DROPTES - A UN FELLOWSHIP PROGRAM

AT THE BREMEN DROP TOWER

March 09, 2016

UNITED NATIONS WORKSHOP ON HUMAN SPACE TECHNOLOGY,
SAN JOSÉ, COSTA RICA

Dr. Thorben Könemann
ZARM Drop Tower Operation and Service Company
WWW.ZARM.UNI-BREMEN.DE

Universität Bremen*

*EXZELLENT.
Gewinnerin in der
Exzellenzinitiative

CENTER OF
APPLIED SPACE TECHNOLOGY
AND MICROGRAVITY

ZARM

ZARM‘s Organization Structure

founded in 1985

ZARM - Center of Applied Space Technology and Microgravity

c/o University of Bremen
Am Fallturm, 28359 Bremen, Germany
www.zarm.uni-bremen.de

ZARM - University of Bremen

Research Institute - Faculty 04 Production Engineering

Prof. Dr. Marc Avila
(Executive Director)

Prof. Dr. Claus Lämmerzahl
(Director Space Science)

Prof. Dr. Claus Braxmaier
(Director Space Technology)

Prof. Dr. Marc Avila
(Director Fluid Dynamics)

ZARM FAB mbH

ZARM Drop Tower Operation and Service Company

Prof. Dr. Claus Lämmerzahl
Peter von Kampen
(Executive Board)

Christian Eigenbrod
Dr.-Ing. Thorben Könemann
Ulrich Kaczmarczik
(Scientific / Technical Management)

ZARM Technik AG

Supplier of Attitude Control Equipment for Satellites

Holger W. Oelze
(Chief Executive Officer)

Peter von Kampen
(Chief Financial Officer)

Marco R. Fuchs
(Chairman of Supervisory Board)

- Research / Teaching
- Technical Support
- Space Hardware

ZARM's Student Programs

Support of Young Scientists

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DropPS
- ZARM -

Drop Tower Project for School Students
- DLR_School_Lab -

DropTES
- UNOOSA -

Drop Tower Experiment Series

UNITED NATIONS
Office for Outer Space Affairs

DLR

- Bremen Drop Tower

Drop Your Thesis!
- ESA Education Office -

Drop Tower Experiment Series

drop your thesis!

esa

- Bremen Drop Tower

REXUS / BEXUS
- DLR / SNSB -

Sounding Rocket and Ballon Experiment Series

DLR

RYMDSTYRELSEN
Swedish National Space Board

- Esrange Space Center
  Kiruna, Sweden

Förderverein ZARM e.V.

