

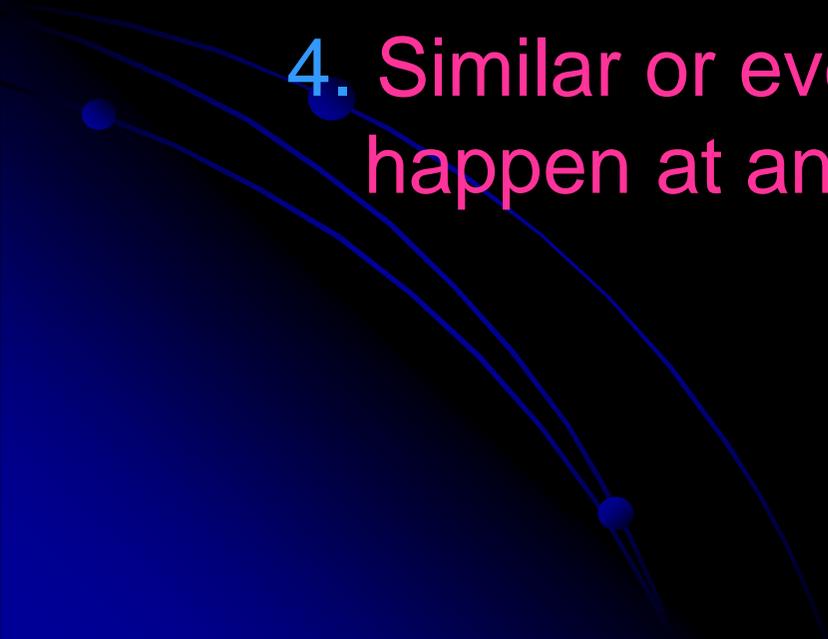
Fifty-second session of the Scientific and Technical Subcommittee of the Committee on
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“CITADEL” INTERNATIONAL PLANETARY DEFENCE SYSTEM AS PROPOSED FOR ESTABLISHMENT

- | | |
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Lessons of Chelyabinsk

1. We have no reliable means to forecast such events.
 2. We have no means for protection against dangerous objects.
 3. Presumed rate of their impact with the Earth is a few times per 100 years.
 4. Similar or even more serious events may happen at any moment
- 

Proposals

1. Proposal on Creation of the "Citadel" International Planetary Defense System // Report at 42nd session of UN Scientific and Technical subcommittee on peaceful application of outer space in Vienna. 2005.
2. Information on research in the field of near-Earth objects carried out by Member States, international organizations and other entities. Note by the Secretariat. A/AC.105/863/Add.1, 28 March 2006
3. Possible Approaches to Implementation of "Citadel-1" International Planetary Defence System Project // Report on Forty-fourth session of the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space. Vienna. 12-23 February 2007.
4. On the Possible Approach to Formation of Echelon of Short-Term Reaction of the International Planetary Defense System. Report on 47-th session of Scientific and Technical Subcommittee of Committee on the Peaceful Uses of Outer Space. Vienna, February 2010.

What Do We Need to Do?

It is necessary to solve a broad range of problems.

The simplest of them are scientific, technical and financial problems.

The most difficult – organizational and international legal problems.



International Planetary Defence System (PDS) “Citadel”

PDS “Citadel” should include two levels :

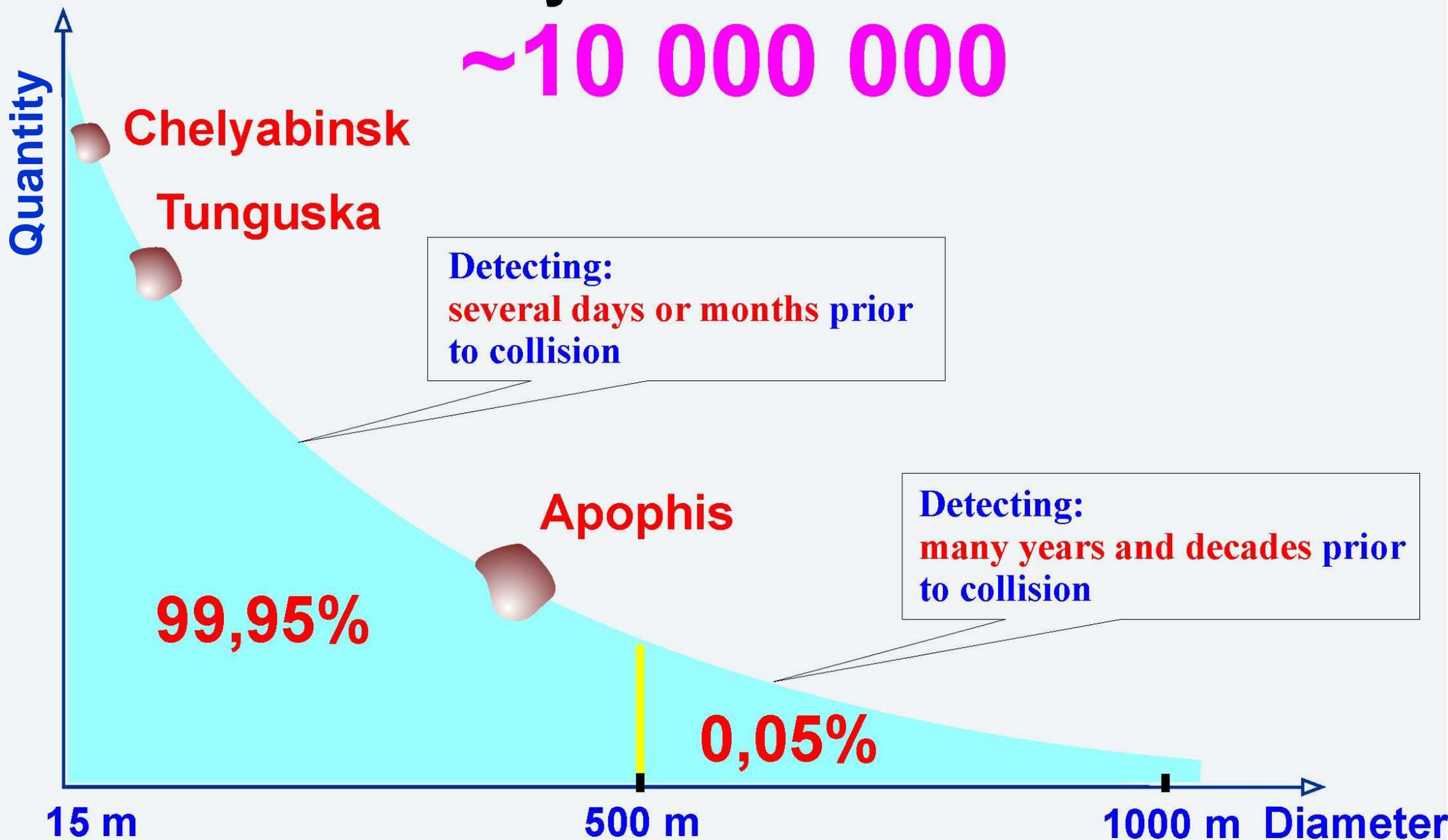
- level for short-term (operative) reaction (LSTR) “Citadel-1”;
- level for long-term reaction (LLTR) “Citadel-2”.

