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GROUP 1 MACHINE PRODUCERS

EASA Meeting June 28 / 29 2018

TCH, machine producer, regulator, standardisation body etc					
First name	Family Name	Job Title	Organisation		E-mail address
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Input Categories

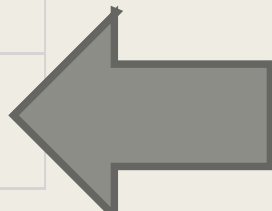
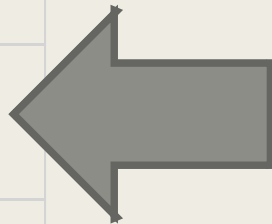
1. Information/knowledge we need from other groups
 - *45 items*
2. Information/knowledge we think that other groups probably need from us
 - *10 items*
3. Ideas on how information and knowledge could be shared
 - *4 items*
4. Information on other activities/organizations that are involved or should be involved in this general area
 - *1 item*

Item 1: Info We Need: Subcategories

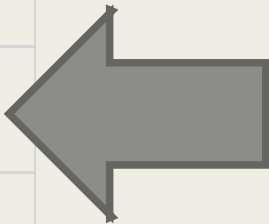
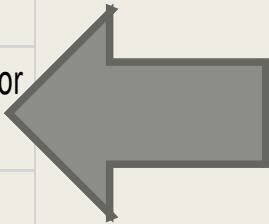
- Airworthiness
- Facility qualification
- Machine operation / features
- Machine qualification
- Organizational
- Part family qualification
- Part repair qualification
- Quality assurance
- Roadmap of component qualification
- Roadmap of future applications
- Sourcing
- Type certification

Name	Organization	Subcategory	Input
M. Petelet / J. Ortner	GE Additive	Airworthiness	Whom and how are Airworthiness Directives issued and determined, when a safety critical issue is identified
Vinu Vijayan / Lukas Fuchs	EOS	Facility qualification	How to "quantify" any change to an AM based facility in terms of, if it affects the airworthiness of its products etc.?
Simon Merkt-Schippers / Julia Moll	TRUMPF Laser	Machine operation / features	Clear requirements for powder recycling / powder handling (Inert vs. Ambient) depending on material
N. Giannelli / R. Brandt	Stratasys	Machine operation / features	How are drawing callouts incorporating pre-processing settings?
N. Giannelli / R. Brandt	Stratasys	Machine operation / features	How do they plan on storing and archiving build-files?
Vinu Vijayan / Lukas Fuchs	EOS	Machine operation / features	Nature/Amount of 'layer level' process monitoring & reliability that would ensure confidence on the end part
Simon Merkt-Schippers / Julia Moll	TRUMPF Laser	Machine qualification	All OEMs bring their "own" individual requirements for machine producers (e.g. for FAT, SAT, Training, IQ, OQ) --> standardisation of offerable packages difficult; What do we need: Clarity about requirements and one aligned procedure that we can follow
Simon Merkt-Schippers / Julia Moll	TRUMPF Laser	Machine qualification	One pre-defined acceptance build job (Aerospace build job) for geometrical and mechanical assessment of machine capability
Vinu Vijayan / Lukas Fuchs	EOS	Machine qualification	what levels of flexibility could be afforded software 'versions'/'updates' on AM system for a certified process?

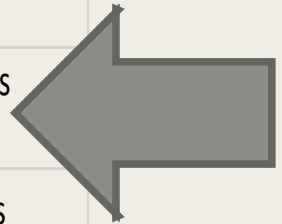
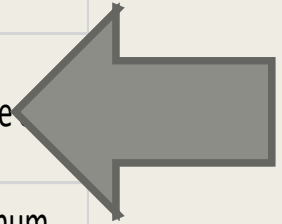
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N. Giannelli / R. Brandt	Stratasys		Design to fab workflow?
Vinu Vijayan / Lukas Fuchs	EOS	Organizational	Changes in the DO organizational struc that would be needed (according to EASA) in terms of DCS/DER etc. required to "include" AM in certifications/type certifications - existing DCS for e.g. for metallic matreials & process will be further AM 'educated'? And how can Group1 support this
Vinu Vijayan / Lukas Fuchs	EOS	Part family qualification	EASA's approach to categorize (AM driven) changes at a part level in terms of Minor or major modification?
N. Giannelli / R. Brandt	Stratasys	Part repair qualification	Is there opportunity for repair parts to be designed for the process and still be an approved replacement? Who dictates this?
Richard Grylls	SLM Solutions	Quality assurance	We need to understand how our in-situ process monitoring is viewed by regulators and how the data could be used to assist qualification.
N. Giannelli / R. Brandt	Stratasys	Quality assurance	What level of statistical process control is needed during part production?
Vinu Vijayan / Lukas Fuchs	EOS	Quality assurance	Amount of manufacturing process tracability & documentation required for parts on in-service aircrafts / what could be 'adequate' configuration control of AM manufactured parts?
Vinu Vijayan / Lukas Fuchs	EOS	Quality assurance	what kind of Quality escape procedures/strategy is required from the Authority side?
M. Petelet / J. Ortner	GE Additive	Quality assurance	Can regulatory bodies , TCHs, AM part suppliers provide guidance for drafting a SB for machine changes and best practices for sharing the right level of information?