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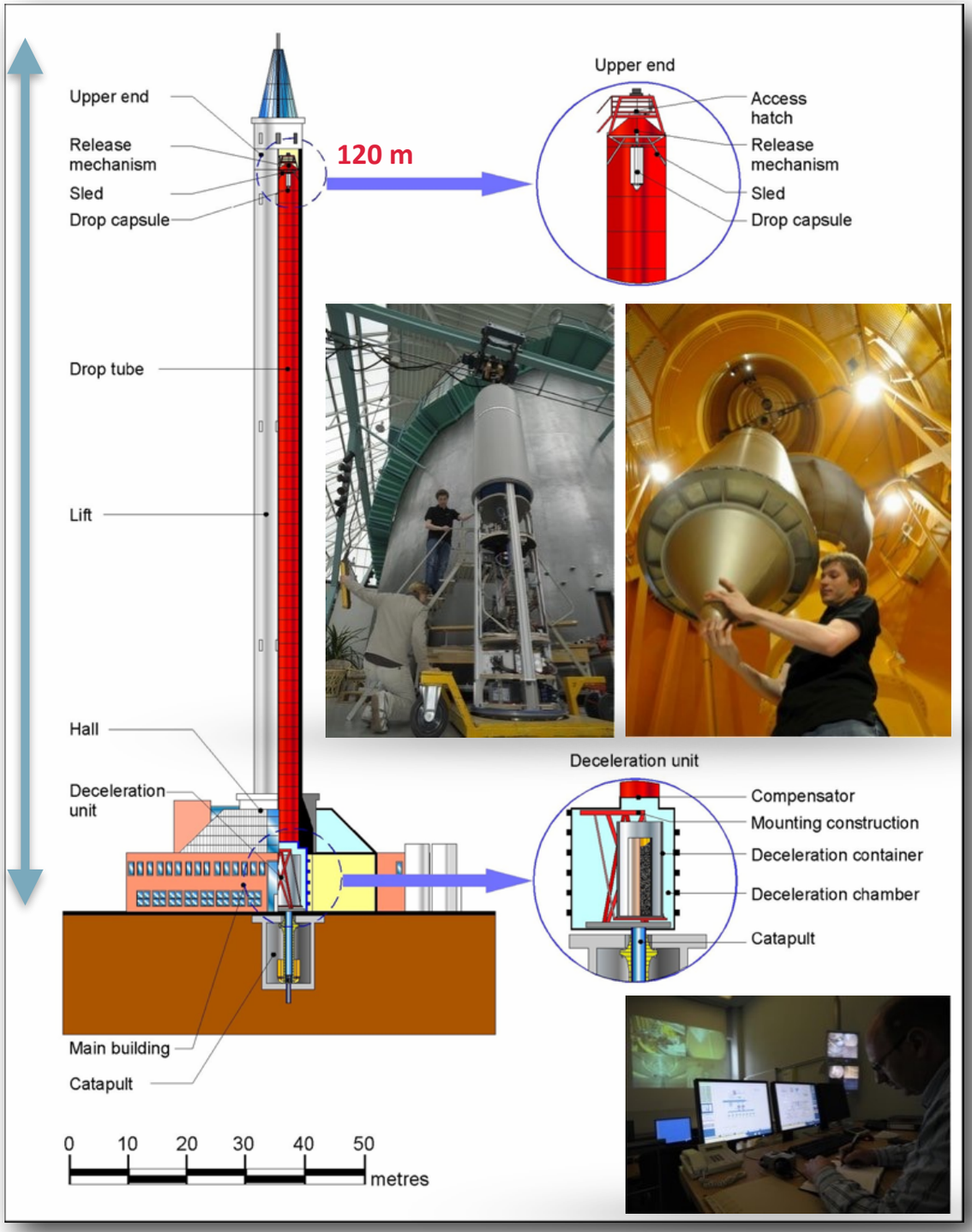
The Bremen Drop Tower - Introduction