In addition the LSTR can include auxiliary (reserve) service:

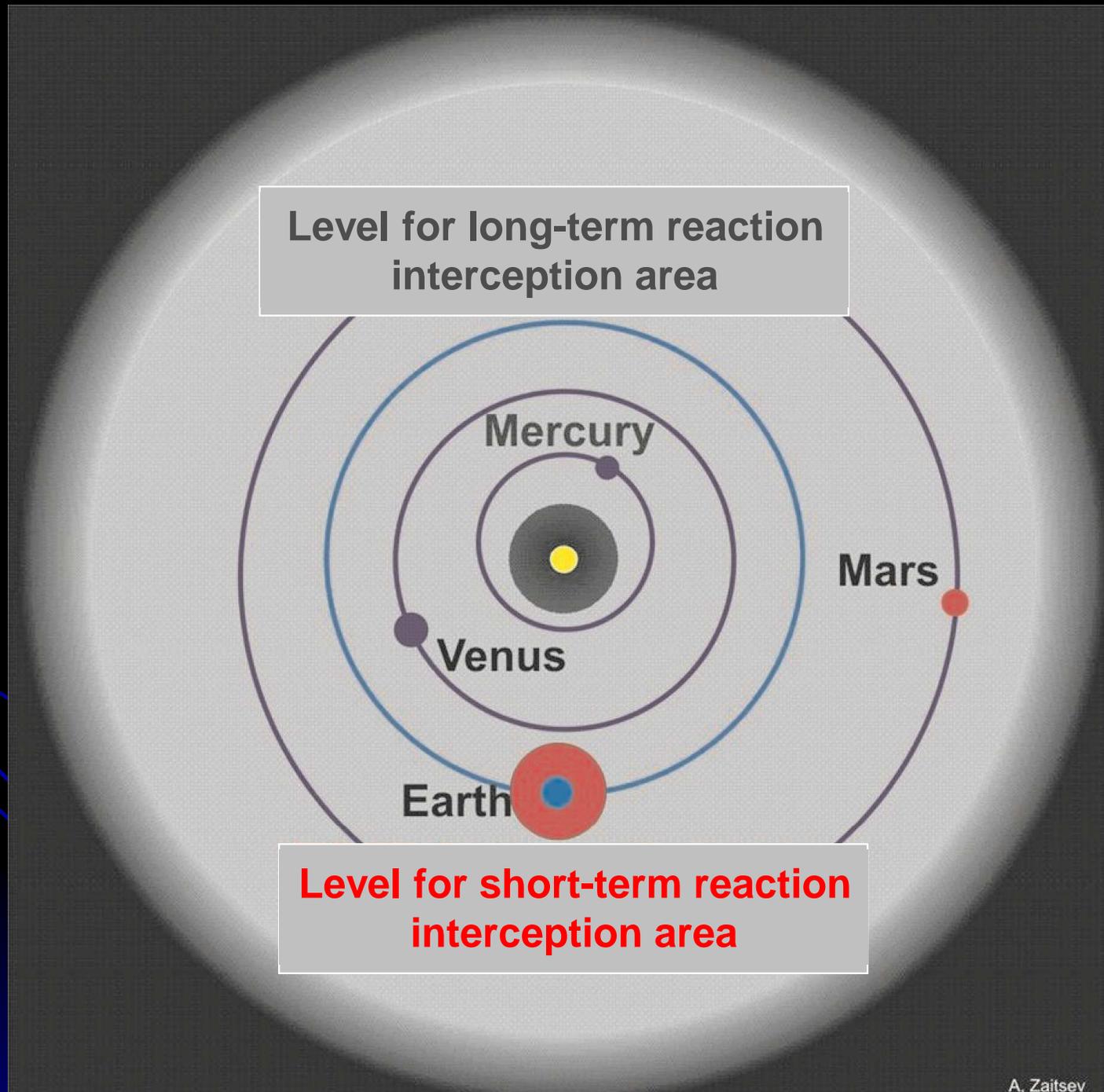
- service for forecasting the regions and consequences of dangerous celestial bodies impact.

Quantity of NEAs D >15 m

~10 000 000



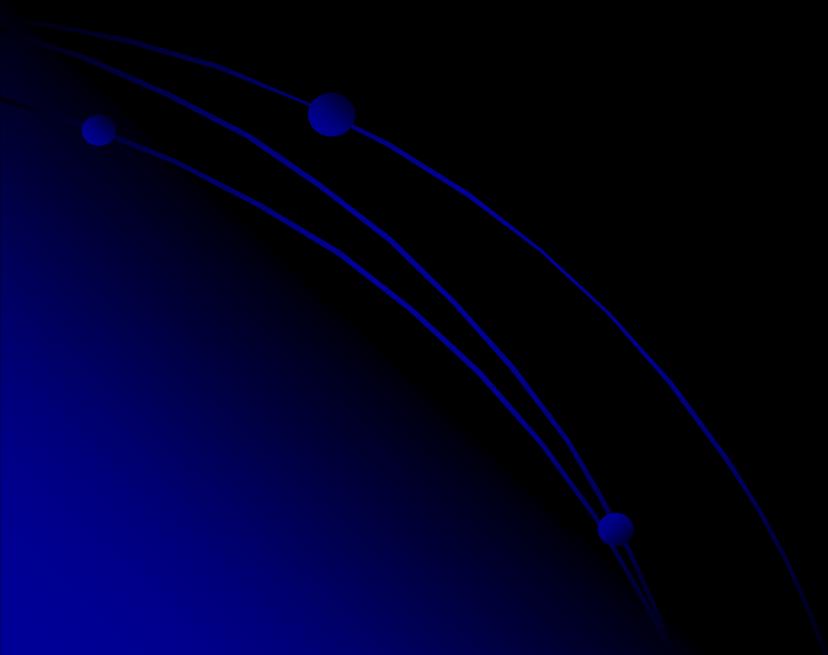
Areas of Dangerous Celestial Bodies Interception



