibitors and anti-scaling agents' is selected. For complex products, where it is not known which component article (location) that the CL substance resides in, the technical function of the substance in the article may not be obvious. In this case it is advisable to select 'Other' and enter 'Not disclosed'
Exposure related description of article	For complex objects, where it is not known which component article (location) that the CL substance resides in, the exposure related description may not be known. In this case it is advised to select all that could reasonably apply
Process category	Select the most applicable PROC (Product Category) codes if known
Environmental release category	Most A&D articles are expected to fall under ERC10a (wide dispersive outdoor use of long-life articles and materials with low release), owing to the conditions of use and longevity. Please refer to figure R.12.7 in the ECHA manual 'How to prepare a substance in articles notification', which contains a decision tree to assist in assigning ERCs
User group(s)	A&D articles are not typically expected to fall under consumer uses. The option 'workers' should be selected in the majority of cases
Tonnage of substance	Has to be entered as numeric value
Concentration of the substance in whole article (%)	Has to be entered as numeric value
Give the overall description of the article and its different parts, describe where in the article the Candidate List substance is present and give the estimated concentration (w/w) in that part/material	
Describe the foreseen use of the article. Include all different future uses during the article service life (e.g. processing of a semi-finished article, installation of the article, maintenance and use of the finished article, disposal)	

NOTE: It is mandatory to submit information for the requirements highlighted in grey in table 4.2.a. Other information may be provided to ECHA, but is not mandated.

Table 4.2.a Required information for CL SVHC SiA notification to ECHA under REACH art. 7(2).

[17] see also ECHA manual "How to prepare a substance in articles notification"

5 How to determine whether a CL SVHC is present in the article

This chapter means to explain how to determine whether a CL SVHC is introduced, during manufacturing or assembly, into or onto an article. Every company in the supply chain needs to individually make this determination for the products it produces or manufacturers, and if a CL SVHC is indeed present, give the result (i.e. the Article 33(1) declaration) to the next company in the supply chain.

This chapter describes the basic considerations regarding chemical reactions involving SVHC substances. It is only applicable for those companies, that use CL SVHC`s in their manufacturing processes. Please be aware that the chemistry involved is mostly very complex, so detail investigation shall be undertaken by chemist/process specialists. Only intended reactions and physical state changes are covered; unintended reaction due to inappropriate storage, environmental influences like UV radiation, moisture and air or aging are out of scope of this guidance. Please be aware that, due to the complexity of chemical processes involved, it is often necessary to either involve chemistry or process technology specialists (in-house or from external service providers), or to turn to the chemical supplier for help, in order to get the necessary knowledge to determine whether a CL SVHC is or is not present in an article.

A CL SVHC substance can be present in an article if a material or a process used for its manufacturing contains such a substance. Therefore, in order to determine whether there is a possibility for having a CL SVHC substance in a given article, a systematic approach per substance at each manufacturing and assembly site is useful. The following flowchart illustrates how to approach the determination process.

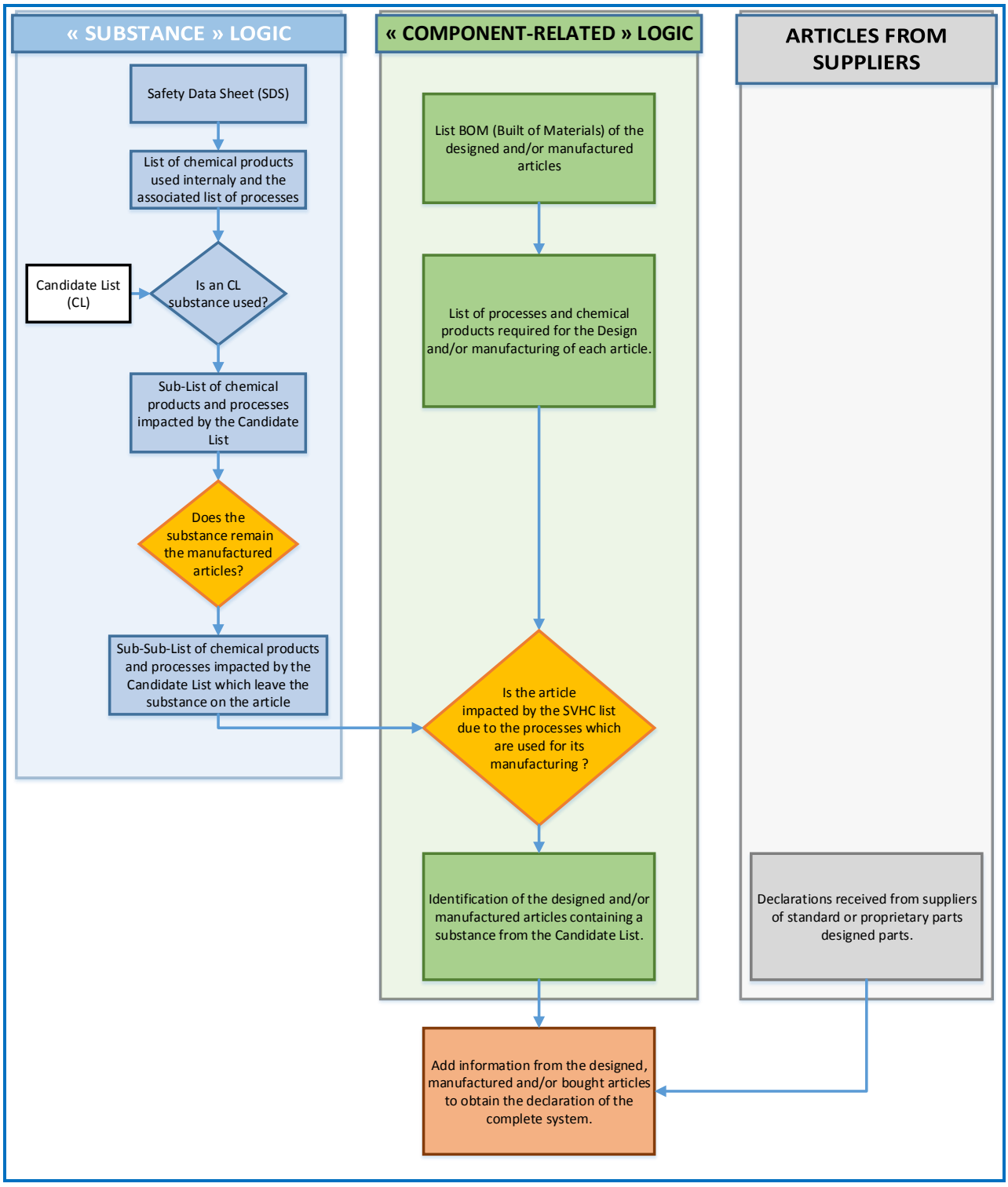


Figure 5.a SiA determination process flowchart

SUBSTANCE LOGIC

First, with the **substance logic** (in the blue box), the company can determine whether a CL SVHC substance is used for a specific manufacturing process. For doing this, the company can usually rely on the existing inventory of chemical products used in article manufacturing. Such an inventory is established by looking into the Safety Data Sheets (SDS) provided by the suppliers of chemicals. It can usually be adapted in a way to show only chemical products that are or contain CL SVHCs.

Once having determined all chemical products that contain a CL SVHC, the company can be able to determine in which production processes these products are used in, or whether the chemical product is directly integrated into the article For further information about CL SVHC used in the A&D industry, see Appendix F.

