

ESSCCON 2021, 9, 10 and 11 March.

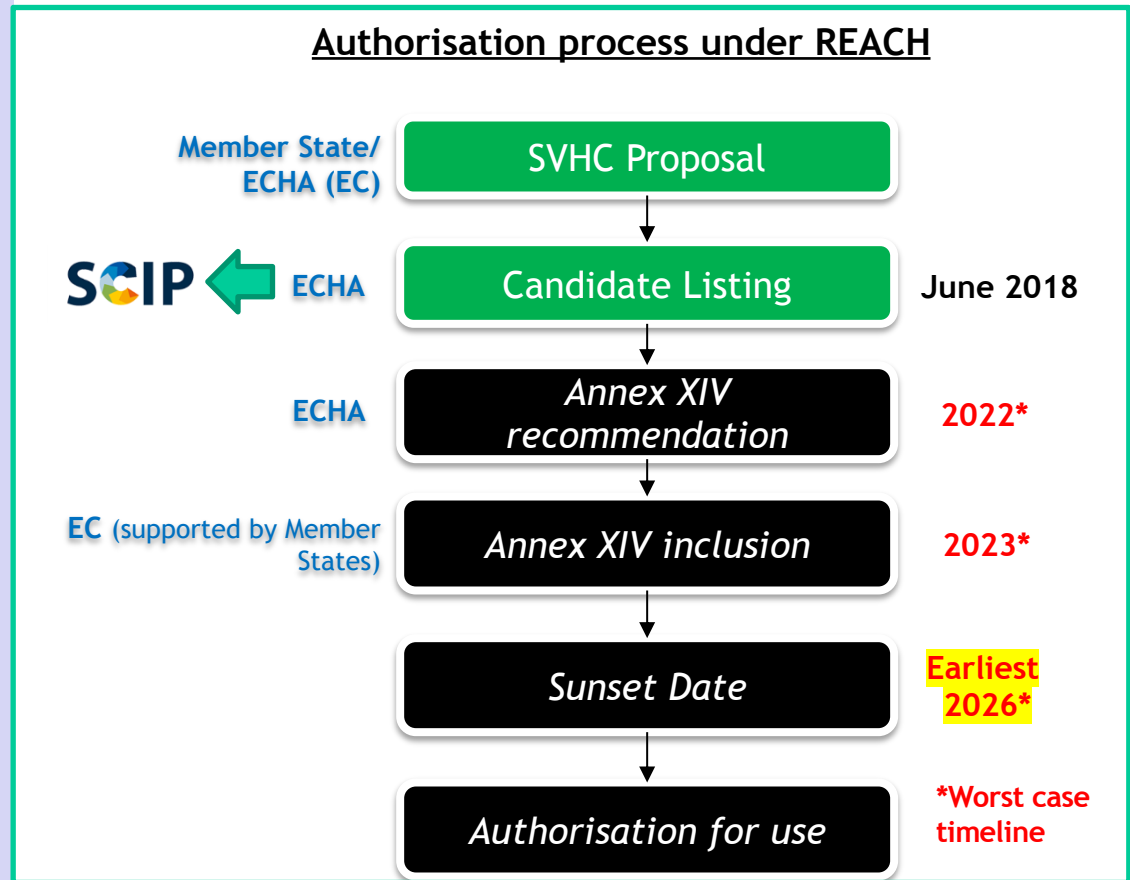
Pb-free Transition for the European Space Sector

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The implementation by the EC of the RoHS directive in 2004 triggered a race to eliminate lead from electronic assemblies. Today most industrial sectors use Pb-free electronics. Space is one of the few sectors still using lead

