



Russian Academy of Cosmonautics  
named after K.E. Tsiolkovsky  
PLANETARY DEFENSE CENTER



# On the Possible Approach to Formation of Echelon of Short-Term Reaction of the International Planetary Defense System

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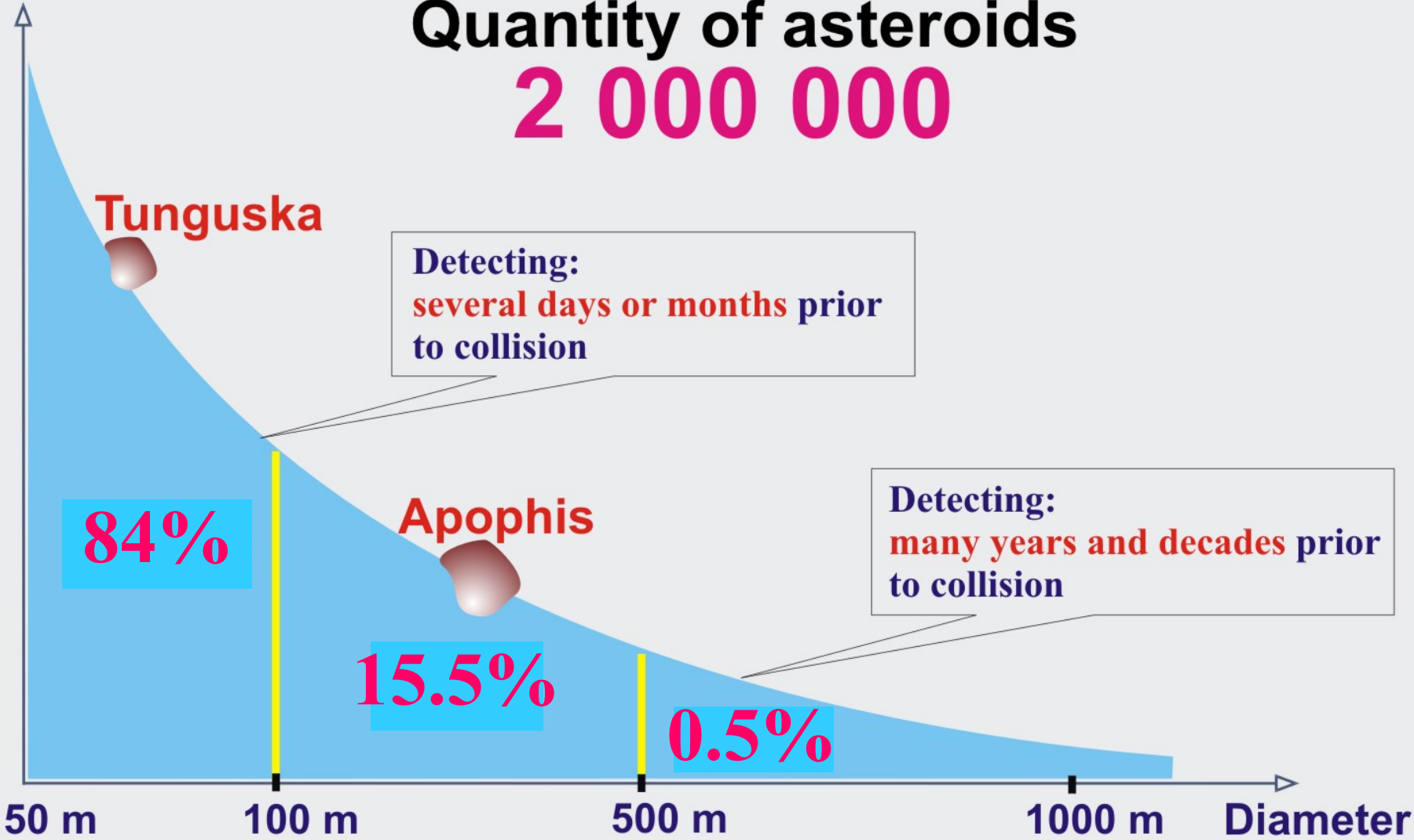
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# Quantity of asteroids