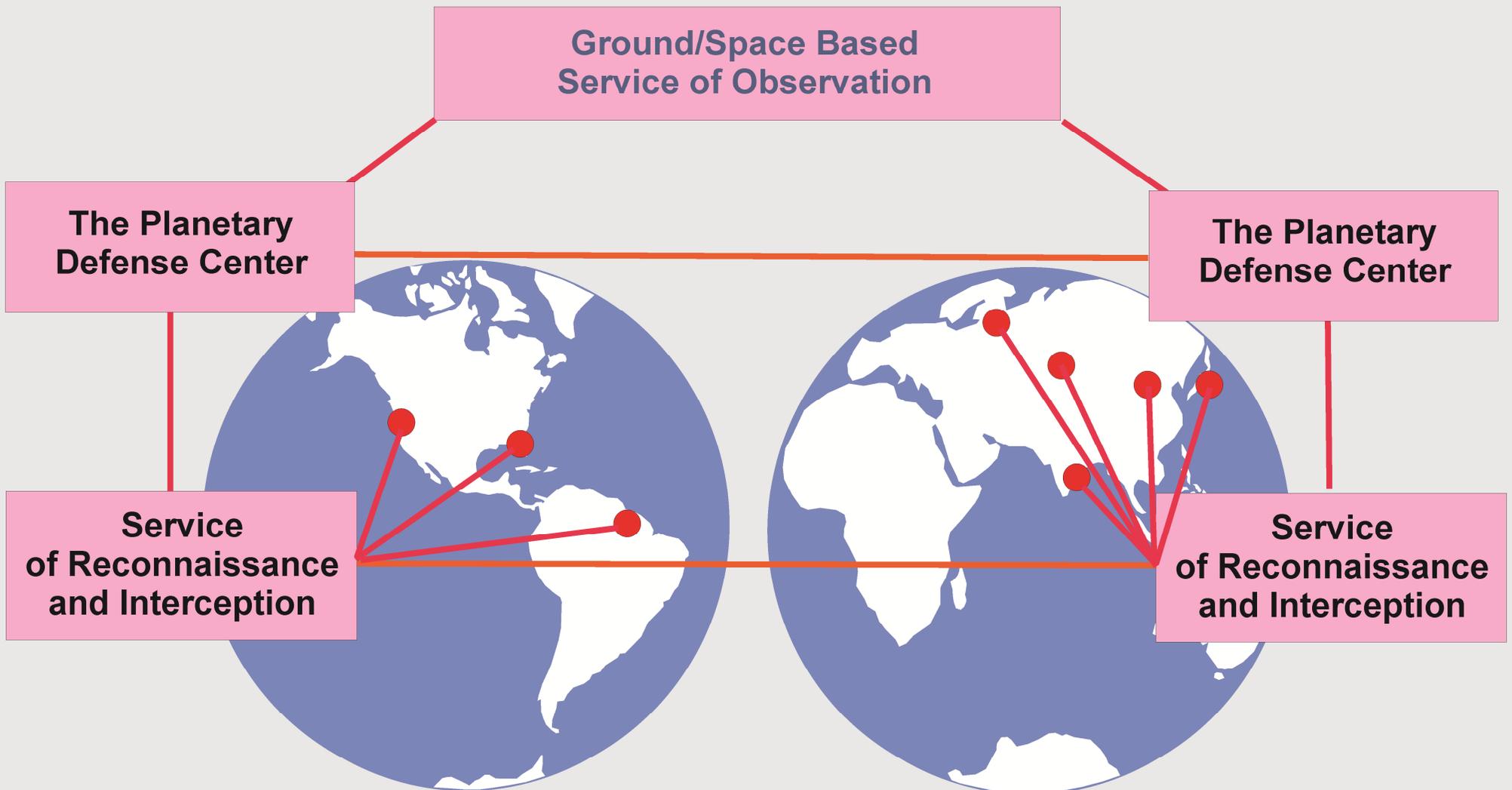
Planetary Defense System Requirements

- To have international status
- To have multiregional structure of ground reconnaissance and interception service
- To provide protection from dangerous celestial bodies
- To provide safety of application
- To exclude several dilemmas:
 - - «Notification dilemma»
 - - «Non-application dilemma»
 - - «Application dilemma»

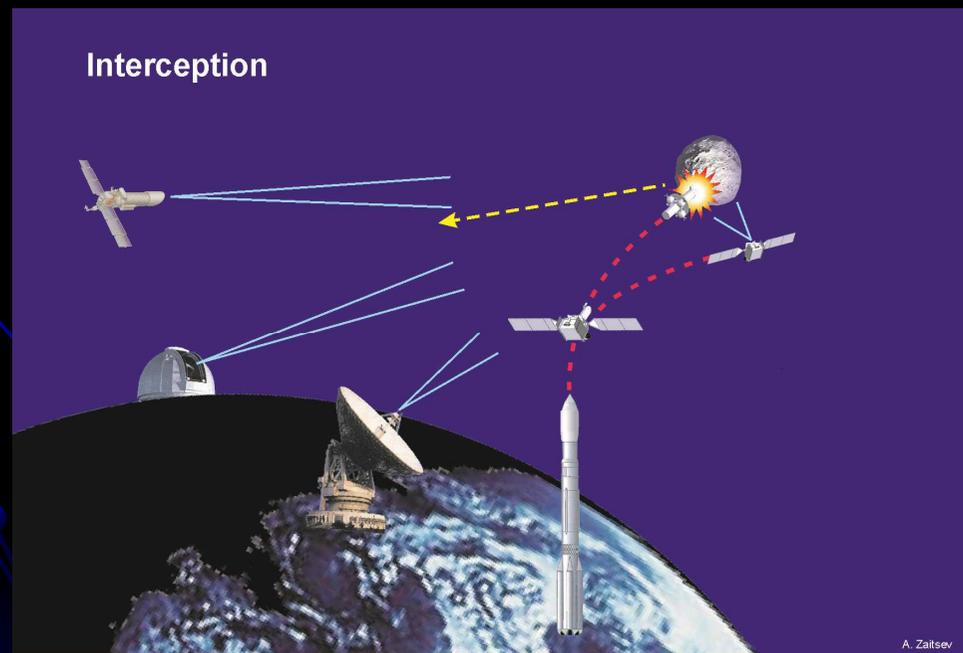
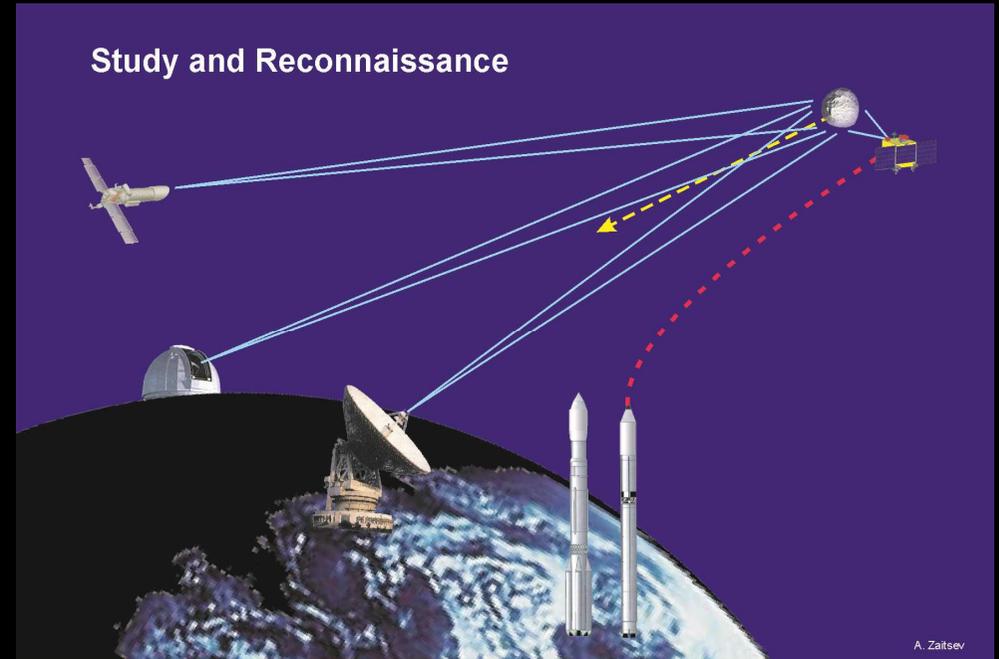
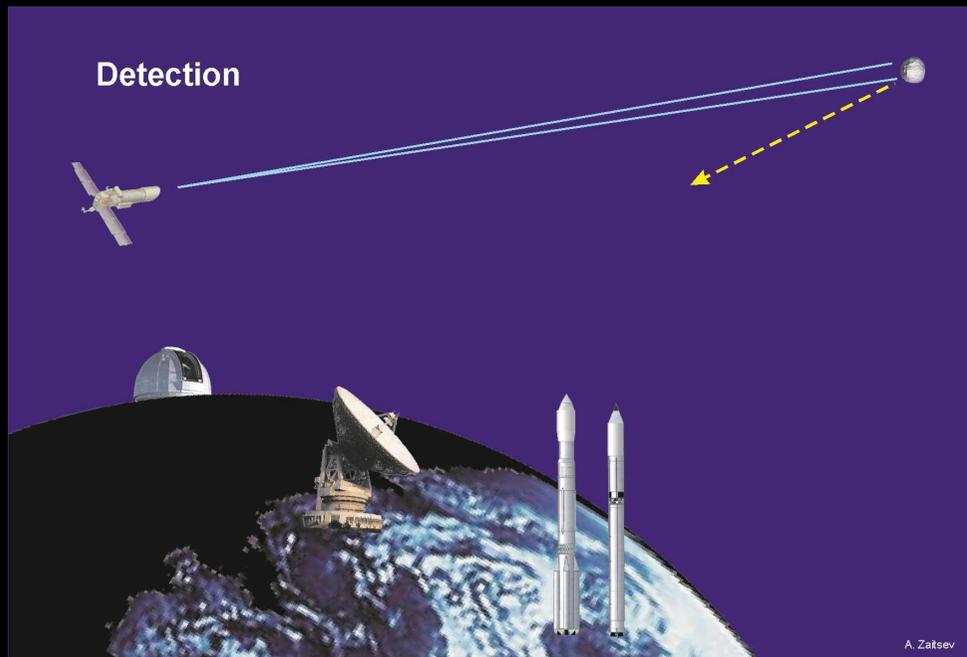
LEVEL FOR SHORT-TERM REACTION
“CITADEL-1”



Composition of the PDS «Citadel-1»