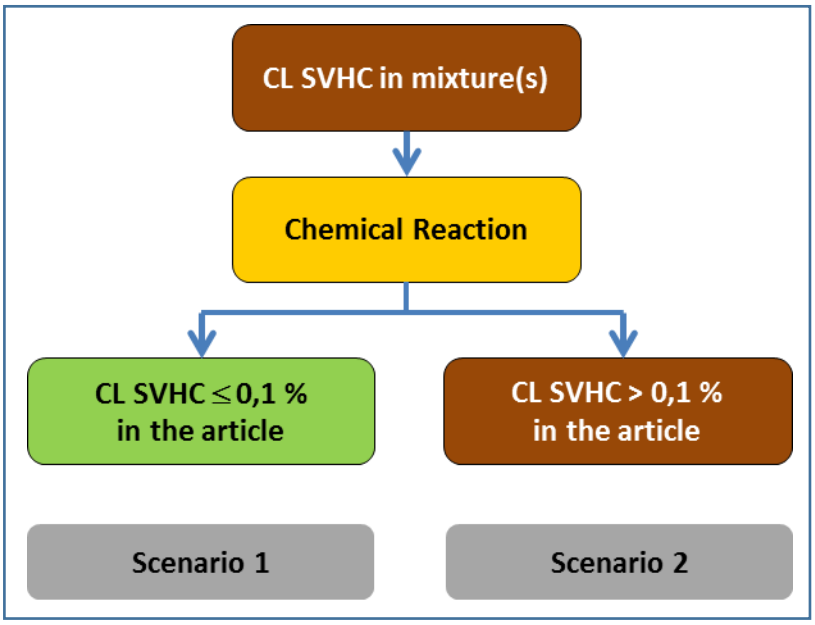


Figure 5.b Flowchart for chemical reaction scenarios

The next step consists of determining whether the CL SVHC remains in the article (i.e. it does not disappear during the process, like solvents). This determination usually requires input from experts that have knowledge about technical details of the processes or materials. The determination differentiates two possible scenarios (see figure 5.b):

Scenario 1

In the first scenario, when using a substance or mixture containing one or more CL SVHCs to treat an article or include it in the article, in the course of the chemical reaction, the CL SVHC can be consumed (e.g. by conversion to another substance), or removed by evaporation, or removed by activities such as rinsing. In such cases, the residual concentration can drop below the 0.1% w/w threshold, depending on the exact environmental conditions and circumstances. Typical examples of such cases are surface treatment activities and adhesives, but it is not limited to this.

Notable examples:

- Chromic acid anodizing (no CrO3 remaining);
- Hard chromium plating (no CrO3 remaining);
- Solvents (evaporate).

In such cases, Article 33(1) declaration is typically not required.

Scenario 2

In contrast, in the second scenario, the CL SVHCs present in the substance or mixture used to treat the article or included into the article, is not altered during the following manufacturing process, is not or only partly involved in the chemical reaction (if such takes place), and is therefore present in the final product. Typical examples for this scenario are:

- Chromate primers and sealants (Strontium chromate etc.);
- NPOE / OPEO in sealants;
- Lead compounds in pyrotechnic mixtures.

When determining whether the CL SVHC is present >0.1% w/w in the final article, especially in the case of paints, it is necessary to take into account that the concentration of the CL SVHC usually increases in the residual reaction product due to solvent evaporation. In contrast, sealants normally do not change much in weight, while adhesives are so broad in possible behaviour that a case-by-case approach must be applied.

The result of the steps just outlined is an inventory of the technical processes which can leave a CL SVHC in or on an article when applied for manufacturing or assembly.

“COMPONENT-RELATED” LOGIC

In a second, **component-related logic** (illustrated in the green box), it is necessary to identify the articles or assemblies of the product that are manufactured or produced with help of the technical processes just identified. This cross-checking of processes and affected articles (part types) is usually manageable for the A&D industry because the industry typically has a broad and detailed control on the design of articles and their material and manufacturing processes, due to Certification and Agreement protocols.

The result of this step is the list of articles (or group of articles) designed, manufactured or assembled by the company that have a CL SVHC in or on the article and that therefore need to be reported in an Article 33(1) declaration. This outcome can then be merged with the Article 33(1) declarations received from the suppliers in the supply chain (see the steps of collecting and storing supplier information, illustrated in blue), and passed on to the recipient of the final product.

If used in the entire supply-chain, the process illustrated in this chapter usually allows a reliable identification of CL SVHCs in the complex objects provided to the customers, which is the basis for a compliant and comprehensive Article 33(1) declaration.

Appendices

Appendix A: ASD product examples with multi-layer supply chains

This appendix A illustrates the complexity of A&D products (SCO) with exemplary aeronautic, space and defence products including their breakdown into ECO's, VCO's and CO's as described in chapter 2.3.

There are more than **20,000** different equipment parts (VCO, ECO) per aircraft with a dedicated technical documentation for installation, operation and maintenance (usually called Component Maintenace Manual - CMM). There is more than **1 million** elementary part number (CO) per aircraft for structural parts, with maintenance and repair documentation at overall assembly level.

Figure A.a Commercial Aircraft BOM breakdown example

The following example shows the connection to the Nose landing gear equipment.

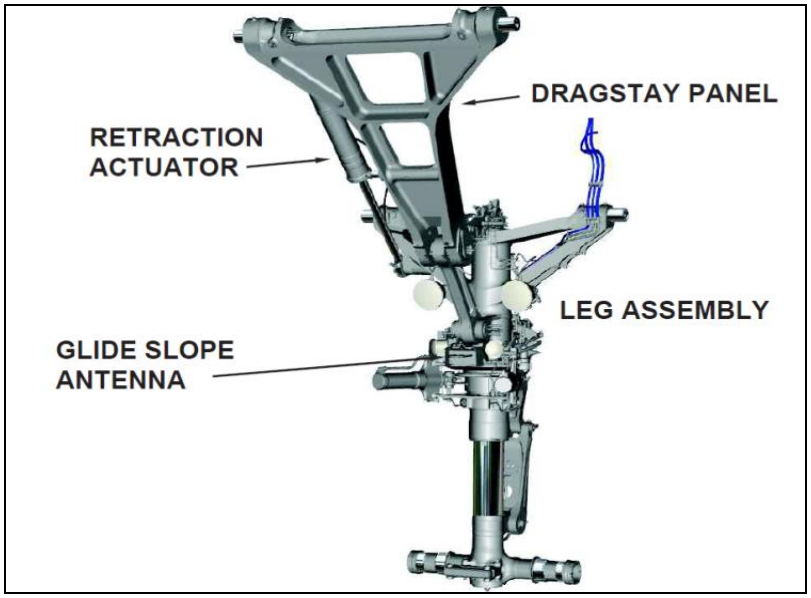


Figure A.b Nose landing gear equipment for aircraft (ref. to A.a)

The family of this Nose landing gear equipment is composed of approx. 1,200 parts. Less than 400 are metallic. According to the nature of the substrate, the cadmium substance is potentially present on this family of equipment for around 100 P/N.