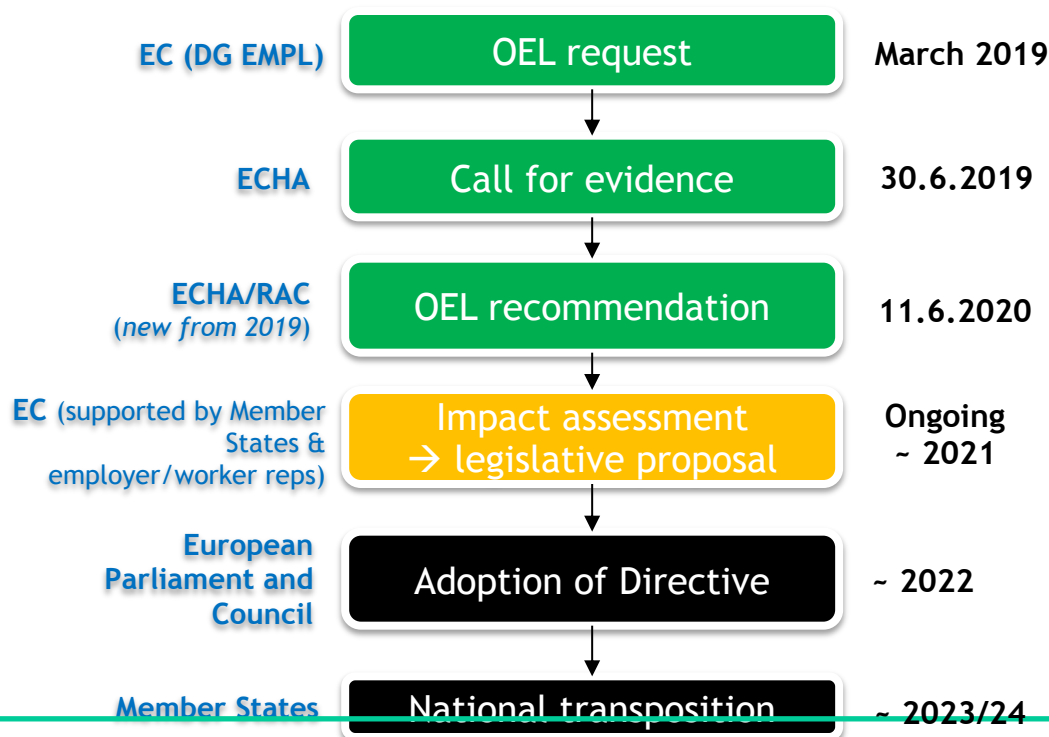
Due to new regulatory pressures (REACH) and Market push and constraints, there is now a consensus that the European Space Sector can no longer avoid the need to plan and implement a managed transition to Pb-free electronics.

In the Regulatory front, while the Space Sector was out of scope of the RoHS Directive, a new risk has recently appeared with REACH. Lead (Pb) has now been included in the ECHA Registry of SVHC Intentions and in 2018 it has been included in the REACH Candidate List of SVHC for Authorisation. This route can result in lead being banned in Europe.



However, at the same time, the EC is exploring an alternative route to manage the health risks of lead that will not result in a broad ban. It has initiated a review of lead in the frame of the EU OSH (Occupational Safety and Health legislation). ECHA has been mandated to propose an update for the existing OEL.

EU OEL revision process for lead and its compounds under Council Directive 98/24/EC (Chemical Agents)



The updating under OSH could have a deprioritisation effect for lead under REACH, however today we cannot preclude the final outcome of the process, it could be either complying with OEL requirements at the workplace or to resort to Requests for Authorisation or both

- Due to the overall transition of the Electronics Industry worldwide to a Pb-free realm, the Space Industry is more and more confronted with a situation where they **cannot avoid using EEE parts with Pb-free finishes** and they need to manage the associated risks.
- The growing use of **commercial components (COTS)**, notably for the expanding market sector of constellations (New Space), means that European Space Industry is already using large amount of components with lead-free terminations even when the equivalent leaded high-rel version is available.

- Market pressure may also result on potential future difficult availability of leaded solder paste
- In order to prepare for that future risk, the European Space Industry will need to introduce lead-free soldering processes, an extensive and very expensive undertaking for the European space Industry
- Changing to lead-free soldering is not required for massive COTS introduction

SCSB Decision

- Taking into account of all these, in May 2019 the SCSB agreed to launch a joint task force consisting of MPTB and CTB members with the mandate to assess the effort to:

In the domain of EEE components, electronic assembly technologies and PCBs, ensure a successful industry-wide transition to a Pb-free technology while preserving or improving current levels of quality and reliability

Main issues:

- Although initially it was thought that 6 months would be enough, it actually took a year to complete the activity and issue a road map.
- This roadmap is complex since, in addition to the necessary R&D actions, there are Economical, Competitiveness and Regulatory issues that complicate the discussions.
- The different actors are at different levels in the transition, thus very early we were confronted to the issue of how to share information without giving up competitive advantage.
- We discovered that there was significant sharing at the National level but very little coordination at the European level. Basically the same studies were being duplicated in the countries (+ ESA) interested in the subject.

