



**Space Mission Planning Advisory Group  
Report to STSC 2016**

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**ESA**

**Technical Directorate and SSA Programme  
(Chair of SMPAG)**

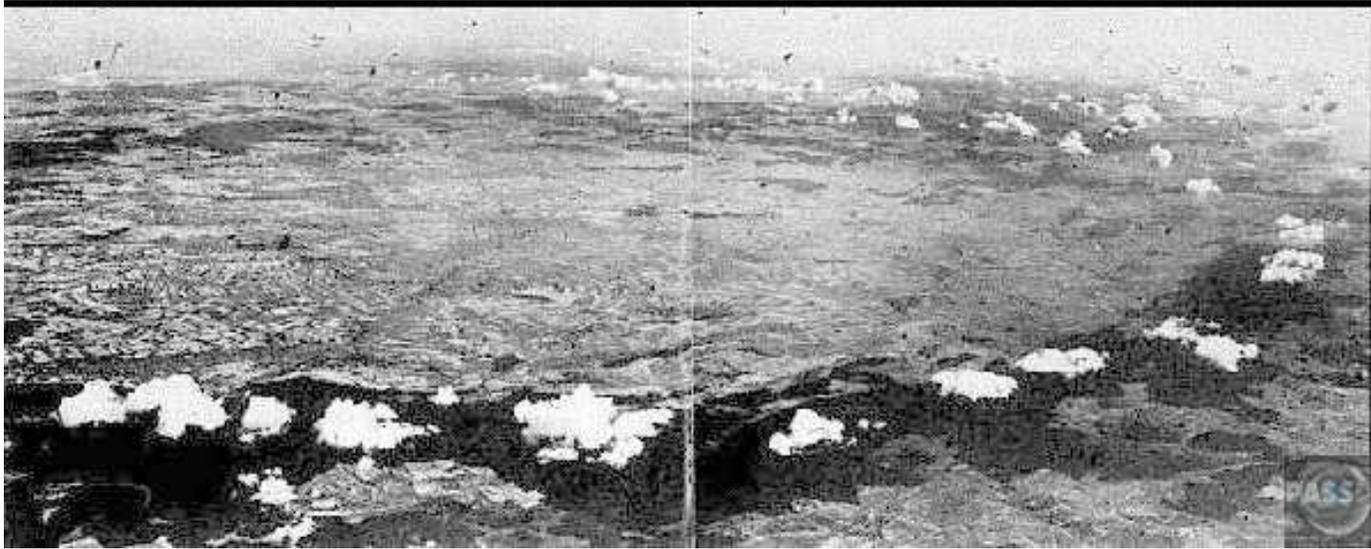
**16 February 2016**

# **SMPAG purpose and membership**

**The purpose of the SMPAG is to prepare for an international response to a NEO impact threat through the exchange of information, development of options for collaborative research and mission opportunities and NEO threat mitigation planning activities.**

**Membership is open to all national space agencies or governmental or inter-governmental entities that coordinate and fund space activities and are capable of contribution to or carrying out a space based NEO mitigation campaign.**

# Impact crater



Nördlinger Ries

25 km, 15 Mio  
Jahre

Meteor Crater in  
Arizona

1.2 km, 50 000  
Jahre



# **SMPAG formation and status**

**The SMPAG was officially established in February 2014**

**SMPAG Terms of References were finalized in June 2014**

**SMPAG has established a work plan in November 2015 which is a living document**

**SMPAG works in close coordination with IAWN**

# SMPAG Membership

## (Status 16 February 2016)

### **Official members with nominated delegations:**

AEM (Mexico)	ESA
ASI (Italy)	NASA (USA)
Belspo (Belgium)	ROSA (Romania)
CNES (France)	ROSCOSMOS (Russian Federation)
DLR (Germany)	SSAU (Ukraine)
IAWN (ex officio)	SUPARCO (Pakistan)
ISA (Israel)	UKSA (UK)
JAXA (Japan)	KASI (South Korea)