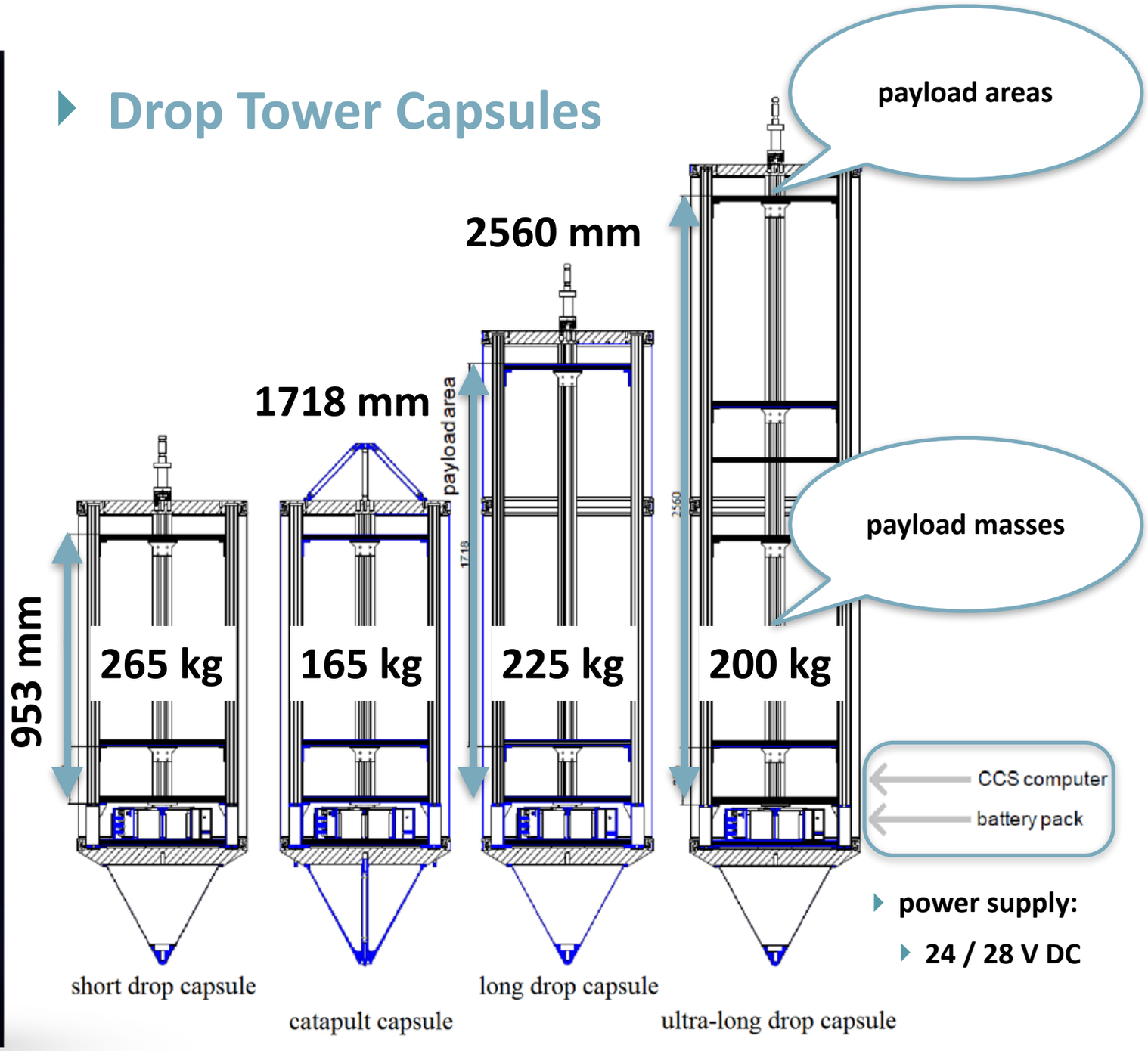
operation started in 1990



- drop mode:
  - 4.74 s in weightlessness
  - highest quality - 10^{-6} g (µg)
  - decelerations of up to 50 g
- catapult mode:
  - worldwide unique system
  - 9.3 s in weightlessness
  - highest quality - 10^{-6} g (µg)
  - accelerations of up to 30 g
  - decelerations of up to 50 g
- daily operations (up to 3 times)
- on-site technical support