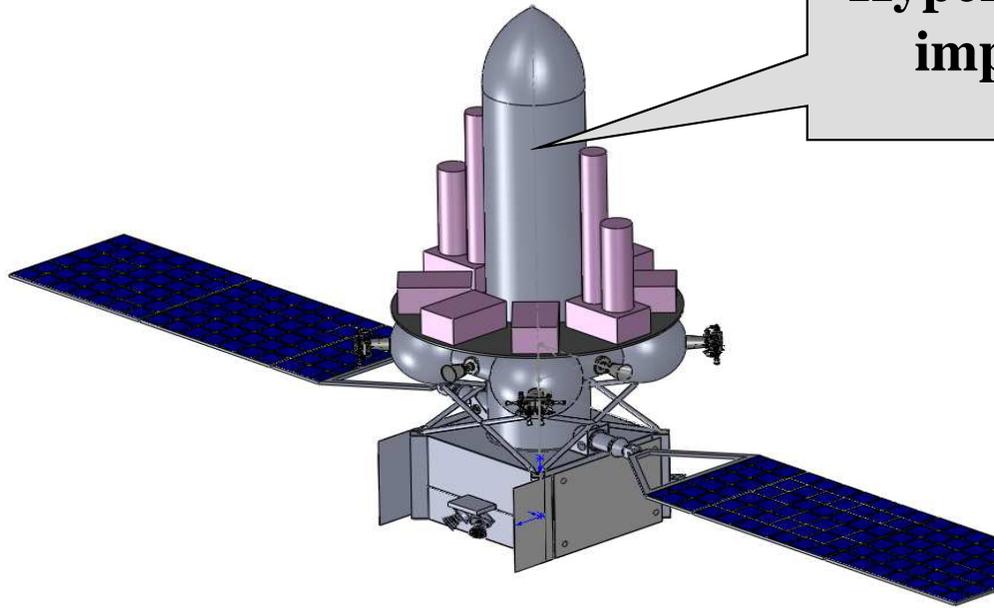


«Citadel-1» Operation Scheme



Examples of S/C-interceptors

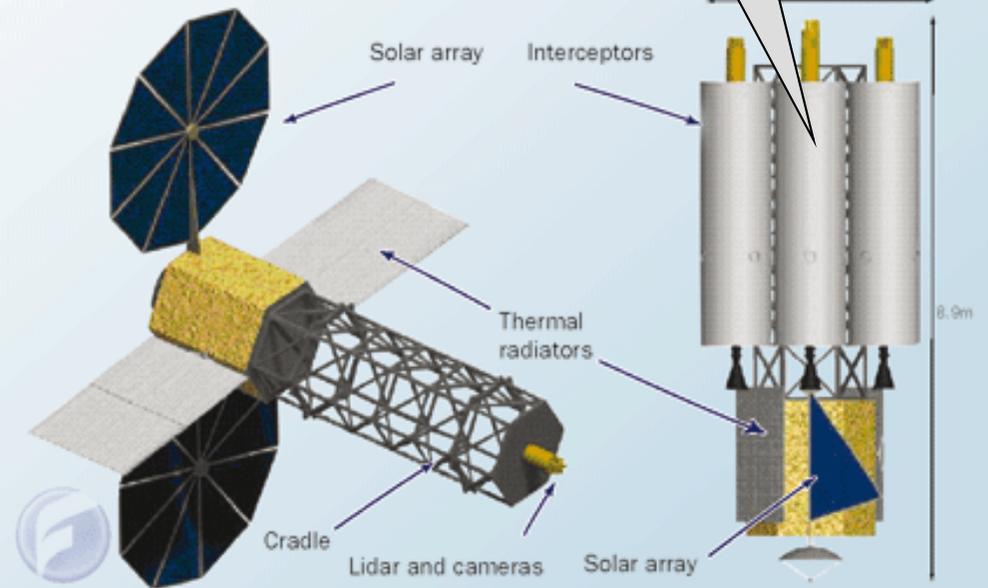
Hypervelocity impactor



Nuclear devices

NASA'S ASTEROID INTERCEPTOR

Isometric view

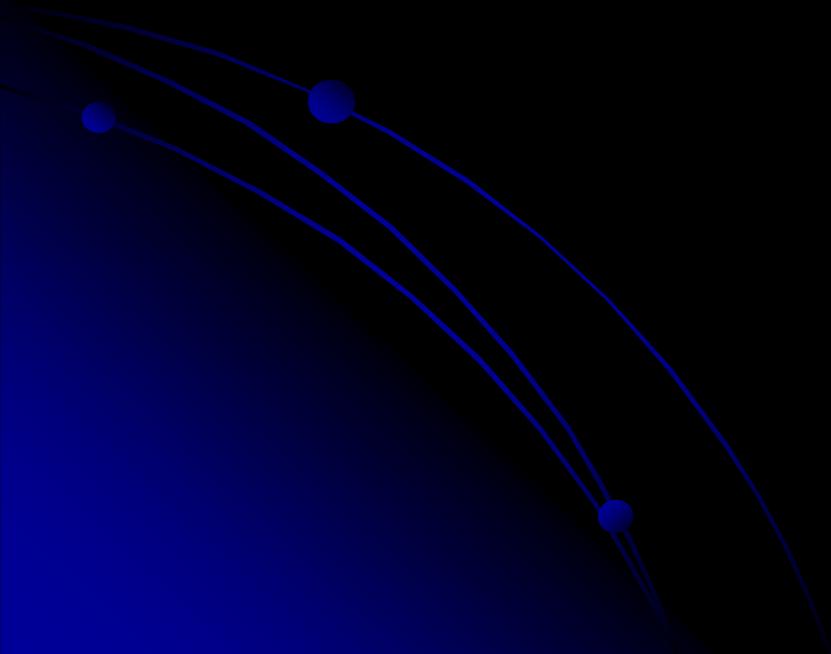


S/C mass - 4000 kg

Including
The block of
Interception

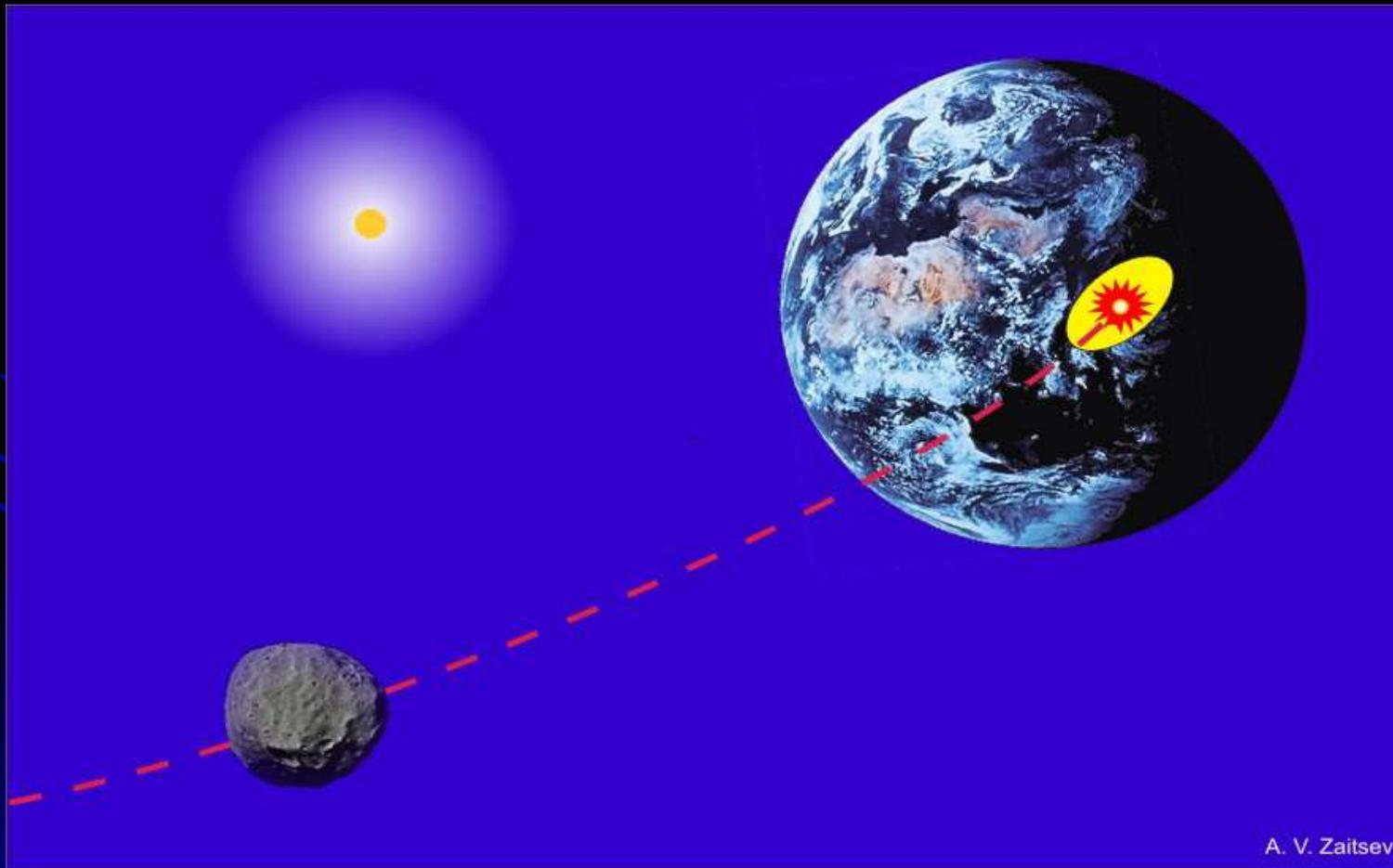
- 3500 kg

**SERVICE FOR FORECASTING THE REGIONS
AND CONSEQUENCES OF DANGEROUS