# 2 000 000



# The Planetary Defense System «Citadel-1» (echelon of short-term reaction)



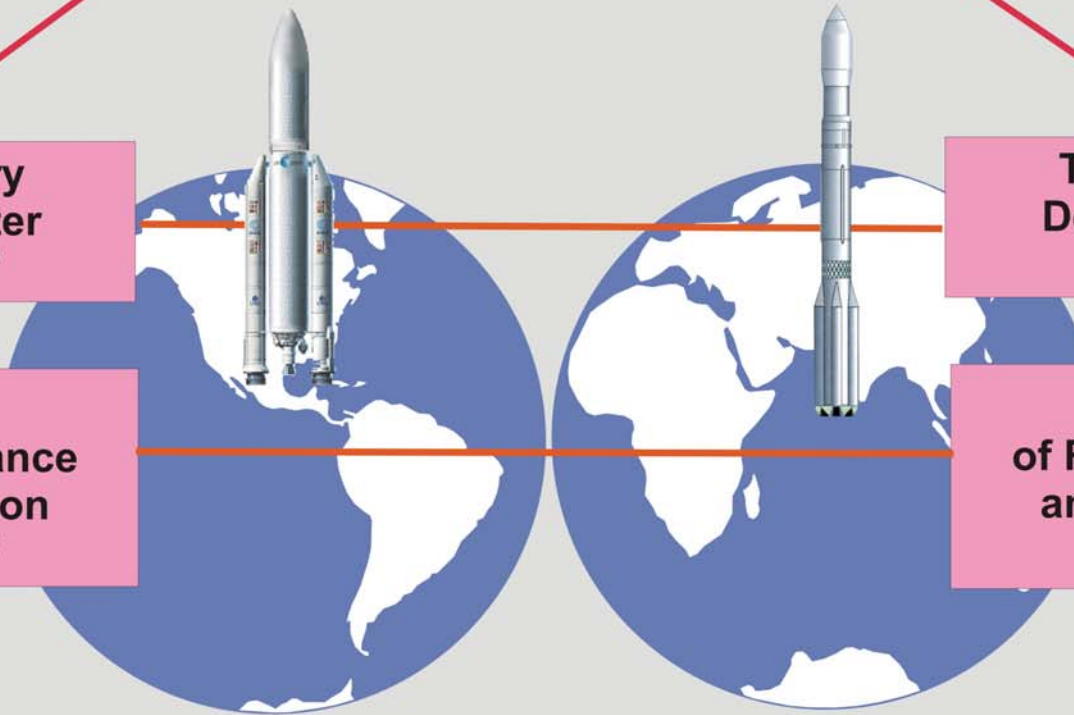
Ground/Space Based  
Service of Observation

The Planetary  
Defense Center  
“The West”