The Bremen Drop Tower - Introduction

Drop Tower Capsules



- power supply:
  - 24 / 28 V DC

The Bremen Drop Tower - Operation

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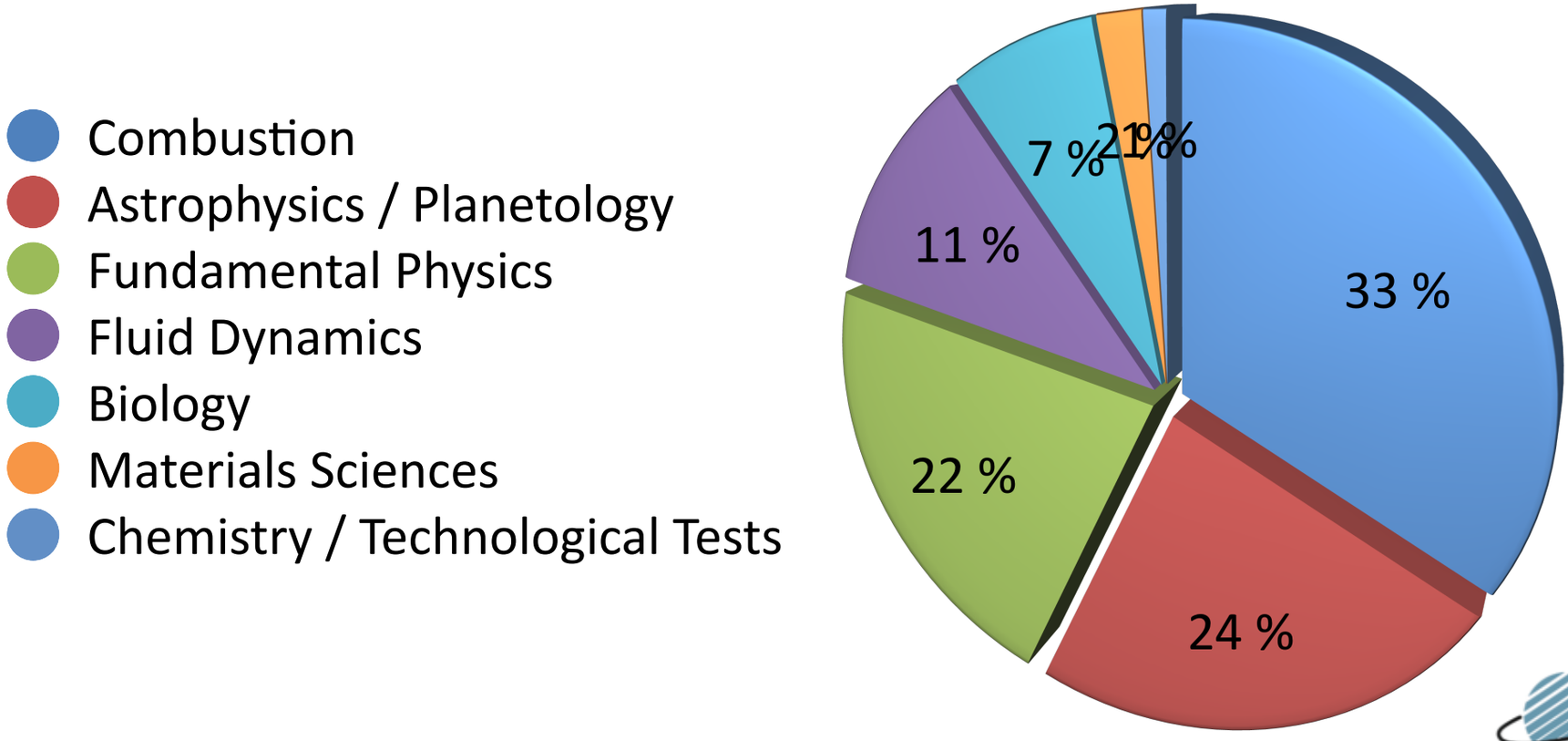
The Bremen Drop Tower - Facts and Figures

- Since the Start of Operation in 1990
  - over 7500 drops / catapult launches have been conducted
  - more than 200 different experiment types have been integrated
  - within international collaborations from over 40 countries
- Research Fields of Drop Tower Experiments
  - fundamental research / mission preparations



The Bremen Drop Tower - Facts and Figures

- Scientific Access to the Bremen Drop Tower
  - National Research Program by the German Aerospace Center (DLR)
    - via DLR Space Administration
      -> Microgravity Research and Life Sciences Program
  - Research Programs by the European Space Agency (ESA)
    - via ESA Human Spaceflight and Exploration
      -> Continuously Open Research Announcement (CORA)
    - via ESA Education Office
      -> „Drop Your Thesis!“ Student Program
  - International Research Cooperations / Bilateral Collaborations
  - United Nations Fellowship Program „DropTES“ (Student Program)
  - Scientific Utilization of the Bremen Drop Tower is free of charge including Technical Support (Positive Proposal Evaluation)

Gefördert durch:
Bundesministerium für Wirtschaft und Energie
aufgrund eines Beschlusses des Deutschen Bundestages

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DropTES - Drop Tower Experiment Series

- General Program Information

  - United Nations Human Space Technology Initiative (UN-HSTI) Fellowship Program

  - Annual HSTI Science Activity at the Bremen Drop Tower

- First Cycle was initiated by UNOOSA, DLR, and ZARM in 2014
  - Executing Agency:
    United Nations Office for Outer Space Affairs (UNOOSA)
  - Supporting Agency:
    German Aerospace Center (DLR) Space Administration
  - Hosting Institution:
    Center of Applied Space Technology and Microgravity

