

Particle Impact Risk and Vulnerability Assessment Tool PIRAT

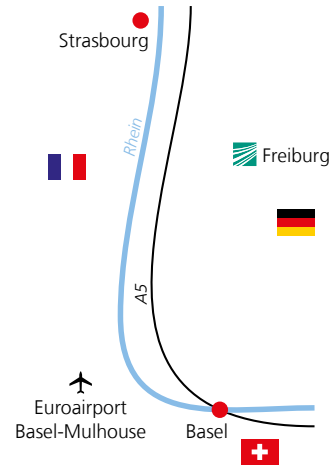
The risk for operational satellites of being impacted by small particles is increasing due to the rising amount of space debris in Earth orbits. Even collisions with small particles from sizes of one millimeter upwards can have fatal consequences for satellites, if such particles hit mission-critical equipment placed behind the spacecraft structure.

During the past 16 years, researchers at the Fraunhofer Institute for High-Speed Dynamics, Ernst-Mach-Institut, EMI, in Freiburg have developed the computational methodology and software tool PIRAT Particle Impact Risk and Vulnerability Assessment Tool. PIRAT computes the failure probability from hypervelocity impacts of space debris and micro-meteoroids for each individual spacecraft component.

Spacecraft design engineers use PIRAT to determine the “weak points” in the satellite design with regards to hypervelocity impacts. PIRAT allows to define and to explore easily protection measures for particularly exposed components during early spacecraft design stages. PIRAT quantifies the benefit gained from application of specific protection measures. PIRAT was introduced in 2014 in the European Space Agency's (ESA's) Concurrent Design Facility (CDF) as a tool to support ESA's engineers during Phase 0/A of spacecraft design. The software is available for licensing from EMI.

Workshop content

This workshop provides you with a comprehensive overview in hypervelocity impact effects on spacecraft components and the methods to derive spacecraft equipment survivability numbers based on it. Owing to 25 years of experimental analysis of spacecraft component failures under hypervelocity impacts, Fraunhofer EMI is offering you a unique experience in designing spacecraft systems with high robustness against particle impacts. Each participant at the workshop will receive a trial version of PIRAT and experience hands-on training by the developers of PIRAT.



CONTACT

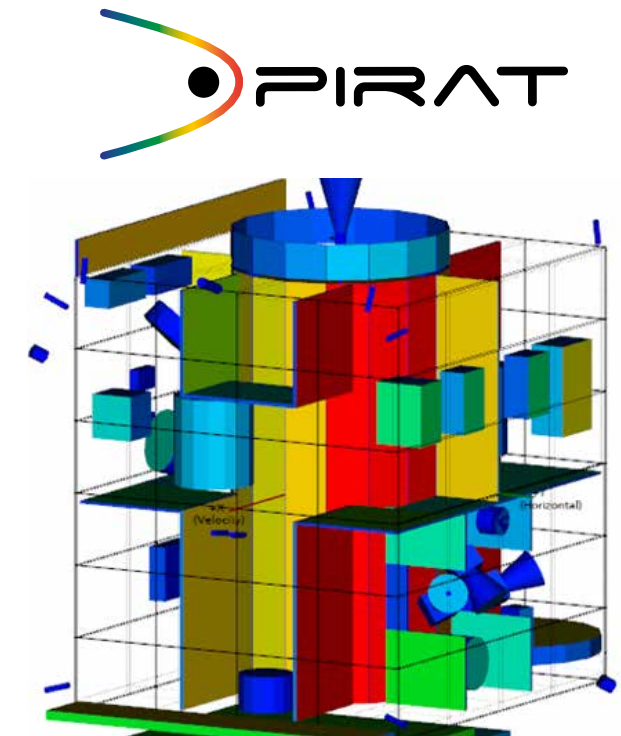
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3rd PIRAT WORKSHOP Program



NOVEMBER 29–30, 2017

WEDNESDAY, NOVEMBER 29, 2017

- 12.30** Arrival, registration, lunch snack
- 13.30 – 14.15** **Opening session**
DLR's Eu: CROPIS Mission – Overview and Protection Design
Olaf Eßmann, Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR)
- 14.15** **I) Welcome, outlook for the day, participants' expectations**
Scott Kempf, all
- Overview of Fraunhofer EMI
Frank Schäfer
- II) Meteoroid and space debris risk assessment**
Space debris and meteoroid flux models and impact probabilities
Frank Schäfer
- Hypervelocity impact effects, component failure modes, and ballistic limit equations
Frank Schäfer
- Methodology for meteoroid and space debris risk assessment
Frank Schäfer
- III) Vulnerability analyses and hands-on training with PIRAT**
Hand out of PIRAT evaluation kit and installation*
EMI team
- Introduction to vulnerability analyses in early phases of mission development with PIRAT
Scott Kempf
- PIRAT quick start
Scott Kempf
- 18.30** Get-together at EMI including facility tour

THURSDAY, NOVEMBER 30, 2017

- 9.00** *Workshop day 2*
- IV) Vulnerability analysis and hands-on training with PIRAT (continued)**
- Computational methodology – BLEs and orbital flux
Scott Kempf
- PIRAT tutorial – material characteristics and orbital flux
Scott Kempf
- Computational methodology – geometrical analysis
Scott Kempf
- PIRAT tutorial – geometric configuration and analysis settings
Scott Kempf
- Q&A session and conclusion of tutorial
Scott Kempf
- 13.00** Lunch
- 14.00** End of workshop

*All on-site participants, requires MS Windows operating system

REGISTRATION AND ORGANIZATIONAL NOTES

The workshop language is English.

Registration fee

Registration fee 120 euros

Ministries and public authorities are free of charge.

Included in the registration fee:

- PIRAT evaluation kit
- Lunch and coffee breaks
- Get-together

Payment

Bank transfer.

After registration, you will receive an invoice with the bank details.

Off-site participation: Access will be granted through web conference (restricted number of participants).

