

OVERVIEW: 2013 IAA PLANETARY DEFENSE CONFERENCE

William Ailor, Ph.D.
The Aerospace Corporation
Conference Co-Chair
July 10, 2013



*2013 Planetary Defense Conference
International Academy of Astronautics*



Background (1 of 2)

- 2013 conference was 5th in a series that began in 2004
- Conferences held in
 - 2004 Anaheim, California, USA
 - 2007 Washington, D.C.
 - 2009 Granada, Spain
 - 2011 Bucharest, Romania
 - 2013 Flagstaff, Arizona, USA
- Became IAA Conference in 2009



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Background (2 of 2)

- 43 individuals on organizing committee
 - Chaired by William Ailor (US), Richard Tremayne-Smith (UK)
 - Members represented 31 different organizations
 - Organizing committee developed program; some became session chairs
 - Session chairs invited experts, reviewed abstracts, selected presenters
 - Over 130 abstracts submitted
- 2013 conference sponsored by 23 organizations, attended by 225 individuals
- Conference location: Flagstaff, Arizona
- Activities included tour of Meteor Crater, special session on Chelyabinsk event
- Evening event arranged by NASA, The Planetary Society, and Space Generation Advisory Council featured Bill Nye & panel of experts



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Sponsors

Major Sponsors

The Aerospace Corporation
European Space Agency (ESA)
International Academy of Astronautics (IAA)
National Aeronautics and Space Administration (NASA)
Secure World Foundation

Other Sponsors

American Institute of Aeronautics and Astronautics (AIAA)	NEOShield
Association of Space Explorers	Northern Arizona University
Astrium	The Planetary Society
B612 Foundation	Romanian Space Agency (ROSA)
Ball Aerospace & Technologies Corporation	Russian Federal Space Agency (ROSCOSMOS)
GMV Aerospace	Space Generation Advisory Council
International Astronomical Union (IAU)	United Kingdom Space Agency
Japan Aerospace Exploration Agency (JAXA)	United Nations Office for Outer Space Affairs
The Johns Hopkins University/Applied Physics Laboratory (APL)	
Lawrence Livermore National Laboratory	



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Conference Overview

- Conference brought together world experts to discuss
 - Special session on the Chelyabinsk event
 - Currently funded efforts related to planetary defense
 - State of the art in asteroid discovery
 - Physical characteristics of asteroids
 - Deflection techniques and missions
 - Impact effects
 - Managing consequences of an impact
- Last session: tabletop exercise on hypothetical asteroid impact threat
- Conference White Paper provides summary



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Tabletop Exercise

- Exercise designed by:
 - Debbie Lewis, Director, Resilience Planning at AXIOM (ALDERNEY) LTD, United Kingdom
 - Lindley Johnson, NASA HQ
 - Bill Ailor, Conference co-chair, The Aerospace Corporation
 - Paul Chodas, JPL
 - Don Yeomans, JPL
 - L.A. Lewis, FEMA
- Exercise designed to be realistic in regard to orbit mechanics, time frame and information updates
- Objective: Expose participants to realistic scenario to gain insight into responses from various perspectives



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Focus Areas

- Attendees self-selected to be member of one of following focus groups:
 - NEO Discovery and Follow Up
 - NEO Characterization
 - Mitigation Techniques and Missions
 - Impact Effects
 - Consequence Management and Education
 - Media and Risk Communication
 - Single Nation Concerned (to include disaster preparedness roles)
 - UN, International Organizations, and NGOs
 - Space Agencies
 - General public
- Each group looked at problem and developed responses based on their areas of responsibility



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The Exercise



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Threat Discovered: April 16, 2013

- Announced to conferences that hypothetical asteroid 2013 PDC-E discovered April 16, 2013
- First estimates:
 - 200-300 meter diameter; impact velocity of ~12.4 km/sec
 - Energy at impact: ~300 MT of TNT
 - 1.2-km keyhole during close flyby of Earth in 2023
 - Initial probability of impact in **2028**: 0.8%



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First Update, 2019

- Based on review of historical data, impact probability risen to 28%
- Object size known to be 300 meters in diameter
- New prediction of possible impact points available