DropTES - Drop Tower Experiment Series

- General Program Information
  - open to student research teams from entities that are Member States of the United Nations
  - research teams should consist of up to four Bachelor, Master and/or PhD students who must be endorsed by an academic supervisor
  - allows to realize a real space / microgravity research project
  - shall be an integral part of the student's syllabus, e.g. as Bachelor, Master and/or PhD theses
  - follows space project guidelines (proposal, reports, reviews)
  - each drop tower experiment series consists of four drops or catapult launches which have to be conducted within one week
  - travel, accommodation, and drop tower utilization are sponsored
  - program language: English / program duration: May - March / experiment series at the Bremen Drop Tower: November

DropTES - Drop Tower Experiment Series

DropTES - Schedule

UNITED NATIONS
Office for Outer Space Affairs

DLR

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Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Announcement of Opportunity			Selection	Experiment Preparation						Exp. Series	
					1. Report	CDR		2. Report			
Final Report (previous campaign)			Outreach Activities (previous campaign)						Announcement of Opportunity (next campaign)		

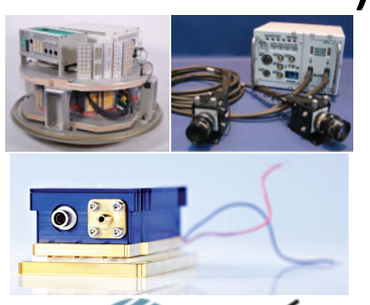
Selection Process:

- proposal evaluation by selection board (UNOOSA, DLR, and ZARM)
- one research team per DropTES cycle will be selected each year

Experiment Preparation (Home Laboratory):

- assisted by ZARM (consulting, drawings, manufacturing of hardware)

Experiment Series (Bremen Drop Tower):



- experiment integration (drop tower capsule) - first week
- experiment drops or catapult launches - second week

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DropTES - Drop Tower Experiment Series

DropTES - Schedule

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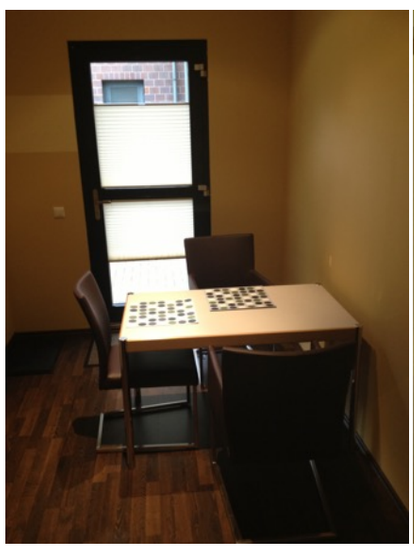
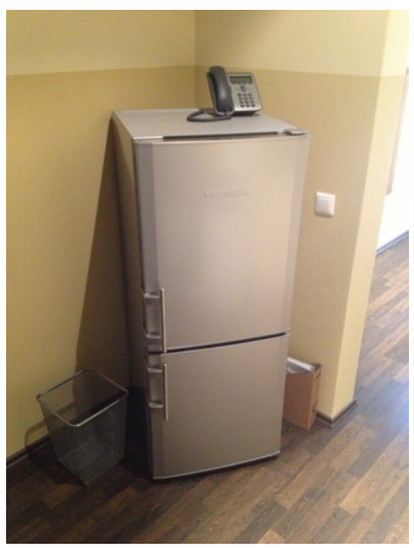
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Announcement of Opportunity			Selection	Experiment Preparation						Exp. Series	
					1. Report	CDR		2. Report			
Final Report (previous campaign)			Outreach Activities (previous campaign)						Announcement of Opportunity (next campaign)		

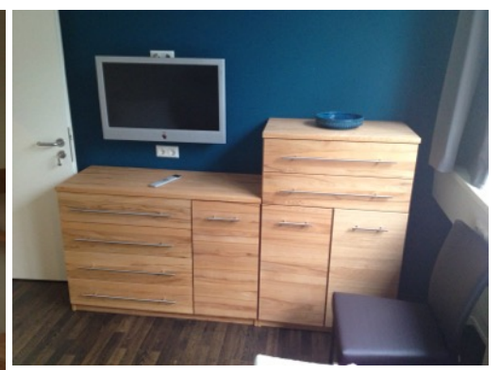
Experiment Series (Accommodation):