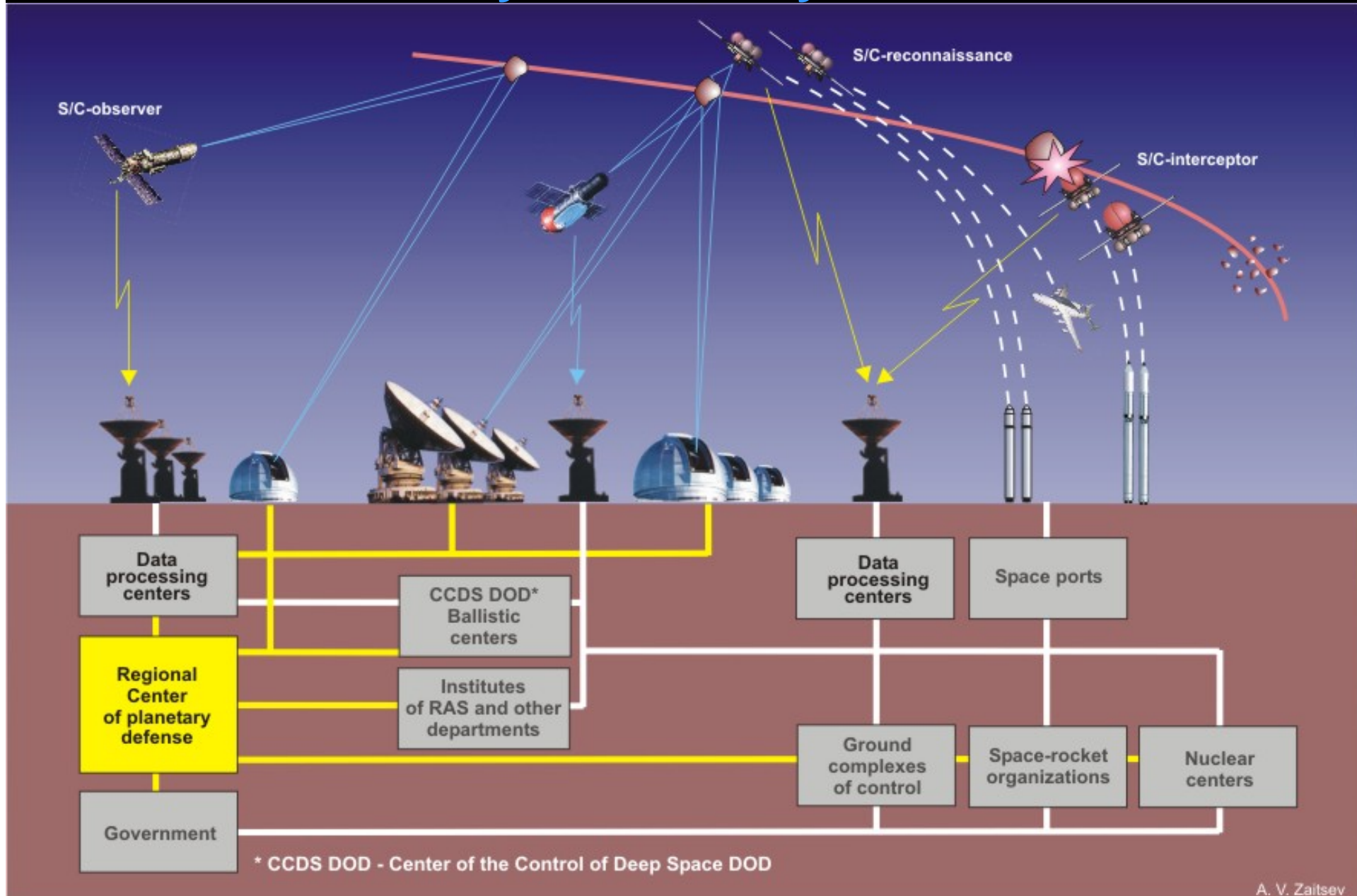
The Planetary  
Defense Center  
“The East”

Service  
of Reconnaissance  
and Interception  
“The West”

Service  
of Reconnaissance  
and Interception  
“The East”