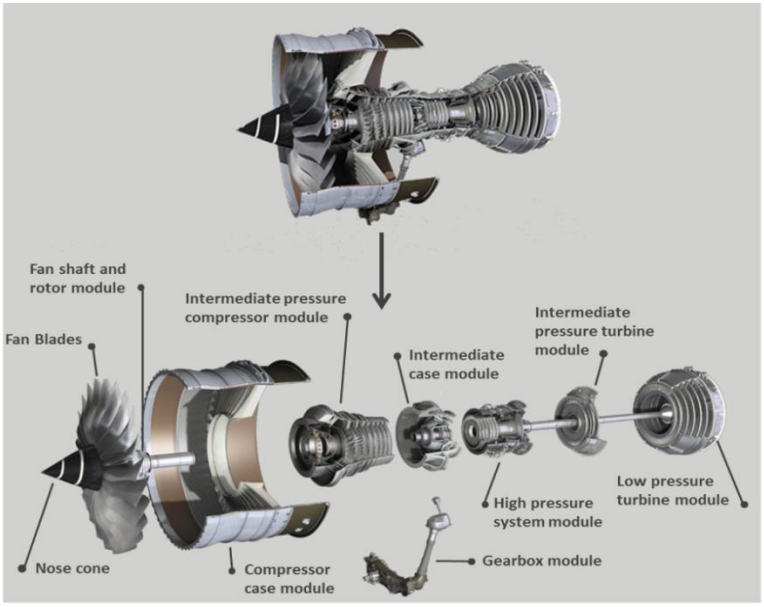


Figure A.c Aircraft Engine module breakdown example (ref. to A.a)

The engine is assembled from several individual modules. Each module comprises many components and assemblies (ECOs, VCOs and COs), which will have undergone many manufacturing processes, some

of which have the potential to introduce SVHCs into the product. Typically, a single engine contains 30,000 – 40,000 parts, of various complexity levels.

Figure A.d Example Aerostructure/Wing breakdown (ref. to A.a)

It is recognised that aircraft come in many different configurations, from the small private, to the large passenger and transporter platforms. Whatever the type, they all conform to stringent manufacturing and maintenance regulations (i.e. airworthiness). Aircraft manufacture is on a truly global scale, with the large aerospace enterprises managing vast supply-chains. A multitude of materials, processes and substances are used in a variety of ways in aircraft from 'Articles', 'Complex Objects' through to 'Super Complex Objects'.

The example shows a commercial aircraft - a super complex object, with a wing assembly cascades down to a single article – a 'Gear Rib'.

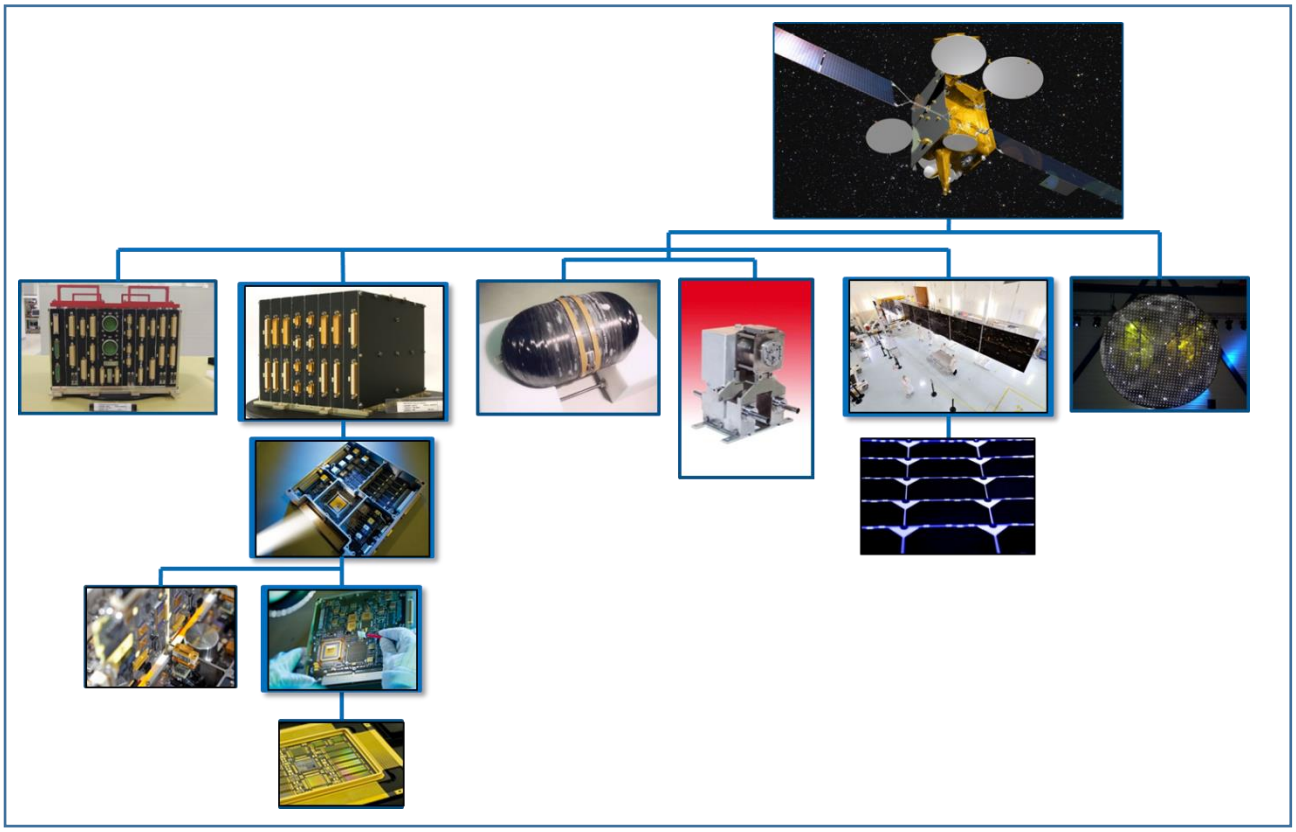


Figure A.e Breakdown of a Telecommunication Satellite

The simplified product breakdown of a telecommunication satellite consists of:

- **Level 1 – Telecom Satellite SCO (~1,000,000‘s parts)**
- Level 2 – Platform ECO (~100,000‘s parts)
- Level 3 – Remote Interface Unit VCO (~10,000‘s parts)
- Level 4 – Electronic Assembly VCO (> 1,000‘s parts)
- Level 5 – Printed Circuit Board CO (~1,000‘s parts)
- Level 6 – Hybrid Component CO (~100‘s parts)
- Level 7 – Electronic Component CO (~10-100 parts)

Example of Satellite Launcher Breakdown with System Control Attitude (SCA) including two tanks of liquid monopropellant and six thrusters" and a "Vehicle Equipment Bay".