- academic supervisor - in a hotel next to the drop tower
- up to four students - in ZARM's apartment at the facility on side

- Weather Conditions -
Bremen in November (avg.)
max. 8.0°C / min. 2.3°C
sun: 1.8 h/d, rain: 11.5 d





- two separate rooms with two beds each

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DropTES - Drop Tower Experiment Series

- Report on First Cycle - 2014

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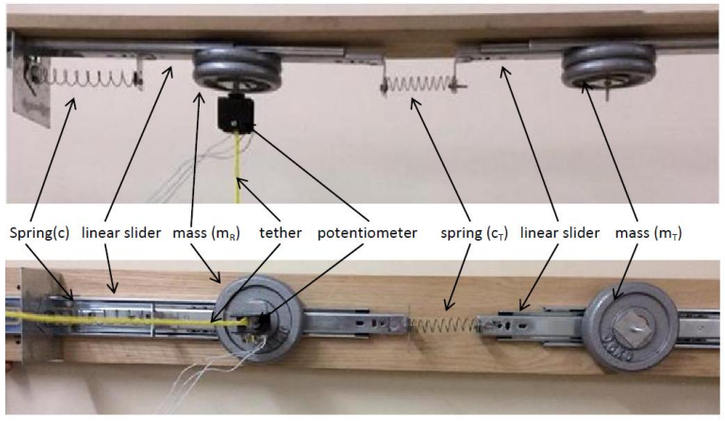
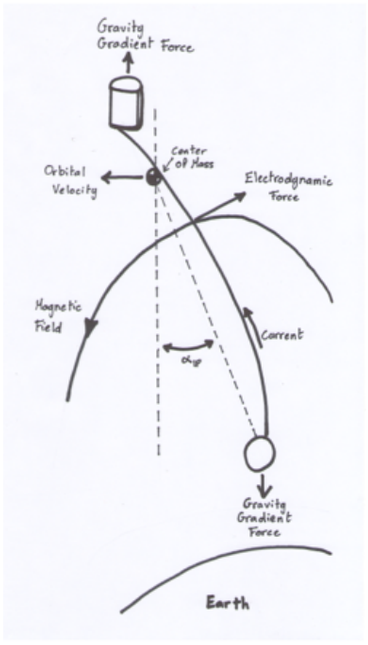
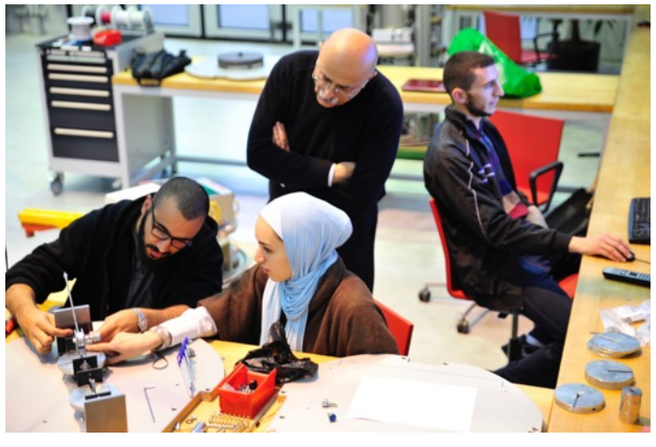
DLR ZARM

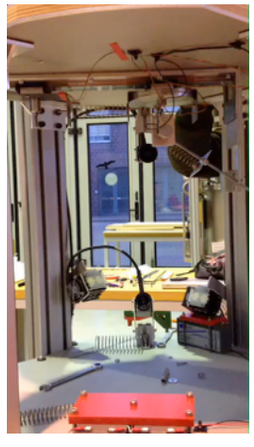
  - Student Team from the German Jordanian University (GJU) selected „Stabilizing the Electrodynamic Tether by using Tilger“
  - Experiment Preparation at GJU in Jordan