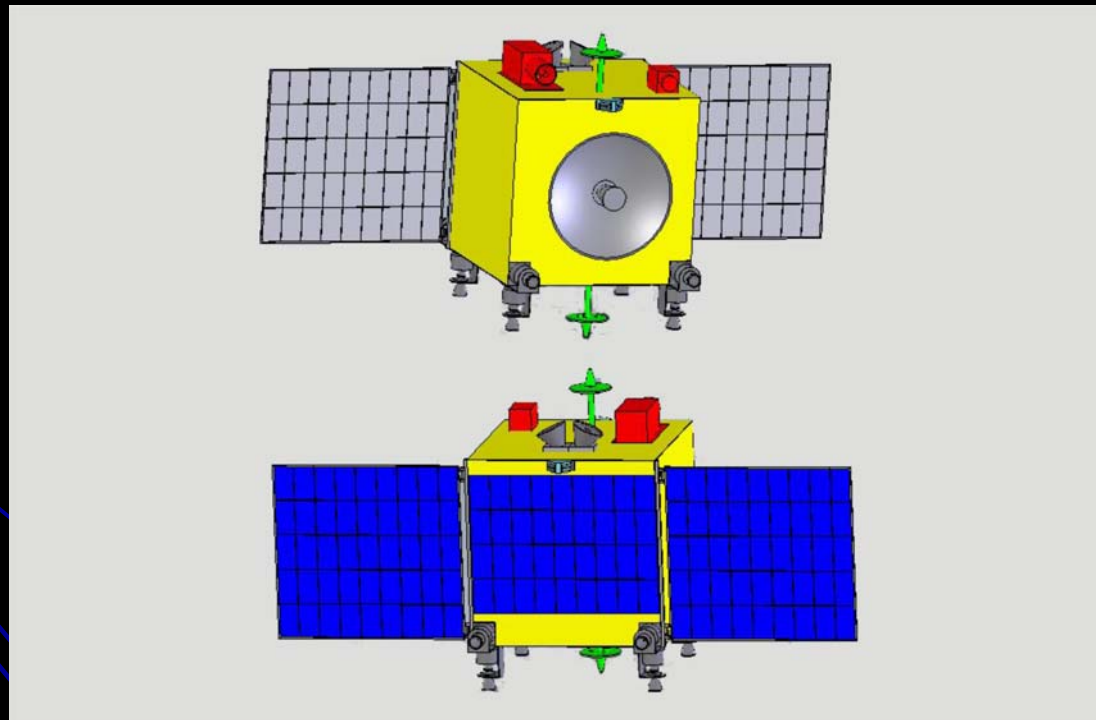


# The Scheme of Activity of the Planetary Defense System "Citadel-1"



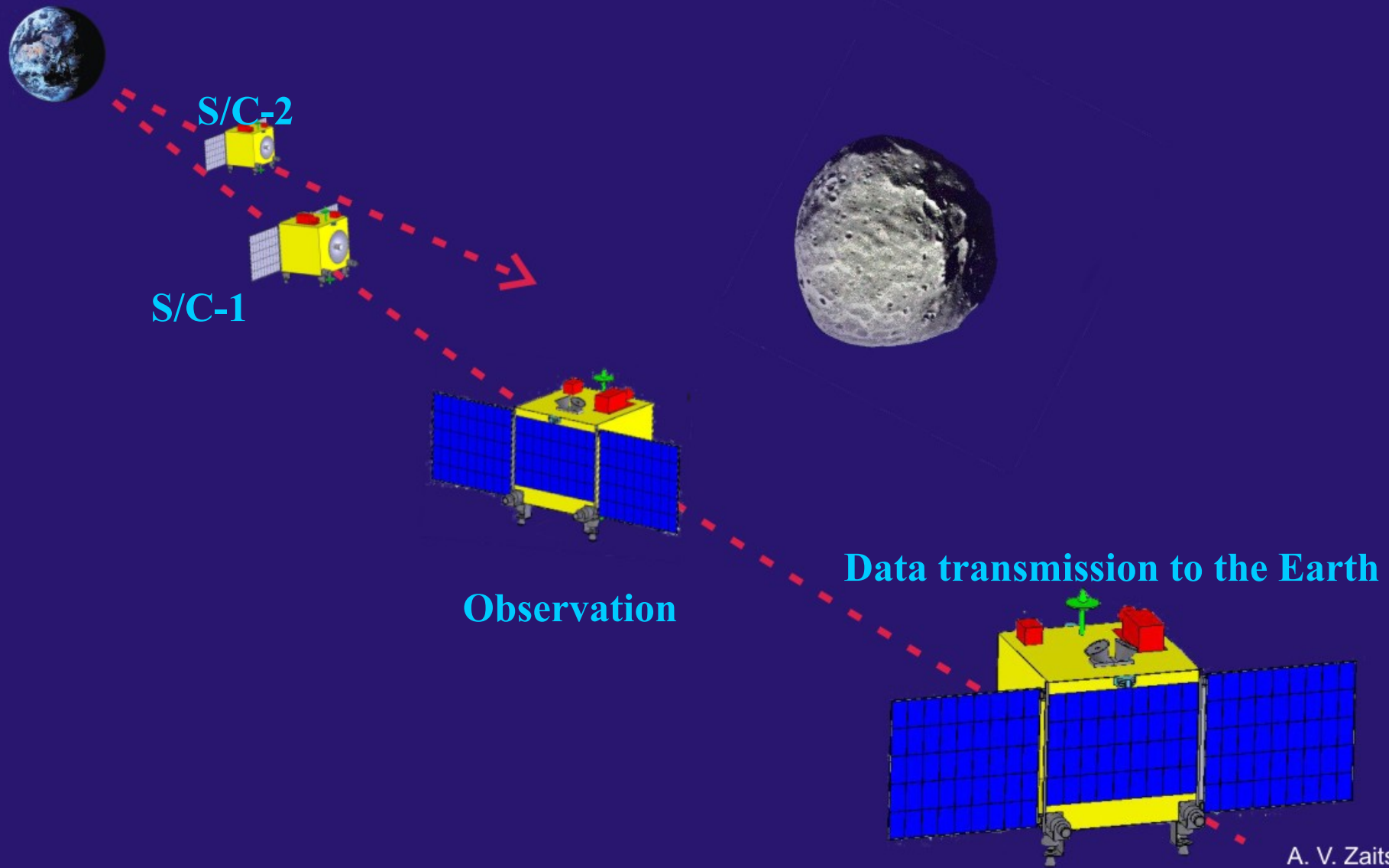
# S/C-reconnaissance

S/C-reconnaissance should be created  
by joint efforts of space agencies  
