

# H2020 EPICEA PUBLIC WORKSHOP 13 JUNE 2019

ELECTROMAGNETIC PLATFORM FOR LIGHTWEIGHT  
INTEGRATION/INSTALLATION OF ELECTRICAL  
SYSTEMS IN COMPOSITE ELECTRICAL AIRCRAFT

## DISCUSSION AND QUESTIONS

OFFICE NATIONAL  
D'ETUDES ET DE  
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## TRL ACHIEVEMENT ON EM VALIDATION ACHIEVED ?

- Fully-numerical EM validation is successively achieved:
  - Large methodological knowledge developed on NTC1 and NTC2
  - Comparison to numerical results fully achieved on ETW configurations on NTCs and the EPICEA barrel
- Experimental validation is « acceptable » on MTLN and antenna configurations if we consider the following challenges:
  - Tests carried out at distance
  - Numerical simulations performed in a remote time (time and distance constraints)
    - Unexpected time for computer developments and validation
    - Unexpected delays in mock up modifications
  - Complexity of the mockup
    - Size and weight of the mockup
    - SGN and CRN leading to non usual grounding practices
    - Unknown material constitution
    - Uncontrolled parameters: quality of electrical contacts, cable parameters and geometry
    - Some installation conditions still under question
    - Some test measurements still under questions (non linear effects on LIE, S-parameter measurement with cables)



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## TRL ACHIEVEMENT ON EM WHAT TO DO TO IMPROVE TRL 4

### On the cooperative platform

- Avoid some still existing out of platform actions
  - Model CRN/SGN as MTLN
  - CRN/SGN common mode impedance calculation with MoM code
  - Massive post processing
    - BUT the platform is a real OPEN environment to import data
    - There will be always models to be improved for physics reliability

### On the reference measurements

- Build physically NTCs
  - Even if such types of results already exist in the open literature made outside the EPICEA platform environment
- Perform verification tests on the mockup:
  - Tune and simulate at the same time
    - Check grounding braids of equipment
    - Check linearity of results (LIE)
    - Check influence of coaxial cables for S-parameter measurements (ISW)
- Extend EPICEA barrel applications (real equipment boxes) for EM susceptibility and EM emission assessment



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## TRL ACHIEVEMENT ON EM WHAT TO DO TO GO OVER TRL 4 ?

### Transition: “technology demonstration”

- Improvement of the EPICEA platform (see TRL4)
- Extend capabilities (Heating of cables ?, global optimization process...)
- Plug other modules (BA's 3D solvers ?)
- Prepare cable architecture environment (end users) for EM simulation

### “Component and/or breadboard validation in a relevant environment”

- Apply the process and platform in an industrial program with real cable architecture
- Global optimization on weight/geometry/EM protection and heating
- Compare to real standards (ARPs, AMCs)



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## SOME QUESTIONS TO THE AUDIENCE

- Cooperative modelling
- IS modelling
- Antenna modelling
- CR activity



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## SOME QUESTIONS TO THE AUDIENCE *COOPERATIVE EM MODELLING*

- Feed back on this approach?
- Willingness to be part of it ? Ready to cooperate ?
- Interest seen in this approach ?
- What is missing to be convinced to apply it ?
- How and where to evolve ? Multi physics ? EM Standards ?



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## SOME QUESTIONS TO THE AUDIENCE *IS MODELLING*

- Feed back on capabilities demonstrated ?
- How to manage IS integrity with a massive composite structure ? One merged CRN/SGN or one CRN + one SGN ?
- What level of complexity to be reached for real validation ?
- For which objective ?
  - Design, qualification ?
- How to get missing information on equipment impedance ?
- Future evolution of such modelling approach ?



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## SOME QUESTIONS TO THE AUDIENCE *ANTENNA MODELLING*

- Feed back on capabilities demonstrated ?
  - On realization
  - On modelling
- How to really test the scale 1 effect of the carrier ?
- What is the real impact of the composite material ?
  - On antenna performance ?
  - On antenna installation (lightning protection)



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## SOME QUESTIONS TO THE AUDIENCE *CR ASSESSMENT*

- Do you feel concerned by CR on aircraft ?
  - Some experience on CR events already ?
- Your feedback about EPICEA results ?
- Is there finally an impact of the composite material ? Are there applicable protection measures except lowering exposure time ?
- What impact to you foresee of such investigations at aircraft level ?
  - On airborne equipment ?
  - On crew and passengers ?