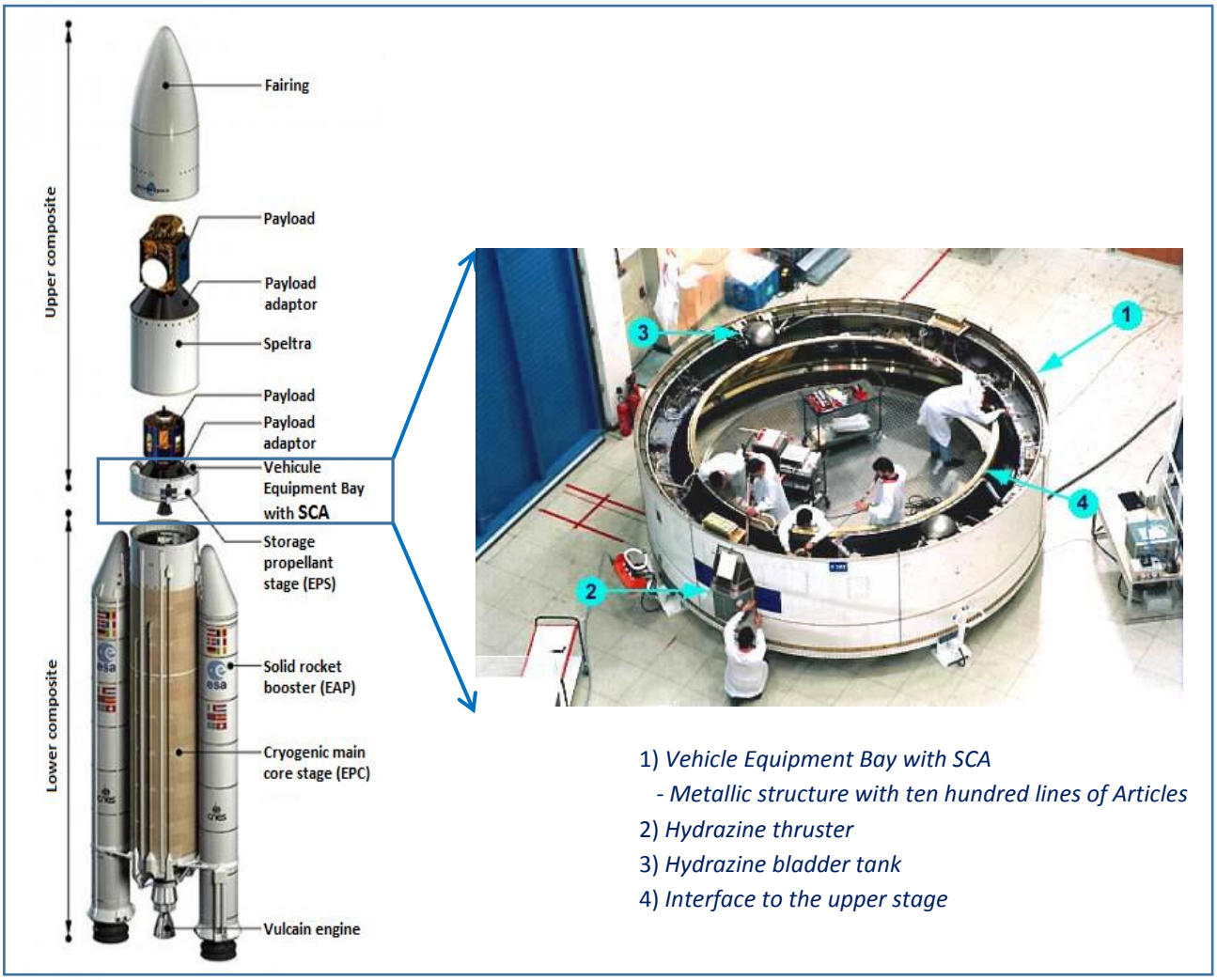


Figure A.f Example of Satellite Launcher Breakdown with System Control Attitude (SCA)

Tanks, like this main battle tank, are super complex objects and consist of at least **350,000** individual component articles. In this example, the tower alone comprises **6,500** different equipment numbers and **45,750** individual component articles. Equally, the vehicle chassis consist of another **45,000** individual component articles, which are listed as **7,400** part numbers. This shows that one part number usually comprises several component articles (i.e. meets the definition as a VCO or ECO) - for example, the screen and the motor are each counted as only one part in the parts list.

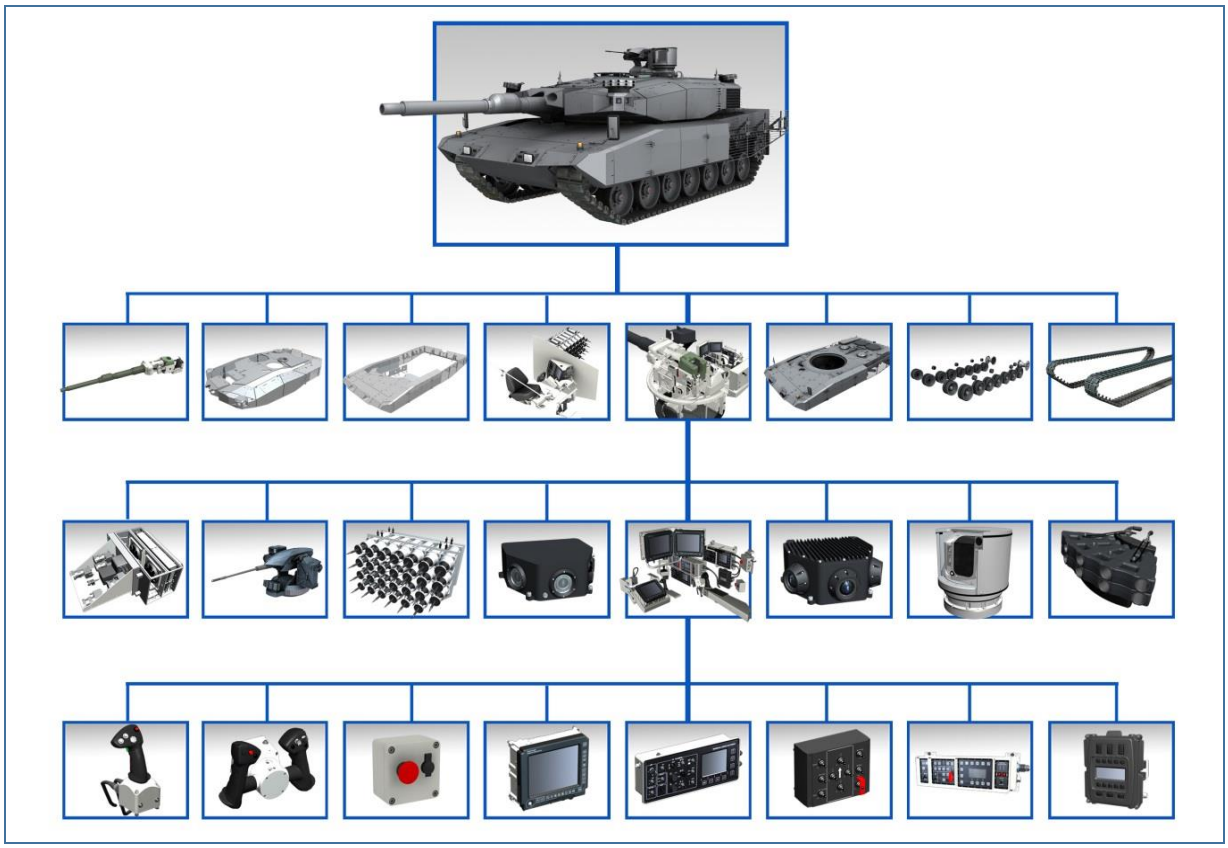


Figure A.g Example of tank product breakdown

Appendix B: Template for Art. 33 REACH declarations

This appendix shows an illustrative template of how an Article 33(1) declaration could look like. It follows the rules and suggestions explained in further detail in chapter 3.1. However, this template is in no way mandatory or binding, but merely a suggestion for voluntary use by ASD members or companies in the A&D supply chain. As mentioned in chapter 3.2.2, the CL SVHC declaration and information on safe use can be either communicated via separate documents, or included in existing technical or other publications.

Company logo and address

Contact details of REACH expert (in case clarification is needed)

REACH Declaration on substances in articles

Referring to the product:

- **XXXX product name, possibly other indicators XXXX**

Date of issue: XXXXXXX

If applicable: further information on issuing facility of the legal entity

XXXX_Company name_XXXXX confirms awareness of the obligations arising from the REACH regulation (Regulation (EC) No. 1907/2006) and hereby declares compliance with applying duties.

In compliance with Article 33(1) of the REACH regulation, we hereby inform the recipient of our product that the supplied product contains at least one so-called REACH Candidate list substance in a concen-tration above 0.1% weight by weight; i.e. a substance of very high concern meeting the criteria in Article 57 and identified in accordance with Article 59(1) of the REACH Regulation. In accordance with ECJ judgment C-106/14, issued 10 September 2015, the concentration threshold of the substance was determined in reference to the weight of the affected component article contained in the product.