of Russia, USA, West Europe, China, Japan, India etc.



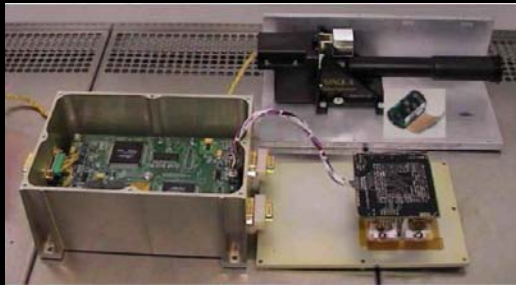
S/C mass - 120 kg  
Including  
Payload mass - 14 kg

# Fly-by about the DCB



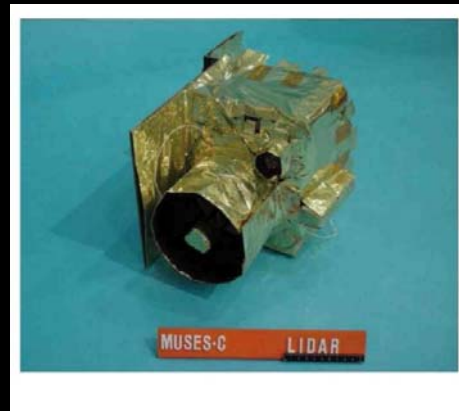
# Scientific instruments of S/C-reconnaissance