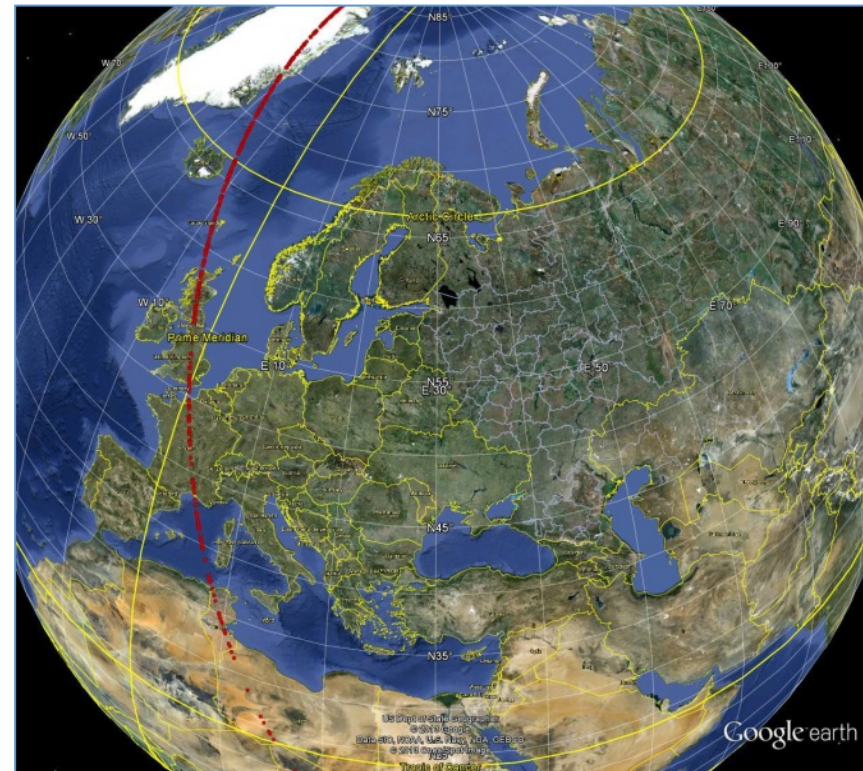
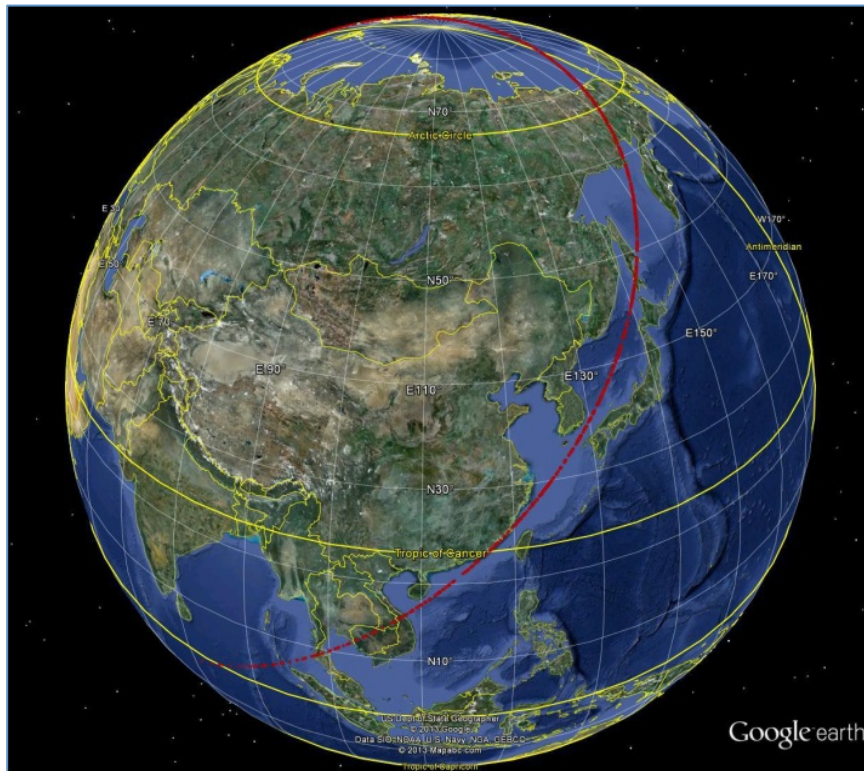


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2019 Prediction of Possible Impact Points in 2028

Impact Probability now 28%



Each red spot represents possible impact point. Impact with Earth not certain.