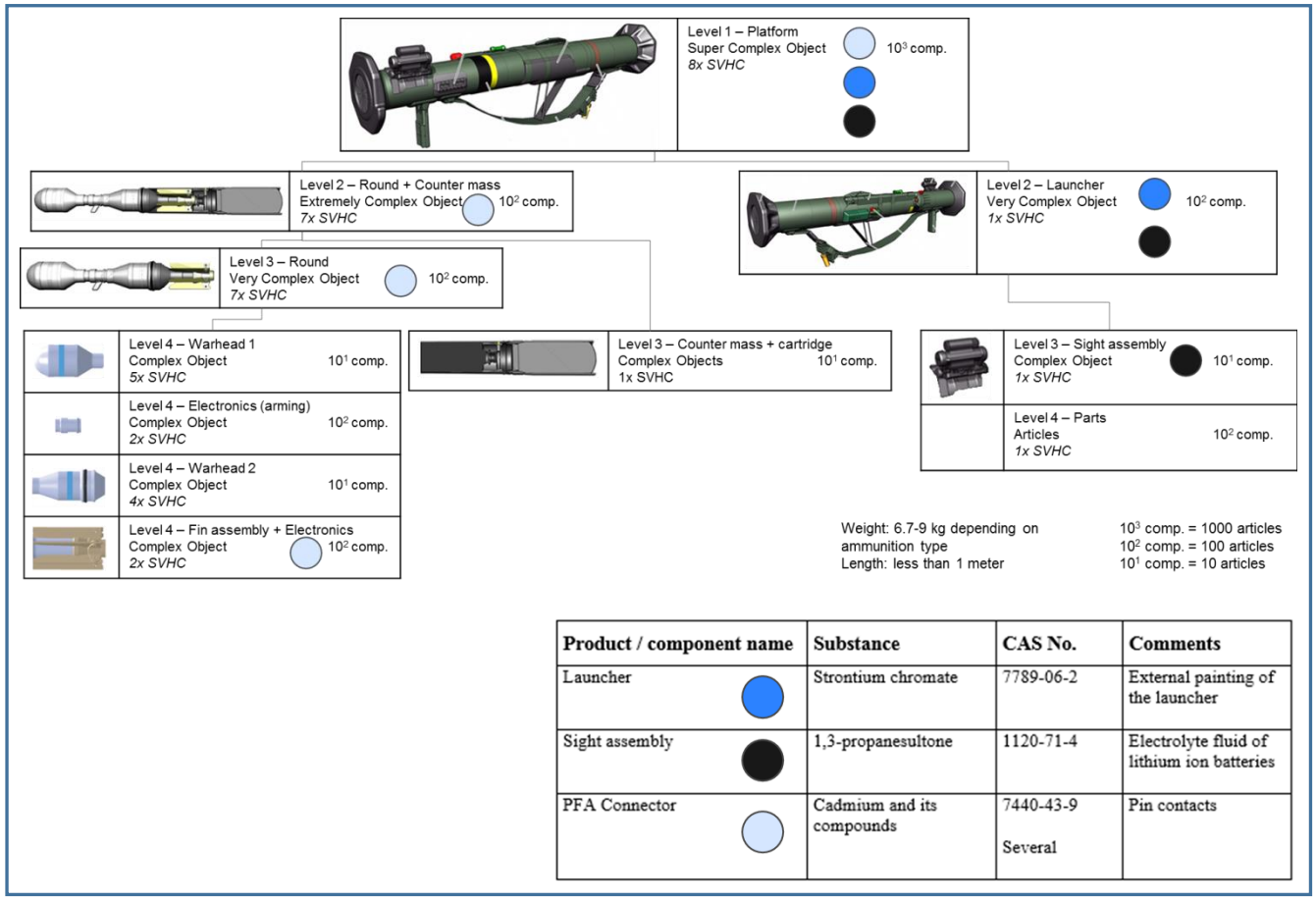
Substance name	CAS Number	EC Number	Present in
XXXXXX	XXXXXX	XXXXXX	XXXXXX
XXXXXX	XXXXXX	XXXXXX	XXXXXX
XXXXXX	XXXXXX	XXXXXX	XXXXXX
such as in REACH candidate list	Or other numerical identifier		Component article identifier, or name of a higher level assembly in case of aggregation

Where applicable, additional information to allow for safe use of the product can be found in XXXXXXX_name of applicable document, e.g. maintenance manual_XXXXXX.

Signature (if applicable)

Figure B.a Illustrative Template of REACH Art. 33(1) declaration

Appendix C: Illustrative example of aggregation method



Product / component name	Substance	CAS No.	Comments
Launcher	Strontium chromate	7789-06-2	External painting of the launcher
Sight assembly	1,3-propanesultone	1120-71-4	Electrolyte fluid of lithium ion batteries
PFA Connector	Cadmium and its compounds	7440-43-9 Several	Pin contacts

Fig. C.a Illustration of how aggregation is done for the purpose of SiA declaration (example of ground weapon system)

REPORT 1 (1)

Date | Issue | Document ID

Issued by

Classification Company Confidentiality
COMPANY RESTRICTED

Classification Export Control
NOT EXPORT CONTROLLED

Classification Defence Secrecy
NOT CLASSIFIED

Appendix A REACH Article 33 Declaration

EU and EEA suppliers of articles which contain substances on the Candidate List in a concentration above 0.1% (weight / weight) have to provide to their customers sufficient information to allow safe use of the article. This obligation is based on Article 33 of the REACH Regulation.

The table below contains all parts containing greater than 0.1 percent by weight of product/system [1].

Product / component name	Substance	CAS No.	Comments
Launcher	Strontium chromate	7789-06-2	External painting of the launcher
Sight assembly	1,3-propanesultone	1120-71-4	Electrolyte fluid of lithium ion batteries
PFA Connector	Cadmium and its compounds	7440-43-9 Several	Pin contacts

Figure C.b Final Art. 33(1) declaration for "Ground Combat Weapon System"as aggregated according to method shown in Figure C.a

Appendix D: Methodology for hazardous materials management in technical documentation

The flow of hazardous materials data from suppliers into technical documentation, and on into Technical Publications, is basically described in chapter 2.5. It can be comprised of **four stages** as described below and shown schematically as follows:

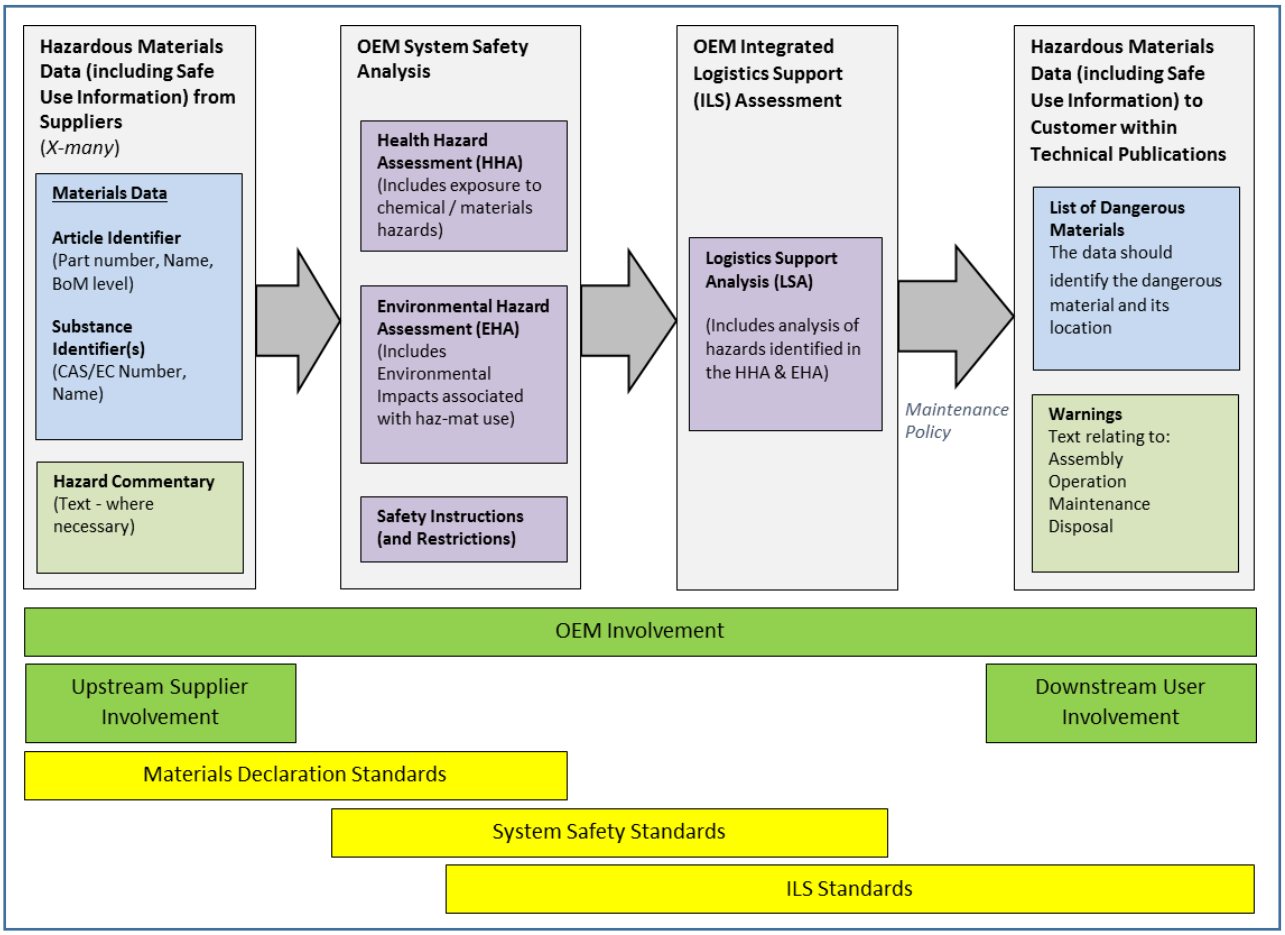


Figure D.a Hazardous Materials Data Flow within Technical Documentation

Stage 1: Hazardous Materials Data (including information to allow safe use) from Suppliers

Where articles and simple assemblies are supplied for incorporation within complex objects, CL SVHC data, perhaps as a subset of hazardous materials data, might be provided via any of the transmission modes described in Chapter 3.1.4, below.

However, in order to facilitate efficient data management, it can be helpful to flow data along the supply chain in accordance with the requirements of Materials Declaration Standards, or to adopt the principles within them. Such standards are described in Appendix E.

Hazardous materials data, and the CL SVHC subset, will normally include substance identifiers such as the Chemical Abstract Service (CAS) or European Community (EC) Number and chemical name and identify the location of each substance (Part number, Name). The location information may be aggregated at any level in the Bill of Material (BoM) in order to make it meaningful, as described in Chapter 3.1.3, below. Where necessary, hazard commentary should also be provided.
Suppliers of complex objects to systems integrators producing COs, VCOs, ECOs or SCOs may provide hazardous materials data, including the CL SVHC sub set, within documents such as Health Hazard Assessments (HHA), Environmental Hazard Assessments (EHA), Hazard Logs, Safety Assessment Reports and similar documents, as described in section 2 below. Alternatively, the hazardous materials data, including the CL SVHC sub-set, may be provided directly within Technical Publications, as described in stage 4 below. All of the above data is an input to the OEM System Safety Analysis.

Stage 2: OEM System Safety Analysis

The A&D industry utilises several military and civilian standards that govern the management of system safety. Almost all of these standards incorporate safe use requirements and guidelines across the product life cycle. Use of these standards is often mandatory within the A&D sector.
Commonly used system safety management standards include Mil-Std-882E “Standard Practice for System Safety” and Society for Aerospace, Automotive and Commercial-vehicle Industries (SAE) Aerospace Recommended Practice (ARP) 4761 “Guidelines and Methods for Conducting the Safety Assessment Process on Civil Airborne Systems and Equipment”. For more detailed description of these, and the tasks described above, see Appendix D.

The overall System Safety approach for identifying and assessing hazards involves conducting a number of analytical tasks throughout the development of the system's design. One common feature of the system safety standards is the provision of instructions and guidance to identify and analyse hazardous materials (Hazmat). CL SVHCs are a subset of Hazmat and will therefore be included in the analysis and mitigation of hazards (health and environmental aspects). The ECHA Guidance supports this integrated approach [18].
The guidance for documenting Hazmat in the safety analysis recommends that the hazmat location, quantity and substance names are specified, and that instructions for safe use are established. Additionally, it can be helpful to specify the substance CAS no. and/or EC number alongside each substance name.

Relevant outputs of the system safety analysis include:

- Health Hazard Assessment (HHA).
- Environmental Hazard Assessment (EHA)
- Safety Instructions (and Restrictions) that complement design and structural measures in the mitigation of hazards. Information to allow safe use for articles is a subset of Safety Instructions. The Safety Instructions are implemented within system operation instructions or similar.

[18] See ECHA SiA Guidance, Chapter 3.4.1, p.52

The relevant outputs of the system safety analysis, which include the CL SVHC subset, are an input to the ILS Assessment.

Stage 3: OEM ILS Assessment

ILS is an integrated and iterative process for developing a material and support strategy that optimises functional support, leverages existing resources, and guides the system engineering process to lower life cycle cost and decrease the logistics footprint, making the system easier to support. Although originally developed for military purposes, it is also widely used in commercial product support or customer service organisations.

The S-series ILS specifications for the management of ILS activities are in common use within the A&D sector, and these have a common technical language.

A LSA of the system is an important element of the ILS scope of work. The aim of this activity is to contribute to the efficient operation and maintenance of the system. Known data and predictions are input to the LSA. There are many inputs; examples include:

- Design data, definition of the system, and service and design life
- Safety assessments, including the HHA and EHA, and associated requirements/safety instructions.
- Number of products to be supported, operating cycles, operating and storage environments
- Maintenance levels, available facilities, supplies and personnel

The output of the LSA is the Logistics Support Analysis Record (LSAR), from which data is fed into the Technical Publications for the system. This will contain safety assessments, as detailed above, which include the CL SVHC subset.

Stage 4: Hazardous Materials Data (including information to allow safe use) to Customer within Technical Publications

One of the S-Series ILS specifications is S1000D [19], the international specification for technical publications. This standard defines the information model and guides how the technical documentation (maintenance manuals etc.) should be written for system operators and maintainers. It can be helpful to adopt this standard, or follow the principles within, in order to enable information to allow safe use for complex objects to be incorporated within Technical Publications for the benefit of end users and maintainers.

S1000D contains descriptive Information Codes, under which Aerospace Recommended Practice for CL SVHCs (and other Hazmats) can be collated and associated with articles and maintenance tasks, thus meeting the Article 33(1) obligation. For a more detailed explanation of how Information Codes can be used, see Appendix D.

For complex objects it can be useful that documents for chemical reporting are established such as a REACH Declaration. The source information provided to the Technical Publications may also be

[19] S1000D is published by ASD & AIA

incorporated within the REACH Declaration for the complex object. Either document may be used to communicate information to allow safe use in accordance with the Reach Article 33(1) obligation. The benefits are:

- Compliance checks (including REACH) will be improved.
- Statements and verification of Article 33(1) compliance can be made during design milestones in the development phase.

Where it is necessary to provide particular information to allow safe use of the article containing a CL SVHC (e.g. location data or commentary), there is no need to separately identify it from the remaining Hazmat data. information to allow safe use for CL SVHCs may be better communicated through complex supply chains by applying relevant information codes from technical publications standards to the information at an early stage in the data flow. Thereafter the data can be efficiently flowed through into the technical publications for use by product end users and maintainers. The information to allow safe use can be identified and accessed via the relevant information codes.