CELESTIAL BODIES IMPACT**

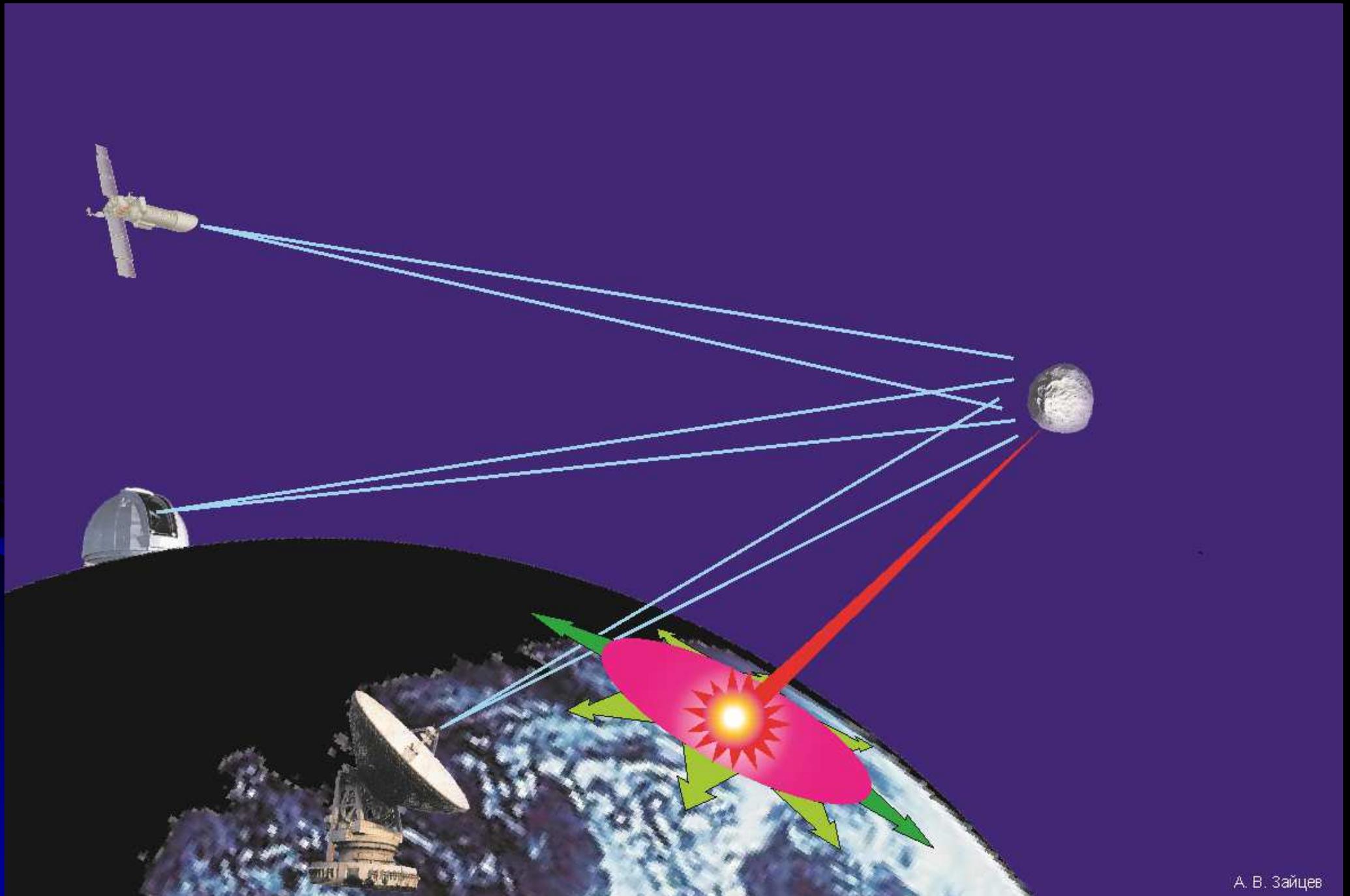


Forecasting Regions of Possible Impact

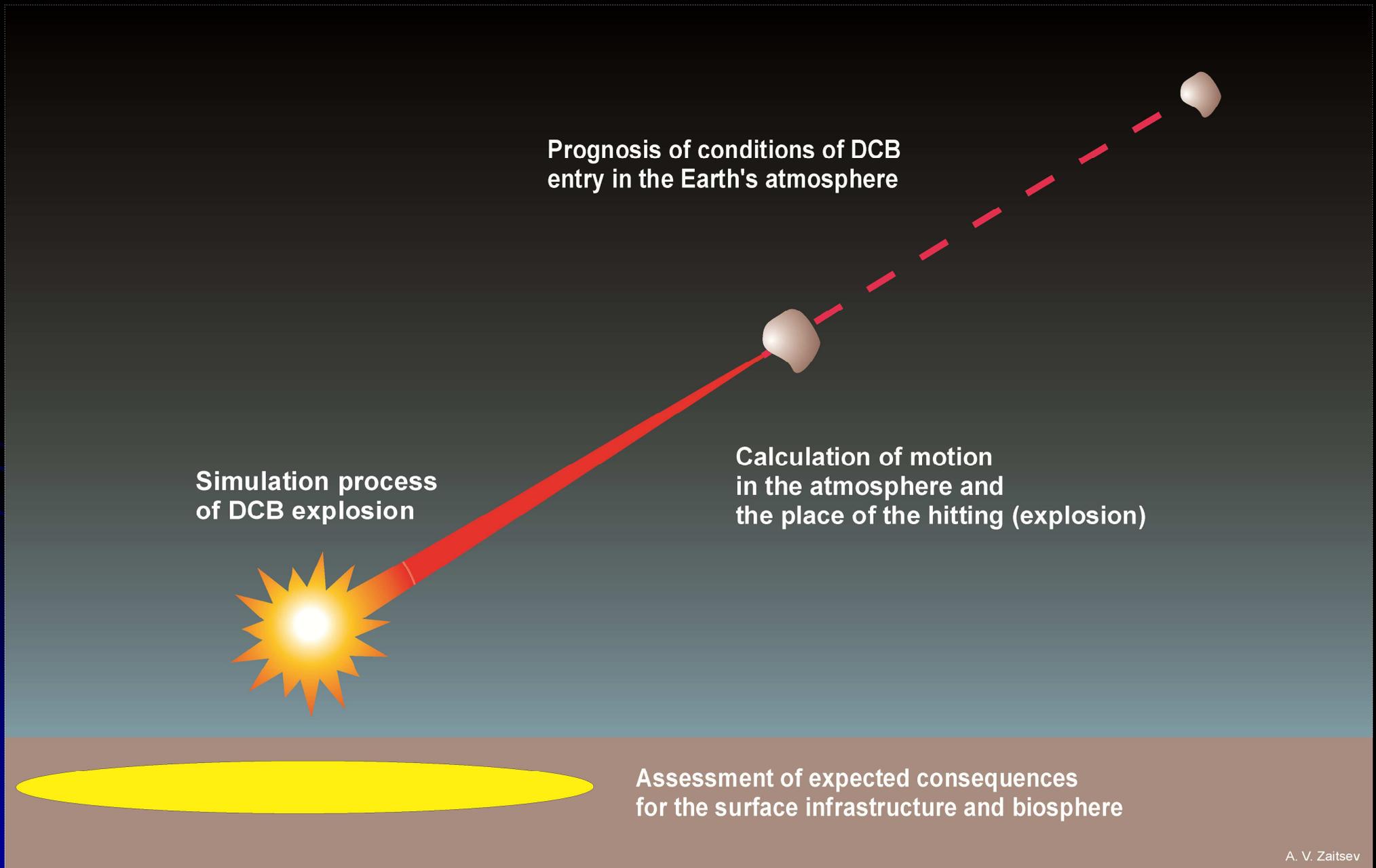
To mitigate the possible consequences of such accidents it is necessary to define the place, time and power of explosion in advance. For this purpose it is necessary to establish a service that would forecast the regions that may be affected by the dangerous celestial bodies.