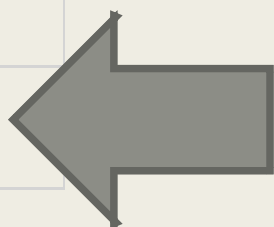
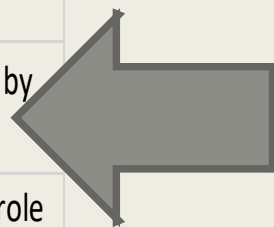
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N. Giannelli / R. Brandt	Stratasys	Roadmap of component qualification	Are they familiar with the NCAMP equivalency process?
N. Giannelli / R. Brandt	Stratasys	Roadmap of component qualification	Is the NCAMP equivalency process widely accepted and used?
N. Giannelli / R. Brandt	Stratasys	Roadmap of component qualification	If NCAMP equivalency is not accepted, what changes are suggested or required.
N. Giannelli / R. Brandt	Stratasys	Roadmap of component qualification	EASA: applicable norms and rules for implementing FDM as manufacturing technology for end-use parts production
N. Giannelli / R. Brandt	Stratasys	Roadmap of component qualification	How much does structural analysis and process simulation play into adoption/qualification?
N. Giannelli / R. Brandt	Stratasys	Roadmap of component qualification	What are your thoughts on inspection? Visual inspection vs. NDI
N. Giannelli / R. Brandt	Stratasys	Roadmap of component qualification	How do we integrate finishing into testing? Full work flow vs. just AM fabrication
N. Giannelli / R. Brandt	Stratasys	Roadmap of component qualification	Are witness coupons viewed as necessary?
N. Giannelli / R. Brandt	Stratasys	Roadmap of component qualification	Are witness coupons viewed as useful?
N. Giannelli / R. Brandt	Stratasys	Roadmap of component qualification	What opportunity is there to create new testing methodologies that are geared towards AM?
N. Giannelli / R. Brandt	Stratasys	Roadmap of component qualification	Who owns the decision of AM vs traditional? Exchange contacts
N. Giannelli / R. Brandt	Stratasys	Roadmap of component qualification	How do they plan on tracking a part to a particular build or material lot?



Name	Organization	Subcategory	Input
Vinu Vijayan / Lukas Fuchs	EOS	Roadmap of component qualification	what is EASA's strategy/first ideas to establish "acceptable" quantitative levels of inspection, in an AM based serial production set up, which should lead to confidence part quality
Vinu Vijayan / Lukas Fuchs	EOS	Roadmap of component qualification	First view from EASA/Group 3b in terms of what "could" be the (overarching) minimum requirements, for AM, to comply with regulations such as EASA part 145
Vinu Vijayan / Lukas Fuchs	EOS	Roadmap of component qualification	EASA / standardization body's understanding of "equivalence strategies"
Vinu Vijayan / Lukas Fuchs	EOS	Roadmap of component qualification	How explicitly should integration / adoption on AM (or any manf technology) should be included at a product specification/ certification specification
M. Petelet / J. Ortner	GE Additive	Roadmap of component qualification	Guidance from TCHs, AM part suppliers on how process parameters are classified as significant and how they should be defined?
M. Petelet / J. Ortner	GE Additive	Roadmap of component qualification	Process or machine output data that simplifies or would aid the certification process
Simon Merkt-Schippers / Julia Moll	TRUMPF Laser	Roadmap of future applications	Roadmap of applications / materials that will come in the next year --> We want to adapt our processes and machine offerings to these roadmaps
N. Giannelli / R. Brandt	Stratasys	Roadmap of future applications	What level of criticality of parts are being looked at for initial adoption of AM? Longer term adoption?
N. Giannelli / R. Brandt	Stratasys	Roadmap of future applications	What material properties are driving the next rounds of certification?
Vinu Vijayan / Lukas Fuchs	EOS	Roadmap of future applications	what kind of changes to requirements definition & compliance planning are foreseen in long term to accomodate AM driven design in aerospace