Appendix E: Standards for data management and system engineering analysis

IPC Standards for information gathering

IPC, the Association Connecting Electronics Industries, is an organization whose aim is to standardize the assembly and production requirements of electronic equipment and assemblies. IPC standards are used by the electronics manufacturing industry, and have also been adopted for general use by many actors in the A&D Industry.

The IPC-1752A and IPC-1754 are Material Declaration Standards to communicate substance information, formatted in XML format.

IPC-1752A "Materials Declaration Management Standard" establishes the requirements for exchanging material and substance data between suppliers and their customers for electrical and electronic product (i.e. CO or VCO). This standard applies to products, components, sub-products and materials that are supplied to producers of electrical and electronic products for incorporation into their products. It covers materials and substances that may be present in the supplied product or sub-product. It does not apply to process chemicals, unless those process chemicals constitute part of the finished product or sub-product.

The standard IPC-1754 "Material Declaration Standard for Aerospace and Defence" is currently (november 2017) under development having the focus to exchange information of material content for complex objects. This standard has the same basic principles as IPC-1752A exchanging material and substance data between suppliers and their customers. However, the IPC-1754 has extended scope of exchanging data through it as well contained requirements for exchanging data for substances in processes (manufacturing processes and treatments). It should be noted that the above standards do not support the provision of safe use commentary in textual format. Where the standards are agreed by the supply chain, provision of safe use commentary must be done additionally.

System Safety standards

There are variety of standards within System Safety and they include:

- Standards for systems design and integration which can be used by OEMs to evaluate and integrate information to allow safe use and provide it in the context of complex objects
- Standards for product support assessment which can be used by OEMs to provide information to allow safe use information for complex objects in the context of a specific product support operation.

The following chapter is a summary of relevant tasks described in the System Safety standard Mil-Std-882E regarding to mitigate hazards connecting to HAZMAT (hazardous materials). To obtain a complete understanding the reader is referred to the standard.

Health Hazard Analysis

Mil-Std-882E contains the Health Hazard Analysis (Task 207) which refers to perform and document a Health Hazard Analysis (HHA) to identify human health hazards, to evaluate proposed hazardous

materials and processes using such materials, and to propose measures to eliminate the hazards or reduce the associated risks when the hazards cannot be eliminated.

Specific health hazards and impacts that shall be considered include:

- Chemical hazards (e.g., materials that irritate or are hazardous because of physical properties such as flammability, toxicity, carcinogenicity, or propensity to deprive an organism of oxygen).

The HHA shall provide the following categories of information:

- Hazard identification. Identify the hazardous agents by name(s) CAS number if available, and the affected system components and processes. Hazard identification also includes:
- Exposure pathway description. Describe the conditions and mode by which a hazardous agent can come in contact with a living organism. Include a description of the mode by which the agent is transmitted to the organism (e.g. ingestion, inhalation, absorption, or other mode of contact), as well as evidence of environmental fate and transport. Consider components of the system which may come into contact with users.

Environmental Hazard Analysis

Environmental Hazard Analysis (task 210) gives guidelines about how to perform and document hazardous substances (often shortened to HAZMAT), for example the substance quantity and location which specific systems/equipment may contain. In these guidelines there are instructions that specify how to control, and if handling measures and personal protective equipment are needed.

The purpose with these analyses is to give information that are needed in the safety instructions and/or in the operating manuals.

Safety instructions:

- The purpose is to provide a complement to design and structural measures taken to prevent incorrect use of the technical system. Basic requirements for the establishment of these are the safety analyses.
- The objective is to established safe use instructions in manuals

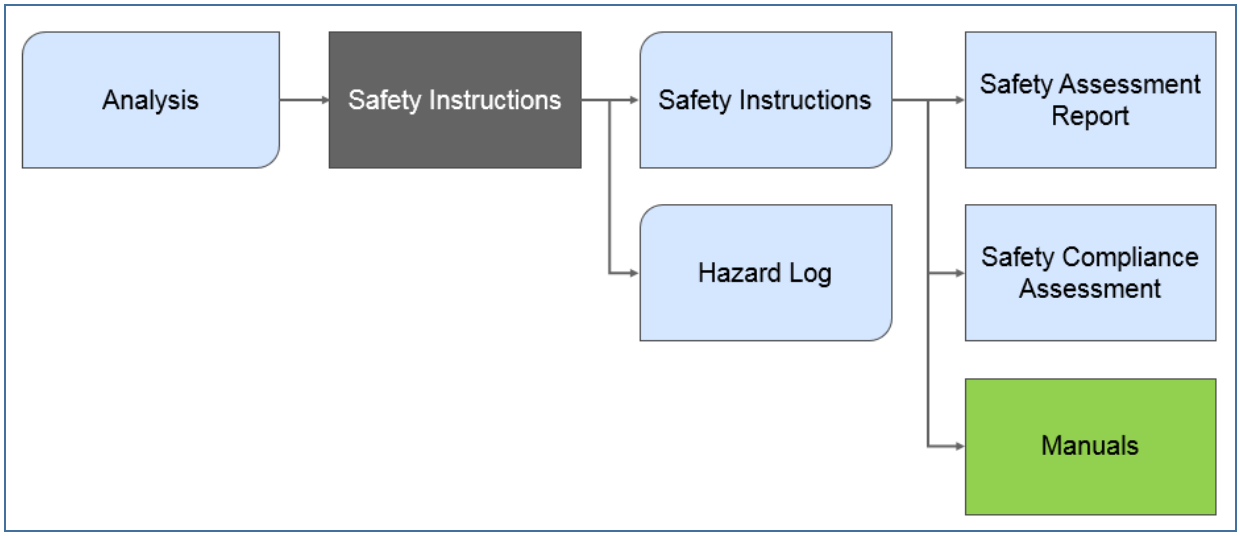


Figure D.a Safety Instructions

International specification for technical publications: S1000D

S1000D was produced by ASD, the Aerospace Industries Association of America (AIA), and the Air Transport Association of America (ATA), together with their customers. S1000D is “an international specification for the procurement and production of technical publications. While the title restricts its use to technical publications, it has been found through application that the principles of the specification can be applied to non-technical publications”.

S1000D “covers the planning and management, production, exchange, distribution and use of technical documentation that support the life cycle of any civil or military project.” Information produced in accordance with S1000D is created in a modular form, called a "data module". The data modules applicable to a product are gathered and managed within a “Common Source Database”.

S1000D Information Codes

S1000D information codes can be applied to articles at any point in the supply chain. Applying the information code and associated safe use information early in the supply chain will facilitate flow of the information through the supply chain and into technical publications.

List of dangerous materials

According to the S10000D standard, information code 016 “gives data on materials which can damage a person’s health. The data identifies the dangerous material and its location”.

Applying information code 016 to dangerous materials and linking those materials to the articles which contain them will enable those articles to be identified and reported upon following their integration within CO`s i.e. products, systems or sub-systems of ASD industry sector. To avoid uncertainty, the dangerous materials may be identified by their CAS/EC number.

The definition of a dangerous material is open to interpretation. A wide definition can be useful in ensuring that the maximum number of dangerous materials possible is identified and listed. However it is important that the CL SVHC subset is included.

General warnings and cautions and related safety data

According to the S10000D standard, information code 012 “gives general WARNINGS and CAUTIONS related to operation and/or maintenance”.

Information code 012 should be applied to the information to allow safe use that is provided for articles. Such information to allow safe use should be linked to the unique article identifier. S1000D Chapter 3.9.3 provides definitions and rules for warnings & cautions and associated notes.