### **Intention of Membership indicated:**

CSA (Canada)  
China

# Threshold criteria



**Crater with 14-m diameter formed by impact from space in 2007 in Carancas, Peru (NEO size : few m)**

**Chelyabinsk impact event (NEO size: 20-m)**



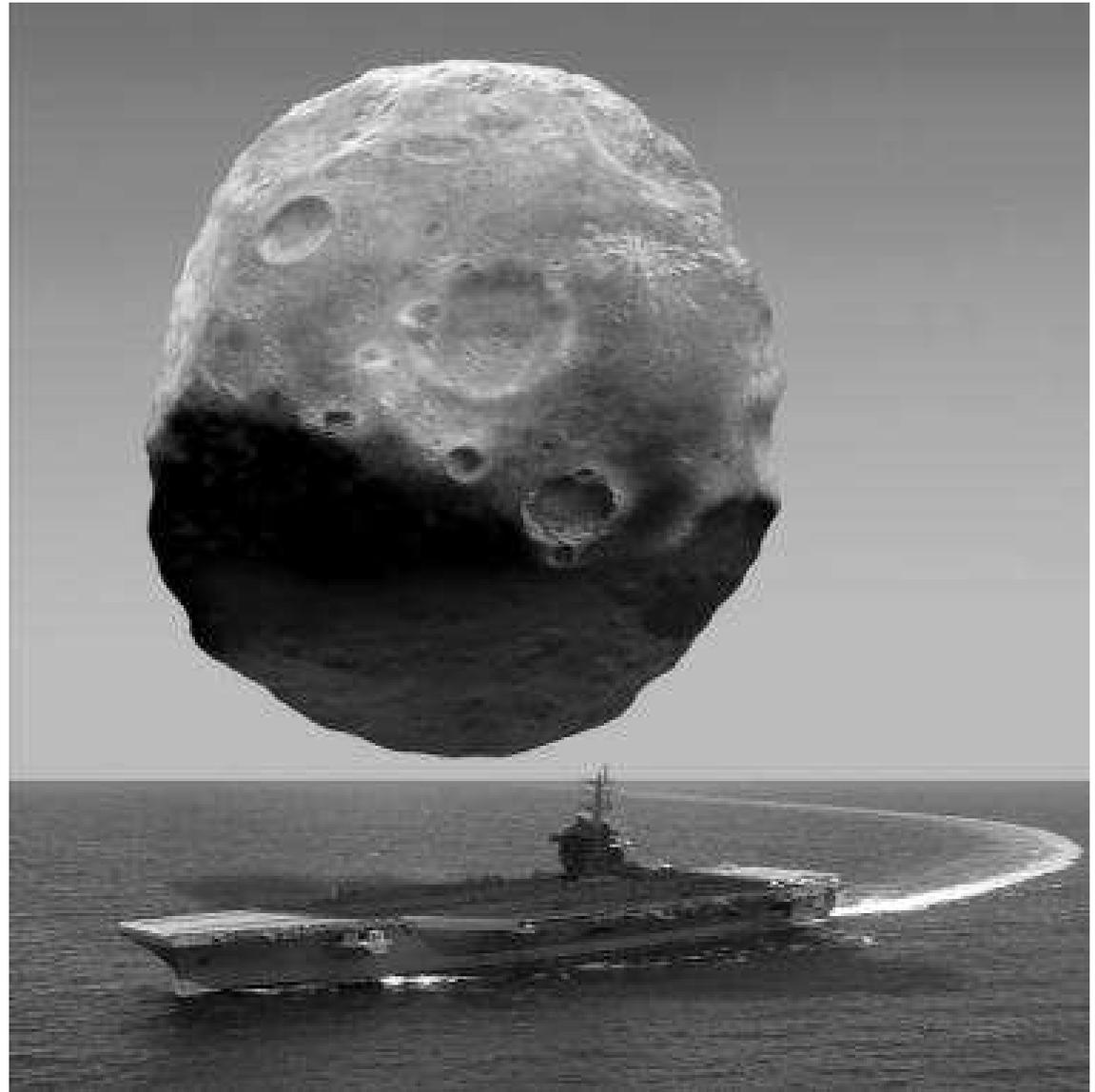
# Comparison of sizes

## **Asteroid 2005 YU 55**

**Diameter  $\approx$  300 m**

**Passed within Lunar distance in November 2011.**

(from SWF Report 2012, illustration by Michael Carrol)



# SMPAG work plan

**A list of 11 activities has been identified by SMPAG:**

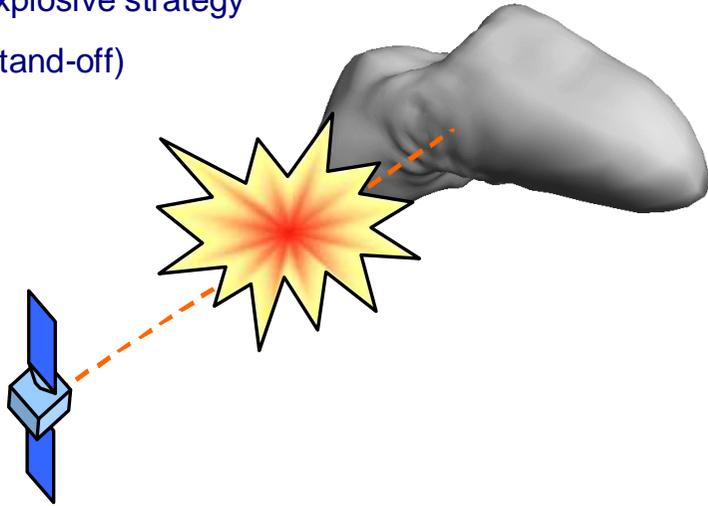
- **Criteria and thresholds for impact threat response actions.  
(Lead: NASA)**
- **Mitigation Mission Types and technologies to be considered  
(Lead: UKSA)**
- **Mapping of threat scenarios to mission types (Lead: ESA)**
- **Reference missions for different NEO threat scenarios  
(Lead: ASI)**
- **A plan for SMPAG action in case of a credible threat  
(Lead: NASA/IAA)**