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Second Update: 2022

- Additional tracking data confirms 2013 PDC-E will impact Earth in 2028
- Possible impact locations updated

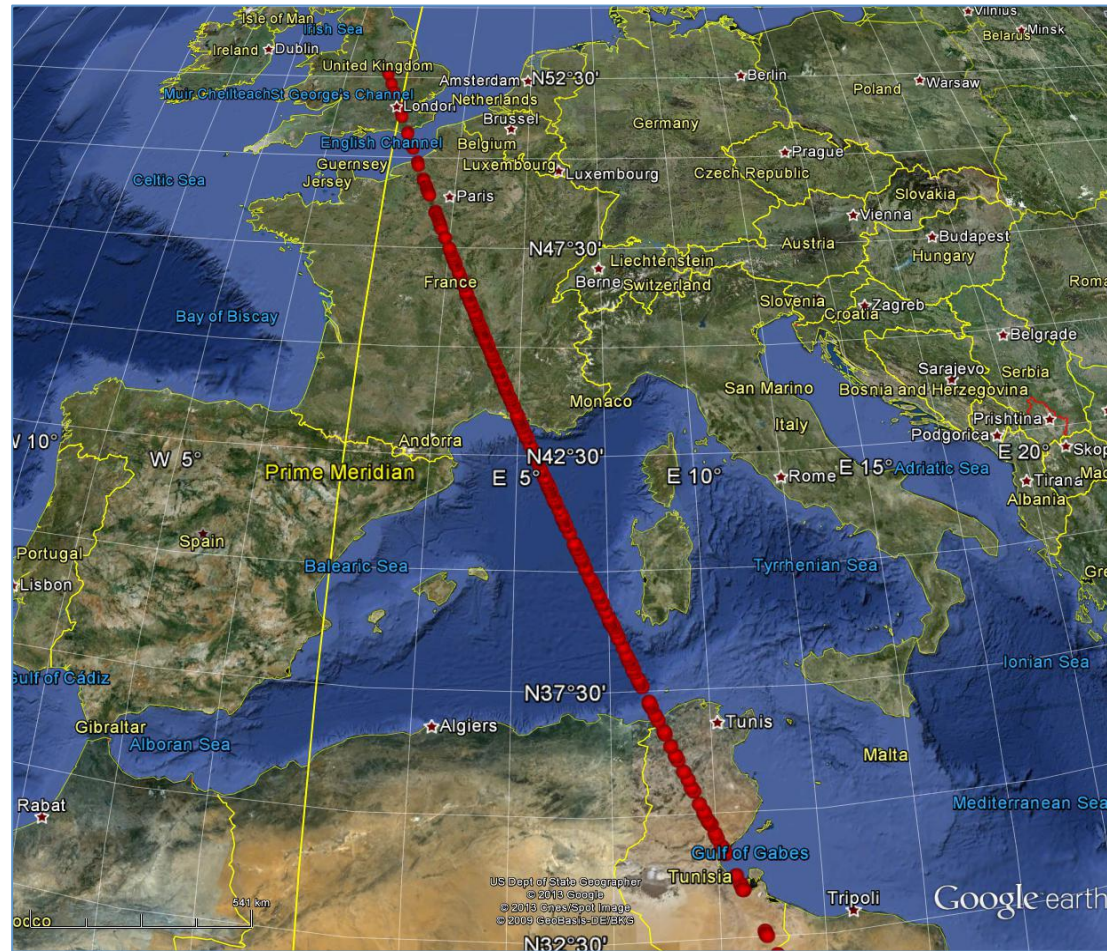


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2022 Predictions of Possible Impact Points in 2028

Impact Probability 100%



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Final Update: 2023

- Radar tracking data from Arecibo becomes available
- Impact predicted to occur in the Mediterranean at 07:40:48 on November 21, 2028
- New impact locations available