Appendix F: List of common CL SVHCs used in the A&D industries sector for article manufacturing

Of the current REACH candidate list (issued on july 7th 2017), the following CL SVHCs are most commonly used in the manufacturing of articles in the A&D industry. However, while used during manufacturing processes, the named substances are not necessarily present above 0.1% w/w in the finished article thus be not mandatory to be reported in Art. 33(1) declaration to the recipient.

Name	Description of use	EC no.	CAS no.
Cadmium	Fasteners, connectors, connectors housing, plated components, solder, corrosion protection plating (steel parts), ball bearings.	231-152-8	7440-43-9
Chromium trioxide	Surface treatment against corrosion (Chromic Acid Anodizing, Chromate Conversion Coating) for aluminum mechanical parts, wave guides, RF parts (adapters, filters, switches...), High temperature cements.	215-607-8	1333-82-0
Strontium chromate	Paint primers for parts: Reaction Wheel Assembly, Aircraft Door Assembly, Notch Filter, Honeycomb Panel Faceskins.	232-142-6	7789-06-2
Potassium dichromate	Hardeners, magnesium surface treatment, corrosion resistant treatment of aluminum components.	231-906-6	7778-50-9
4,4'-isopropylidenediphenol (BPA)	PCB-Layer, epoxy adhesives, hardeners, Polycarbonate.	201-245-8	80-05-7
Cadmium oxide	Cadmium plating, pigments, electrical contacts.	215-146-2	1306-19-0
Dibutyl phthalate (DBP)	Softener and solvent in propellant powder for ammunition, sealants, nitrocellulose paints, film coatings and glass fibres. Plasticiser in polymers, such as PVC.	201-557-4	84-74-2
Sodium dichromate	Etching/pickling solutions, mechanical parts. Sealing solution following sulphuric acid anodising of aluminium. Passivation of steels and Cadmium plating.	234-190-3	10588-01-9, 7789-12-0

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Name	Description of use	EC no.	CAS no.
Aluminosilicate Refractory Ceramic Fibres	Heatshield/insulation media, Solenoid valves, Insulated ducting, thin layer in the inside of ammunition casing (so that it does not melt), heat barrier in batteries for emergencies.	-	-
Pentazinc chromate octahydroxide	Resin catalysts, corrosion resistant paints and primers.	256-418-0	49663-84-5
Potassium hydroxy-octa-oxodizincate-dichromate	Corrosion resistant paints and primers.	234-329-8	11103-86-9
1-Methyl-2-pyrrolidone (NMP)	Outer sheath of insulation covers, aerospace adhesives, hardeners and sealing compounds, SBR Latex production, PCB manufacture. Critical use for manufacture of Space Li-ion batteries.	212-828-1	872-50-4
Chromic acid	Aluminum etch and surface treatment.	231-801-5	13530-68-2
Bis (2-ethylhexyl)phthalate (DEHP)	Plasticiser in the manufacturer of polymer products (PVC).	204-211-0	117-81-7
Lead monoxide (lead oxide)	Piezoceramic components, batteries, ab-sorbents, catalysts, lubricants, corrosion inhibitors, explosives & rubber products.	215-267-0	1317-36-8
N,N-dimethylacetamide	Insulating plates, Adhesive tape for electronics, solvent in manufacturer of various substances such as production of fibres for clothing industrial coatings, polyimide films (space thermal blanket material), paint strippers, ink removers.	204-826-4	127-19-5
Lead diazide, Lead azide	Component of pyrotechnic mixtures (for ammunition), initiator or boosters in detonators/fuses.	236-542-1	13424-46-9
Lead styphnate	Component of pyrotechnic mixtures (for ammunition), primer for small calibre and rifle ammunition, pyrotechnics, powder actuated devices and detonators/fuses.	239-290-0	15245-44-0
Dichromium tris(chromate)	Surface treatment involving immersion of metal components.	246-356-2	24613-89-6
Dichromic acid	Constituent of Chromic Acid etch for Aluminium used prior to other treatments and Chromic Acid Anodising.	236-881-5	7738-94-5

1 **Table F.a Top 20 CL SVHCs used in ASD industry sector for article manufacturing**

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2 # Glossary

Abbreviation	Explanation
A/C	Aircraft
A&D	Aerospace & Defence
AFRA	Aircraft Fleet Recycling Association
AIA	Aerospace Industries Association (US)
AMM	Aircraft Maintenance Manual
AD-DSL	Aerospace & Defence Declarable Substance List
ARP	Aerospace Recommended Practice
ASD	Aerospace and Defence Industries Association of Europe
ASD STAN	Aerospace and Defence Industries Association of Europe – Standardisation
ATA	Air Transport Association (of America)
BoM	Bill of Materials
B2B	Business-to-Business
B2C	Business-to-Consumer
B2G	Business-to-Government
CAA	Chromic Acid Anodizing
CAS	Chemical Abstract Service (numerical identify)
CL	Candidate List (of substances of very high concern for authorisation)
CL SVHC	SVHC listed in the Candidate List for authorisation
CMM	Component Maintenance Manual
CO	Complex Object
EC	European Community
ECHA	European Chemicals Agency
ECO	Extremely Complex Object
ECJ	European Court of Justice
EEA	European Economic Area
EHA	Environmental Hazard Assessment
EOS	End of Service
ERC	Environmental Release Category
Hazmat	Hazadous Materials (as classified e.g. in EU CLP Regulation)
HHA	Health Hazard Assessment
ICAO	International Civil Aviation Organization
ILS	Integrated Logistics Support
IPC	Association Connecting Electronics Industries (former Institute for Interconnecting and Packaging Electronic Circuits
ITAR	International Traffic in Arms Regulation

LRU	Line Replaceable Unit
LSA	Logistics Support Analysis
LSAR	Logistics Support Analysis Record
MIL STD	Military Standard
MRO	Maintenance, Repair & Overhaul
O5A	Once-An-Article-Always-An-Article (new ECJ ruling Sept 2015 on REACH Art. 33)
OEM	Original Equipment Manufacturer
PCB	Printed Circuit Board (assembled)
PDR	Preliminary Design Review
PHA	Preliminary Hazard Analysis
REACH	Registration Evaluation and Authorisation of restricted CHemicals
RIWG	REACH Implementation Working Group of ASD
RMM	Risk Management Measures
SAE	Society for aerospace, automotive and commercial-vehicle industries (former “Society of Automotive”)
SCO	Super Complex Object
SDS	Safety Data Sheet
SE	Systems Engineering
SiA	Substance in Article
SRU	Shop Replaceable Unit
SVHC	Substance of Very High Concern
SWG2	Sub-Working Group 2 (of ASD RIWG)
VCO	Very Complex Object
w/w	Weight by weight
XML	Extensible Markup Format

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References

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European Court of Justice (ECJ, case C-106/14) in September 2015
ECHA Substances in Articles Guidance (ECHA-17-G-19-EN) from June 2017
ECHA Manual “How to prepare a substance in articles notification” (ECHA-16-B-16-EN) from January 2017
ASD Technical Paper "REACH Substances in Articles" dated 22 Sept 2016
ASD Guide on Implementation of REACH
Mil-Std-882E “Standard Practice for System Safety”
SAE ARP 4761 “Guidelines and Methods for Conducting the Safety Assessment Process on Civil Airborne Systems and Equipment”
ECHA Guidance in a Nutshell on Requirements for Substances in Articles
IPC 1754 Material Declaration Standard for the Aerospace and Defense
MIL-Std-882E “Department of Defense Standard Practice System Safety”
Common ECHA-EASA paper “An elaboration of key aspects of the authorisation process in the context of aviation industry” (April 2014)