# SMPAG work plan, cont.

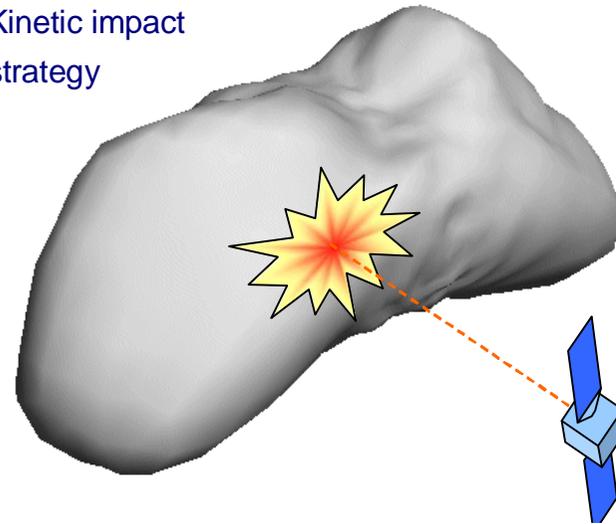
- **Communication guidelines in case of a credible threat (Lead: NASA)**
- **Produce a 'road map' for future work on planetary defense (Lead: DLR)**
- **Consequences, including failure, of NEO mitigation space missions (Lead: TBD)**
- **Criteria for deflection targeting (Lead: TBD)**
- **Study the nuclear device option (Lead TBD)**
- **Toolbox for a characterization payload (Lead: CNES)**

# Possible NEO deflection strategies (Illustrationen von L. Cano, Deimos)

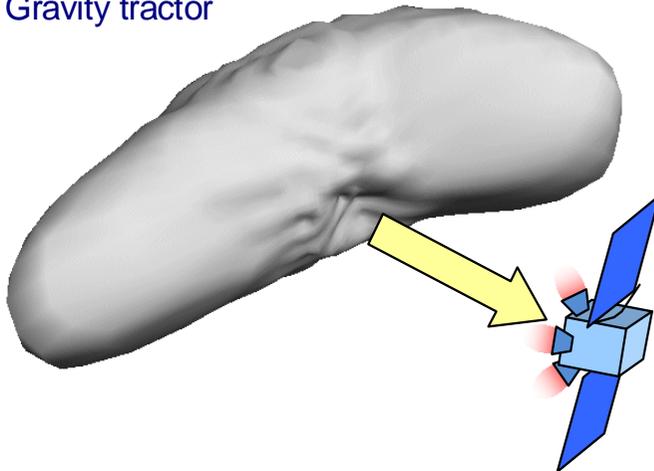
Explosive strategy  
(stand-off)



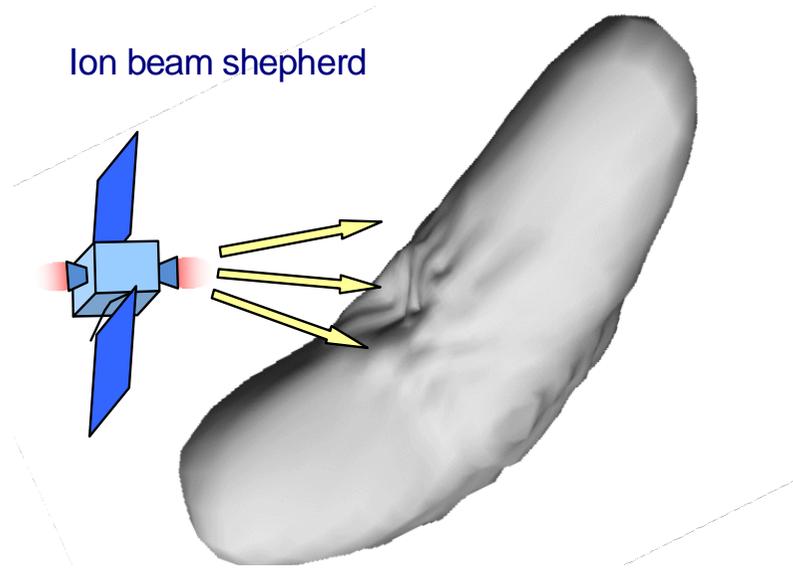
Kinetic impact  
strategy



Gravity tractor



Ion beam shepherd



# NEO deflection

**The kinetic impactor is the most advanced method**



Illustration:  
ESA

# **IAWN/SMPAG Open Forum**

**A joint IAWN/SMPAG Open Forum will be held:**

**on**

**Thursday, 18 February 2016, starting at 13:30**

**in**

**Board Room D, 4<sup>th</sup> floor (Room for STSC plenary sessions)**

**Brief overview presentations by IAWN and SMPAG will be followed by an open discussion.**

**All persons on site are invited to attend.**