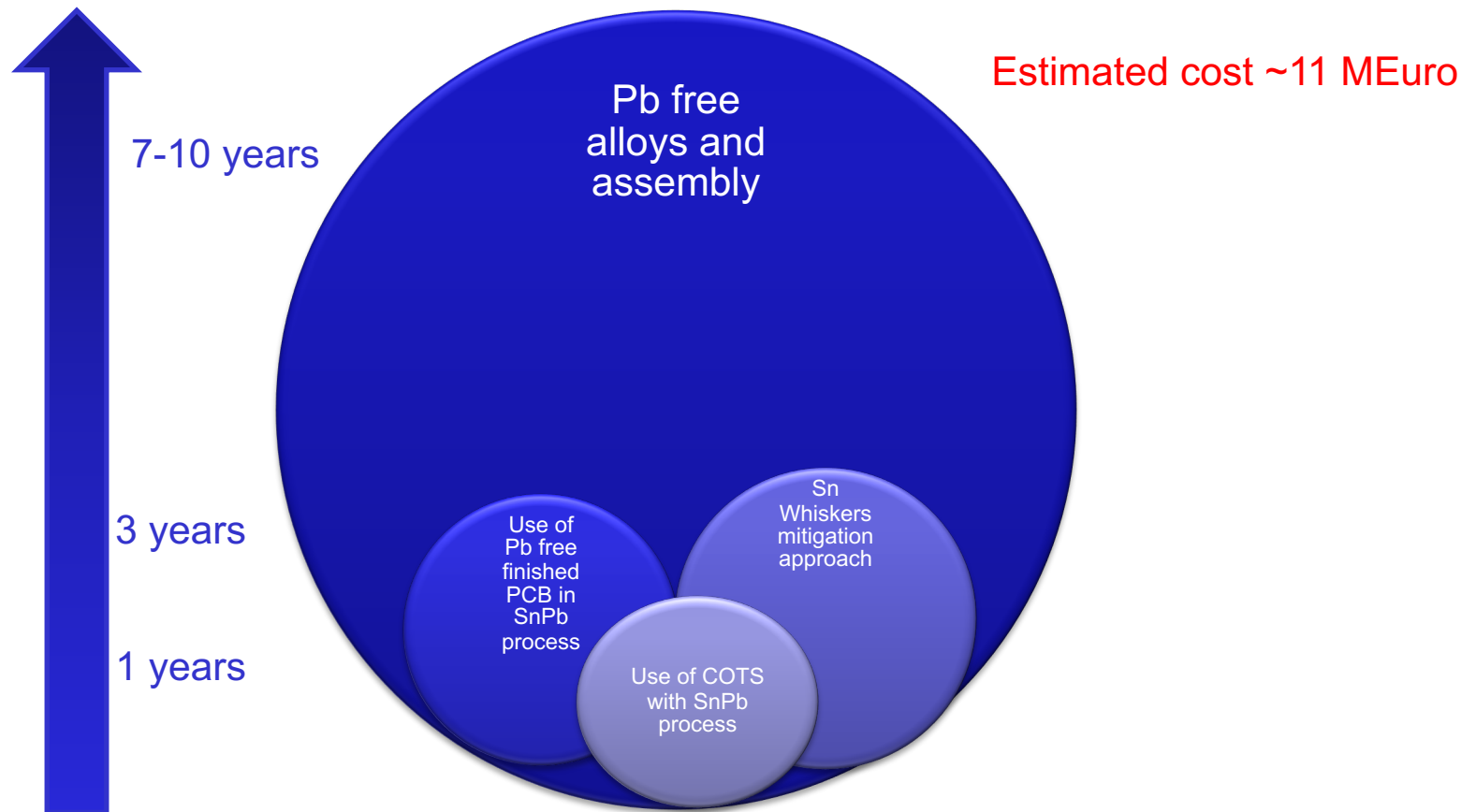
Main Points:

- We have split the Transition Roadmap into 4 independent roadmaps:
 - Roadmap for using COTs with the standard SnPb Assembly Process on standard leaded PCBs. This is very urgent since it is necessary for the widespread introduction of COTs in Space Programmes
 - Roadmap for using lead-free PCBs with the standard SnPb Assembly Process. This is also urgent since related to the use of high pin-count ICs
 - Roadmap for assessment of Sn whiskers mitigation approach. This is also urgent since as it is necessary for the widespread introduction of COTs in Space Programmes

Main Points:

- **Roadmap for the introduction of lead-free solder alloys.**
For this Roadmap we have assessed that:
 - In the short term (< 5 years): no risk associated with regulation or obsolescence of SnPb solder
 - In the medium term (< 10 years): very low risk from Regulation and very low risk associated with SnPb solder obsolescence
 - In the long term (> 10 years): low risk from the Regulatory side and potential risk associated with SnPb materials obsolescence.