The Service for forecasting



The scheme for forecasting



The Dispersion Ellipsis Size (Moscow region)

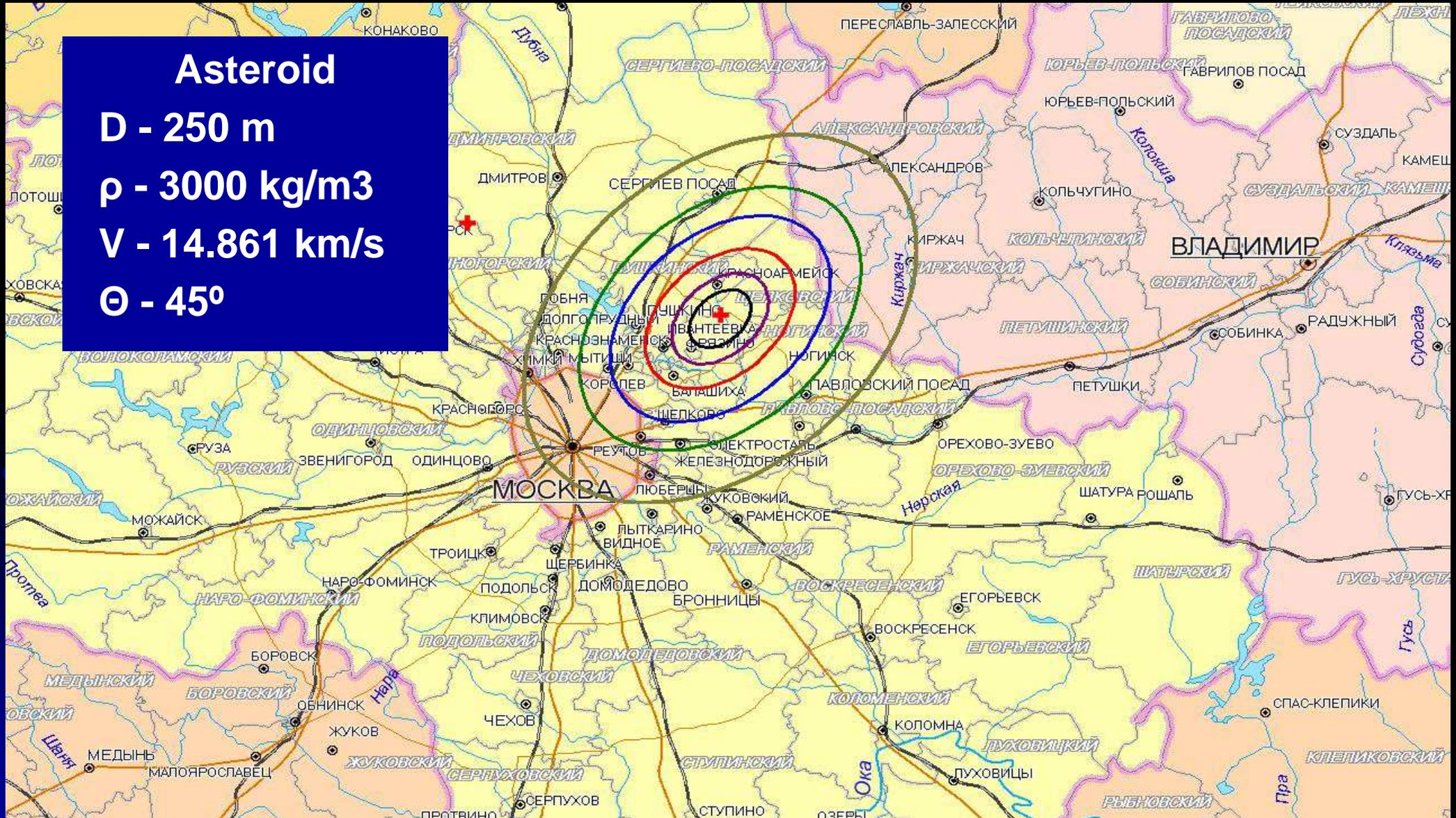
Asteroid

D - 250 m

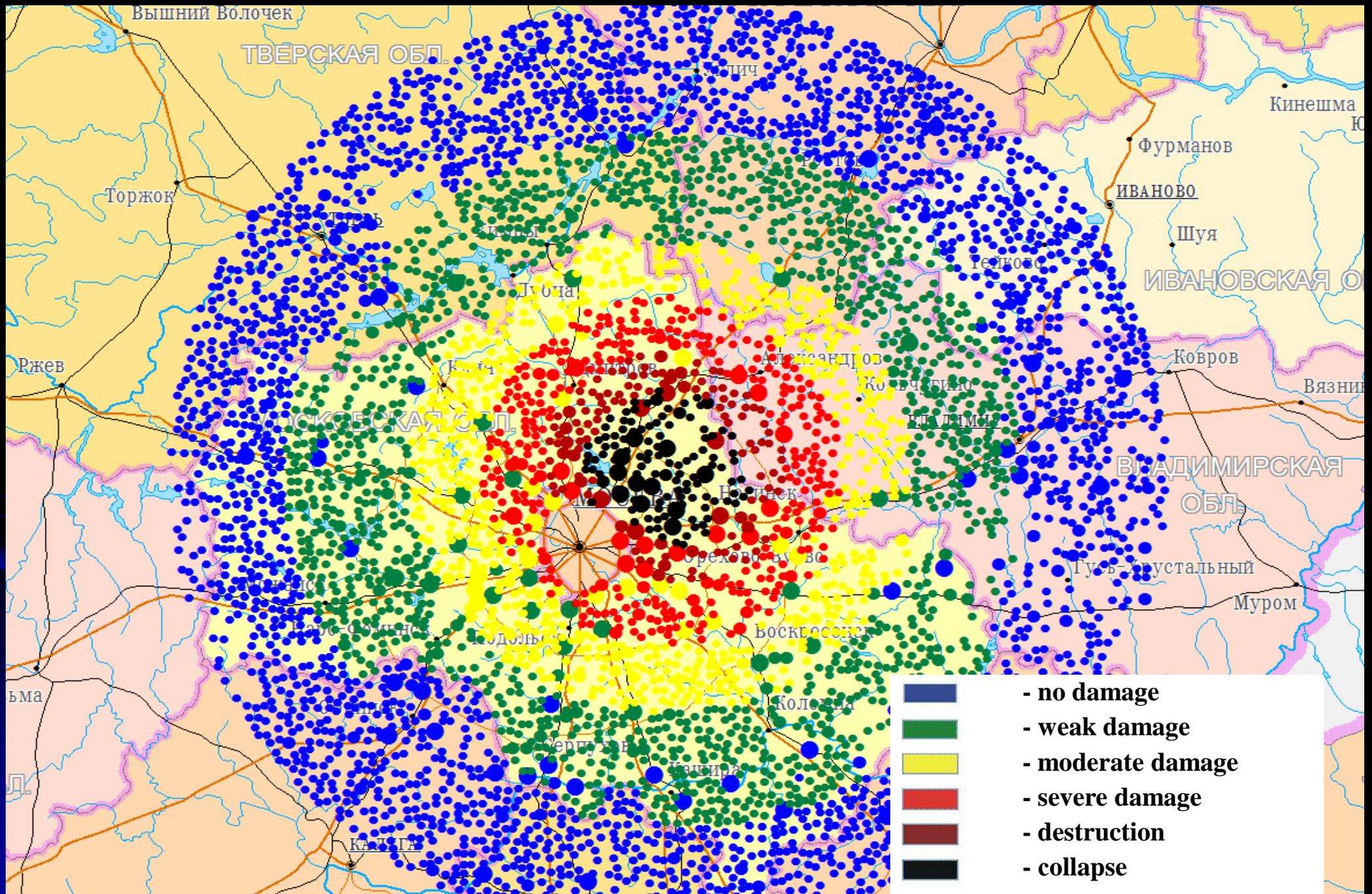
ρ - 3000 kg/m³

V - 14.861 km/s

Θ - 45°

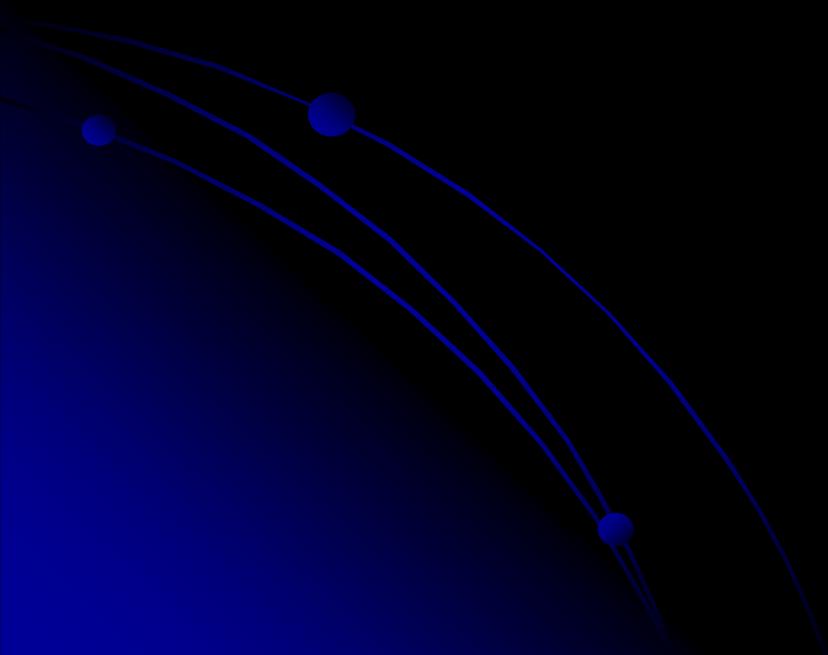


Possible Damage



Consequences for the Population

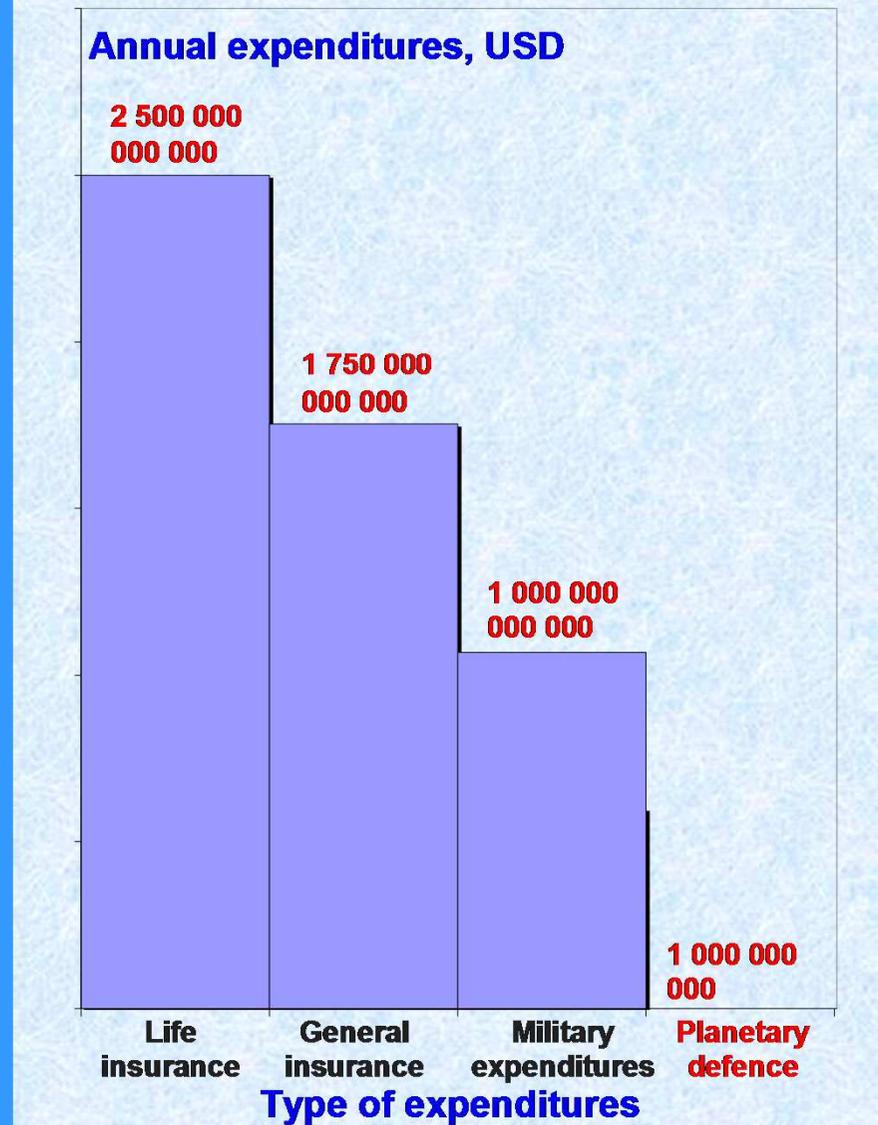
Casualties	- 450 000
Injuries	- 850 000