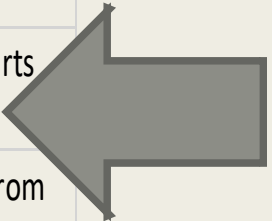
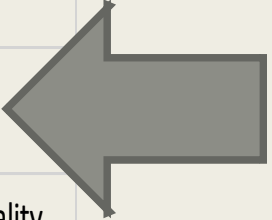
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N. Giannelli / R. Brandt	Stratasys	Sourcing	How critical is secondary sources needed for: raw material, consolidated material, machines?
Vinu Vijayan / Lukas Fuchs	EOS	Type certification	How can a existing TC be effected if an existing part (safety critical or not) be replaced by an optimized AM part with at least same functionallity and reliability?
M. Petelet / J. Ortner	GE Additive	Type certification	How do the regulatory bodies and TCHs see the AM machine manufacturer and their role into the process certification?
M. Petelet / J. Ortner	GE Additive	Type certification	Data storage (including duration) requirements for certified application as defined by TCH or reg. body
M. Petelet / J. Ortner	GE Additive		Current perception of limitations and risks associated with additive manufactuing adoption for serial production



Item 2 – Info We Think Other Groups Might Need

- Deep process understanding
- DfAM training
- Qualification support
- Shared best practices

Name	Organization	Subcategory	Input
Vinu Vijayan / Lukas Fuchs	EOS	Deep process understanding	how sensitive is the quality of a part from an AM system to the parameters in the AM system
Vinu Vijayan / Lukas Fuchs	EOS	Deep process understanding	Can we 'Group1' establish a first list of system and process parameters that could be considered as " will definitely have an effect on the part quality"?
N. Giannelli / R. Brandt	Stratasys	DfAM training	Design for additive, in particular FDM. Often the technology adoption is delayed or discarded only in consequence of part design
M. Petelet / J. Ortner	GE Additive	DfAM training	DfAM and Additive Manufacturing best practices and limitations specific to our modality.
Simon Merkt-Schippers / Julia Moll	TRUMPF Laser	Qualification support	Guidance and support for certification --> Robust machines and reliable processes; Comprehensive (online) monitoring solutions; Machine acceptance tests, maintenance contracts, trainings, benchmarks, procedure for powder recycling, studies for machine capability, mechanical properties (also fatigue)
N. Giannelli / R. Brandt	Stratasys	Qualification support	Qualification process for FDM materials through NCAMP equivalency process
M. Petelet / J. Ortner	GE Additive	Qualification support	Guidance to TCHs, AM part suppliers on critical process parameters based on previous experience that could be classified as significant
Vinu Vijayan / Lukas Fuchs	EOS	Shared best practices	Best practises from current work done to support Aerospace OEMs for AM based parts qualification?
Vinu Vijayan / Lukas Fuchs	EOS	Shared best practices	Projects in pipeline that are aimed at improving confidence in systems & processes from an aerospace certification team
M. Petelet / J. Ortner	GE Additive	Shared best practices	Process control best practices



Item 3 – Ideas on how information and knowledge could be shared

Simon Merkt-Schippers / Julia Moll	TRUMPF Laser	Regular workshops, new norms and standards, newsletters
N. Giannelli / R. Brandt	Stratasys	Identify for each company/insitution a person / department responsible for information exchange and acting as channel between all the groups
N. Giannelli / R. Brandt	Stratasys	Eventually distribution list of a periodic email driven by EASA on updates from all the components of the groups
M. Petelet / J. Ortner	GE Additive	Session in international event gathering TCHs, AM art suppliers, AM machine suppliers for sharing information focusing on barriers and benefits to AM adoption - moderated by regulatory bodies

Item 4 – Other Organizations

Name	Organization	Input
Simon Merkt-Schippers / Julia Moll	TRUMPF Laser	Software companies

Starting Point for Group 1

- We need guidance on the aerospace manufacturing qualification process (machine, part, facility, process, personnel)
 - We need guidance on change management
 - We need understanding of the 5-year roadmap
 - We need our engineers to better understand part or application certification in aviation
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- We want Group 1 to provide expert AM process knowledge to EASA, TC holders, part suppliers
 - We want you all to be able to use the processes well