Road Maps relationship:



Road Maps targets:

ECSS standards for Pb free assembly

Workmanship standards

Fatigue models for assembly

Impact of Pb free assembly
processes on PCB

Assembly reliability
characterization

Pb free alloys
selection

Pb free alloys
characterization

Impact of Pb free
assembly on EEE
parts (ESCC)

Assessment of component
finishes for use with SnPb
processes

Assessment of Sn Whiskers
mitigation methods

Assessment of Pb free finishes
of PCBs

Next

- **A new temporary Working Group has been created under MPTB, but also reporting to CTB, in order to promote the Roadmap and monitor its implementation.**
- **The LFTWG was kicked off in November 2021**
- **Members of the groups are from CNES, DLR, ESA, UK-Space, Arianespace, Airbus, ICME, Ruag, Sodern, Tesat, Thales.**
- **The LFTWG has the goal to coordinate and promote the implementation of the Road Maps and actively seek collaboration with other High Reliability sectors which are also affected by the transition.**

What is happening elsewhere

US Congress Approves Funds for R&D on Pb-Free Electronics in High-Rel Applications ([/ca/editorial/menu-news/34765-us-congress-approves-funds-for-r-d-on-pb-free-electronics-in-high-rel-applications.html](https://ca/editorial/menu-news/34765-us-congress-approves-funds-for-r-d-on-pb-free-electronics-in-high-rel-applications.html))

Published: 22 December 2020
by Mike Buetow

BANNOCKBURN, IL – The US Congress on Monday approved \$10 million for research into the issues surrounding lead-free electronics in mission-critical applications.

The funds are part of the fiscal 2021 defense appropriations bill, which President Trump is expected to sign.

A number of trade groups including IPC had called for these funds to be included under the assertion that the high-rel sector has been slow to adopt lead-free materials, putting it at risk of falling behind best practices.

IPC said industry experts believe a five-year, \$40 million investment in a public-private R&D program would yield more than \$100 million in US defense savings per year and improve military readiness and overall innovation. The Congress provided \$5 million for such R&D in FY 2020.

Over the past 15 years, the commercial electronics industry has largely phased out its use of lead in electronic components and circuit board assemblies, driven by government regulations and concerns about lead's harmful effects on human health and the environment. However, the aerospace, defense and high-performance (ADHP) sectors have been reluctant to migrate to lead-free electronics because there is inadequate data on the reliability of lead-free components in ADHP applications.

The gap between commercial and defense electronics is growing wider as lead-free becomes more established in commercial technologies, and as governments – particularly in Europe – have implemented more stringent rules on the use of lead. Today's defense electronics are now 15 to 20 years behind the commercial market in terms of the underlying materials used, undermining supply chain resiliency and technological superiority.

"This vote is a win for US taxpayers, defense readiness, and the electronics industry supply chain," said Chris Mitchell, vice president of global government relations.

"The migration of the commercial industry to lead-free electronics has created supply-chain concerns for the defense sector that can only be overcome through public-private R&D," he added. "These funds will support a collaborative effort that will help ensure that mission-critical systems have full access to cutting-edge electronics from a robust global supply chain."

"Together with our partners in the Pb-Free Electronics Risk Management (PERM) Council, IPC will continue to take a proactive, long-term approach to this issue," Mitchell added.

<https://www.purdue.edu/newsroom/releases/2021/Q1/purdue-to-co-lead-u.s.-department-of-defense-funded-project-to-advance-adoption-of-lead-free-electronics.html>

The US Congress approved \$10 million for research into the issues surrounding lead-free electronics in mission critical applications as part of the 2021 fiscal appropriations bill



The European Space Industry needs to take actions in order to maintain its competitiveness in electronic manufacturing in the medium term.

Thank you for your attention

Any Questions?