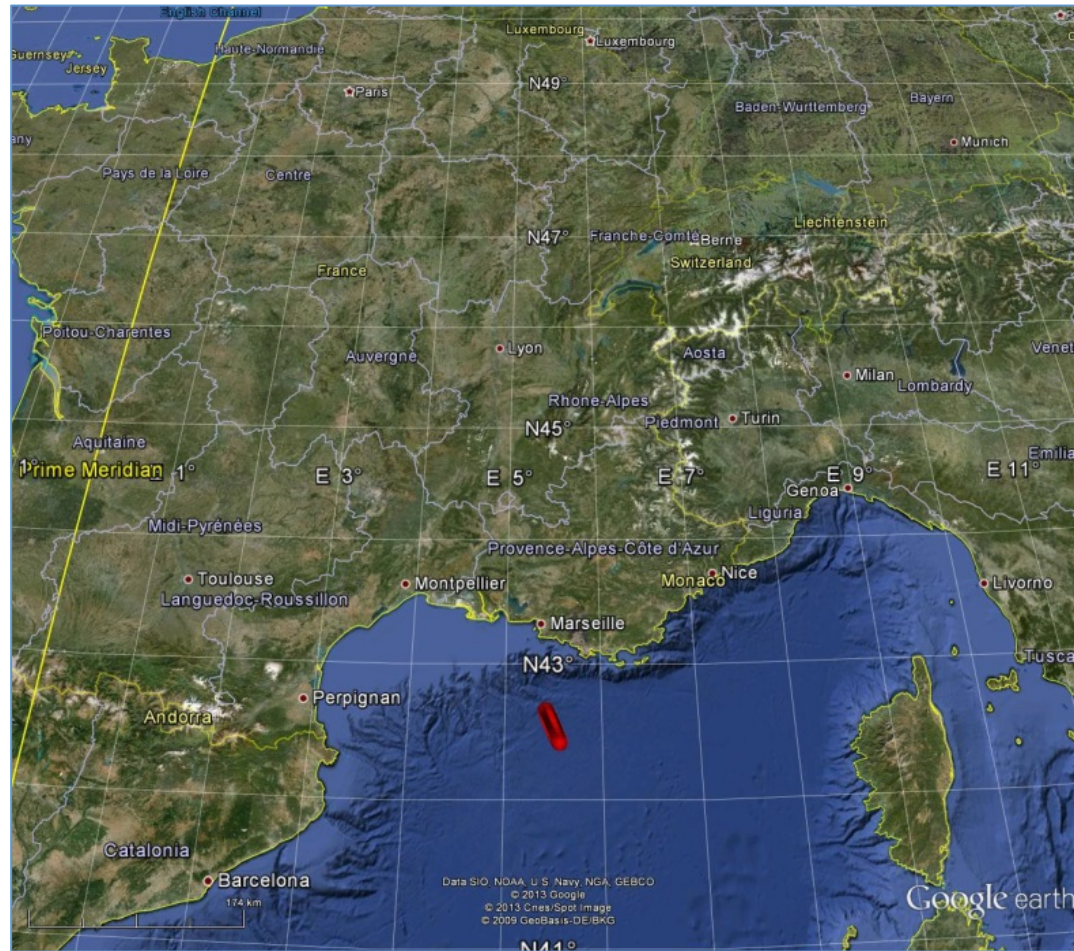


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2023 Prediction of Possible Impact Points in 2028

Impact Probability 100%



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Exercise Feedback

- Need clear, concise, consistent data from trusted sources with frequent updates
- Need to improve public and decision maker understanding of uncertainties and include error bars
- Need interactive tools that public can use to gain understanding of basics of evolving threat and deflection/disruption options
- Need to clarify criteria for go/no-go decision
- Realization that some decisions may not be based on science



Recommendations from Conference

1. Discover: Can't take action if don't see it coming
2. Characterize: Research will help understand how threatening object will respond to deflection/disruption missions
3. Gain confidence: Fly missions to verify that we can move an asteroid
4. Provide disaster mitigation exercises: Educate disaster response community on the nature of asteroid & comet threats and impacts
5. Be prepared: Identify, test, and have available techniques & technologies for planetary defense
6. Expand international efforts: Support United Nations efforts to encourage space agencies to build plans for sharing and coordinating planetary defense actions
7. Communicate: Develop & enhance authoritative web pages to improve understanding of "impact probability," risk, deflection & disruption options, mission design, and other planetary defense topics



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Summary

- Great reviews for and feedback from tabletop exercise
- Good attendance, speakers and participation
- Presentations show major progress being made in understanding threat and discovering threatening objects
- Seven recommendations highlight work that needs to be done

Next Conference 2015; Location TBD



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