Total losses	- 1 300 000



Zones of flooding from a tsunami



Comparison of Expenditures



International legal instruments

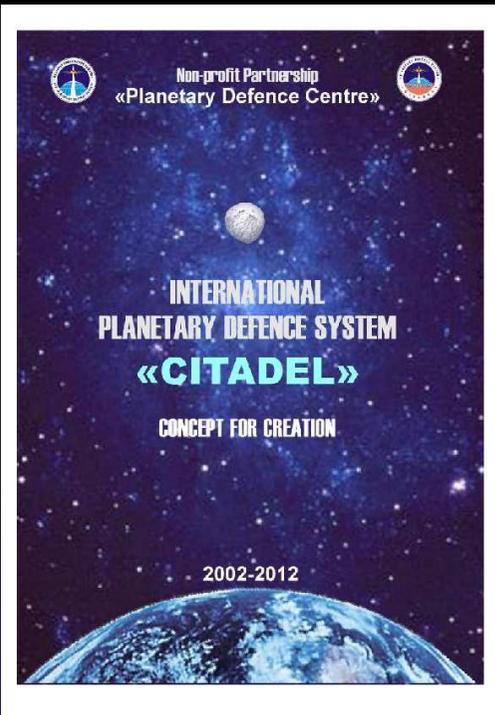
Creation of Planetary Defense System against asteroid-comet danger will demand progressive development of international legal instruments (UN-series Agreement on principles of ensuring the defence of the Earth against asteroid-comet impact danger).