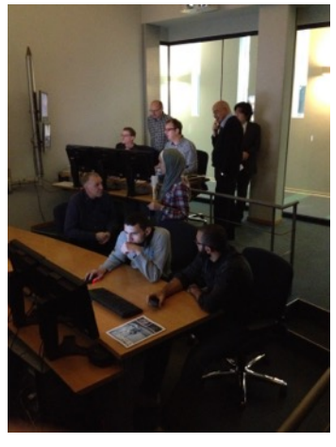


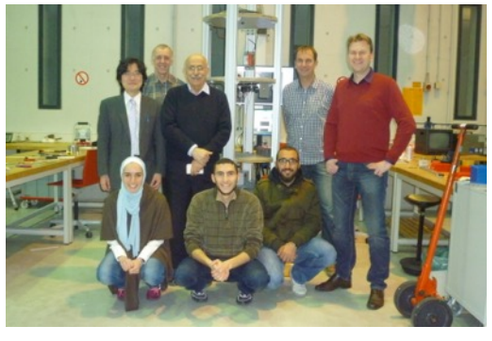


- Experiment Integration and Series at the Bremen Drop Tower









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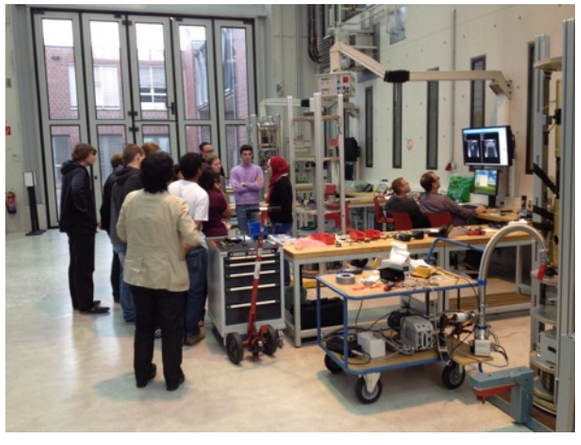
DropTES - Drop Tower Experiment Series

- Report on First Cycle - 2014

  - Student Team from the German Jordanian University (GJU) selected „Stabilizing the Electrodynamic Tether by using Tilger“

  - „Drop Tower Experiment Series“ 2014 - Impressions



- Presentation by Prof. Nabil Ayoub (GJU)

  „Tuned Mass Damping System for a Pendulum in Gravity and Microgravity Fields“

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DropTES - Drop Tower Experiment Series