Organizational issues

- The Planetary Defence System must be created by efforts of all mankind.
 - The most important role will be given to technologically developed countries.
 - The UN (its projected International Planetary Defence Center and its regional offices) could perform Coordinating functions in the development and operation of the System.
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The Concept of the International Planetary Defence System "Citadel"



Non-profit Partnership
«Planetary Defence Centre»

**INTERNATIONAL
PLANETARY DEFENCE SYSTEM
«CITADEL»**

CONCEPT FOR CREATION

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Alexander A. Taranov	Deputy Director of the Department of Rescue-Fire Forces, Special Fire-Fighting Service and Civil Defence Forces of the Emercom of Russia, Dr.	
From Institutes and the Organizations		
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Acknowledgements

We would like to express gratitude to experts who made the Concept possible by their studies in various spheres of science and technology. We hope that the Concept will help to reach understanding between experts and decision makers for establishing efficient international cooperation in developing means of Earth protection from asteroid-comet hazard.

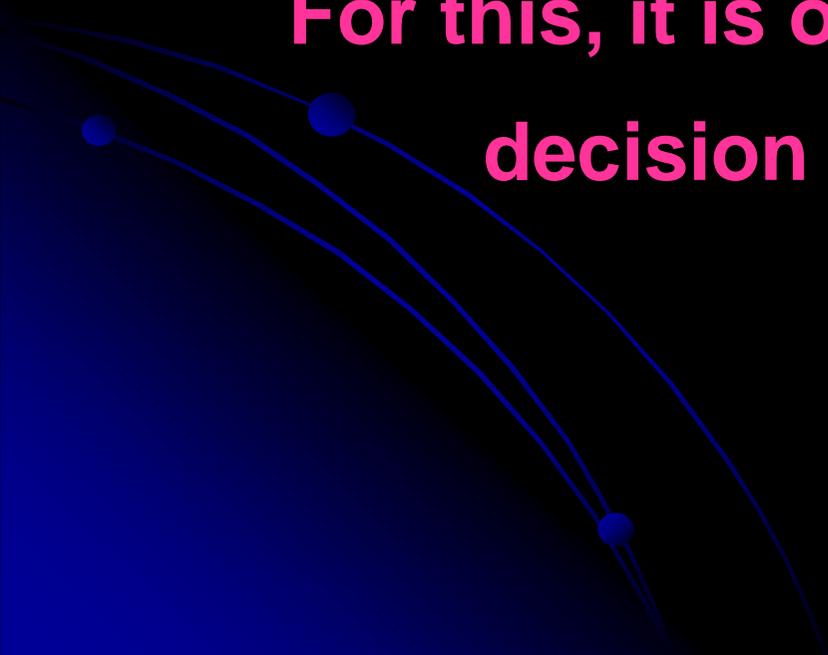
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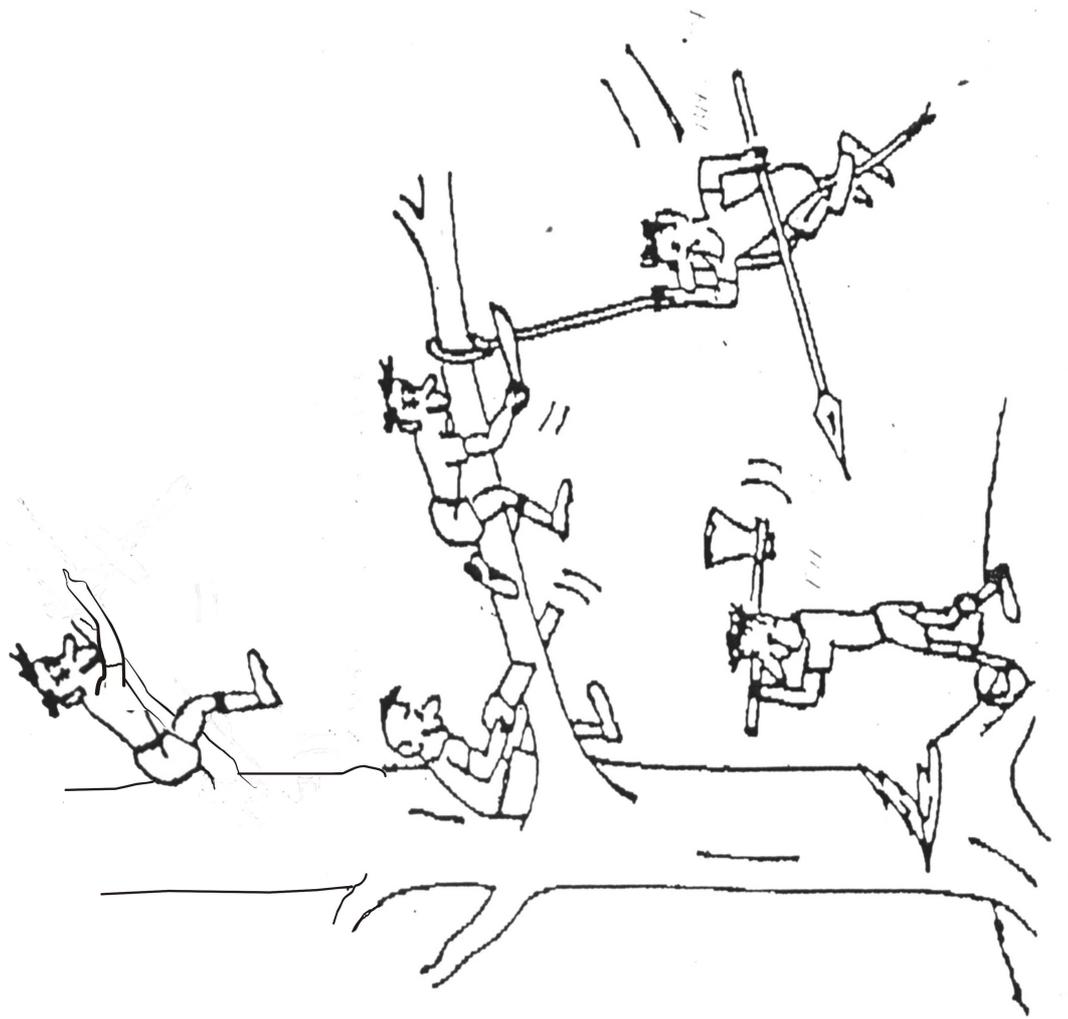
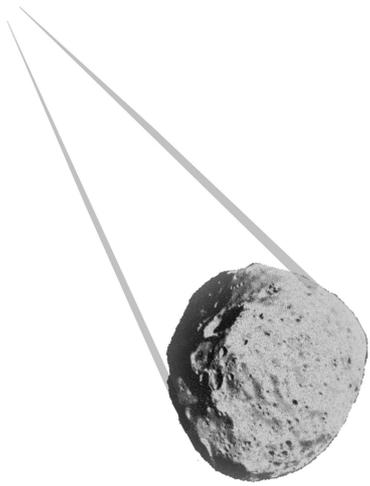
Conclusions

The period of time needed for implementation of the level for short-term reaction is **5-7 years**.

It will protect our planet from asteroids and, partially from comet nuclei.

For this, it is only necessary to take a political decision at the international level.





Thank you for attention