- Report on Second Cycle - 2015

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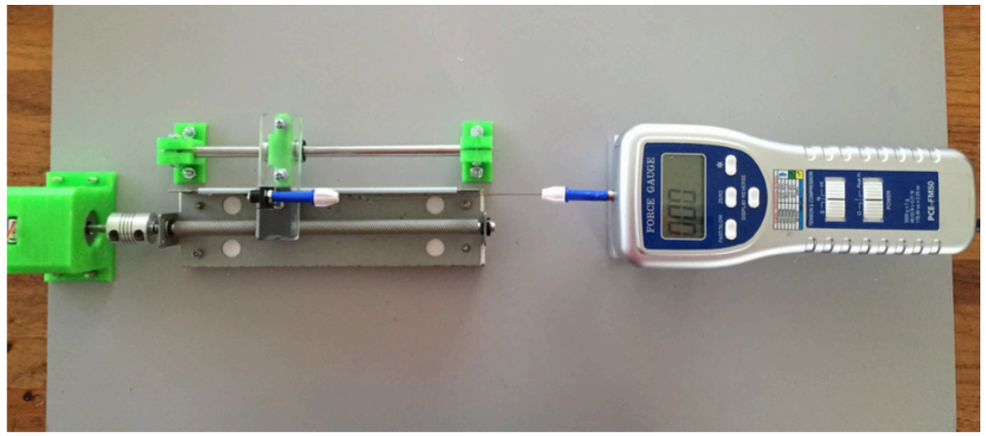
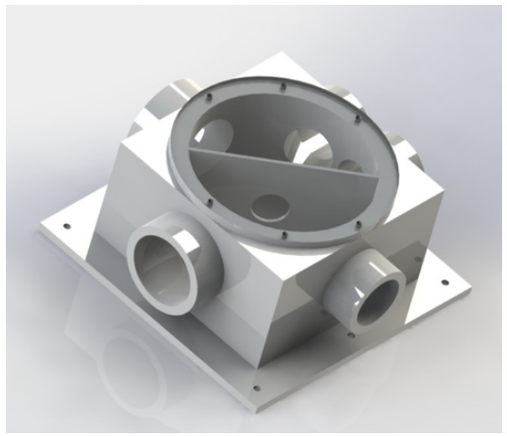
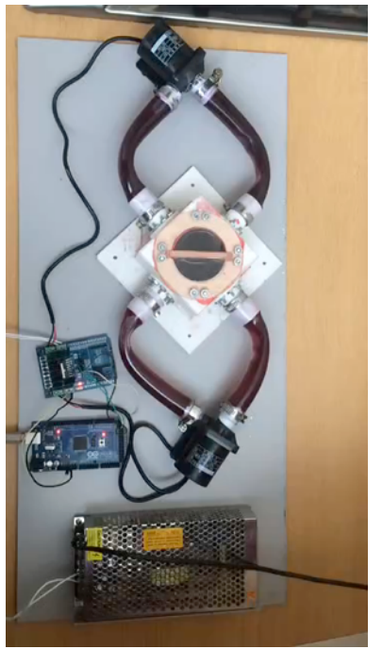
  - Student Team from the Universidad Católica Boliviana „San Pablo”, Bolivia selected - „Performance and Mechanical Evaluation of the Bio Material Nitinol under Microgravity Conditions“
  - Experiment Preparation in Bolivia

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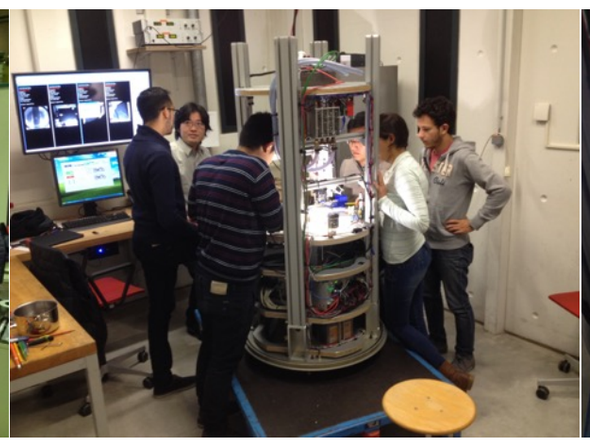
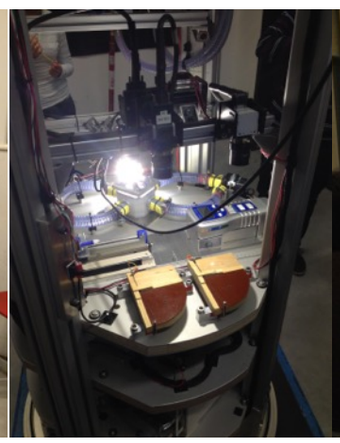

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DropTES - Drop Tower Experiment Series

- Report on Second Cycle - 2015

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DLR ZARM

  - Student Team from the Universidad Católica Boliviana „San Pablo", Bolivia selected - „Performance and Mechanical Evaluation of the Bio Material Nitinol under Microgravity Conditions"
  - „Drop Tower Experiment Series" 2015 - Impressions

Opportunity to visit the

SPACE TECH EXPO EUROPE

RTL NORD

TV Report about DropTES

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Conclusion

- DropTES offers selected student research teams an excellent opportunity to conduct their own short-term experiments under microgravity conditions

- Every time it was a great experience for each team member and also for the entire drop tower team

- Do not miss the possibility to apply…
  - application deadline for the third cycle: March 31, 2016
  - please visit - www.unoosa.org (DropTES) - for more information

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THANK YOU VERY MUCH FOR YOUR ATTENTION

ACKNOWLEDGEMENTS

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