**AMIE Imager**  
**SMART-1, ESA**



**Mass: 2 kg**  
**Power: 9 W**  
**FOV: 5.3°×5.3°**  
**CCD: 1024×1024 pixel**

**LIDAR Rangefinder**  
**Hayabusa, JAXA**



**Mass: 3.7 kg**  
**Power: 17 W**  
**Laser wavelength: 1.064 mm**  
**Range : 50 km Accuracy: ±1m**

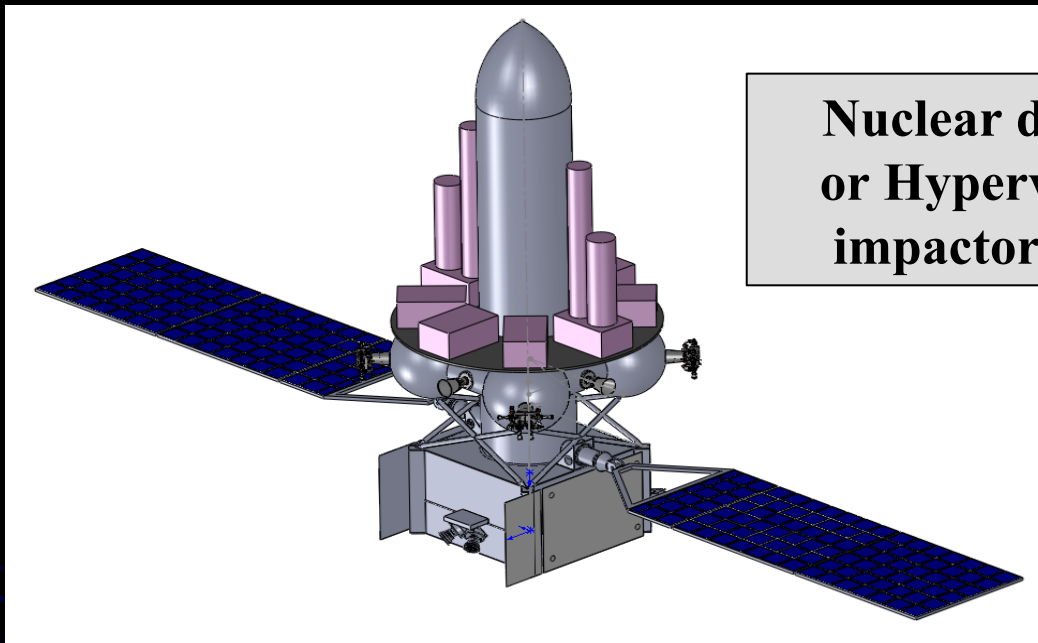
**Gravity Measuring Tool,**  
**Russia**



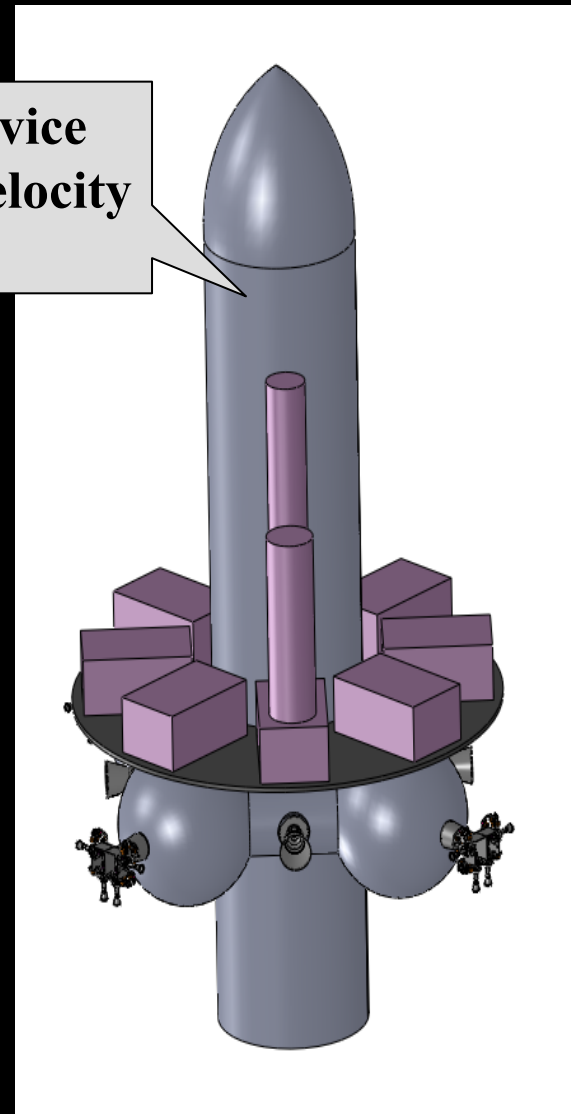
**Mass: 4 kg**  
**Power: 30 W**  
**Range : 50-100 km**  
**Accuracy: 0,001-0,0001 E**

# S/C-interceptor

# The module of interception



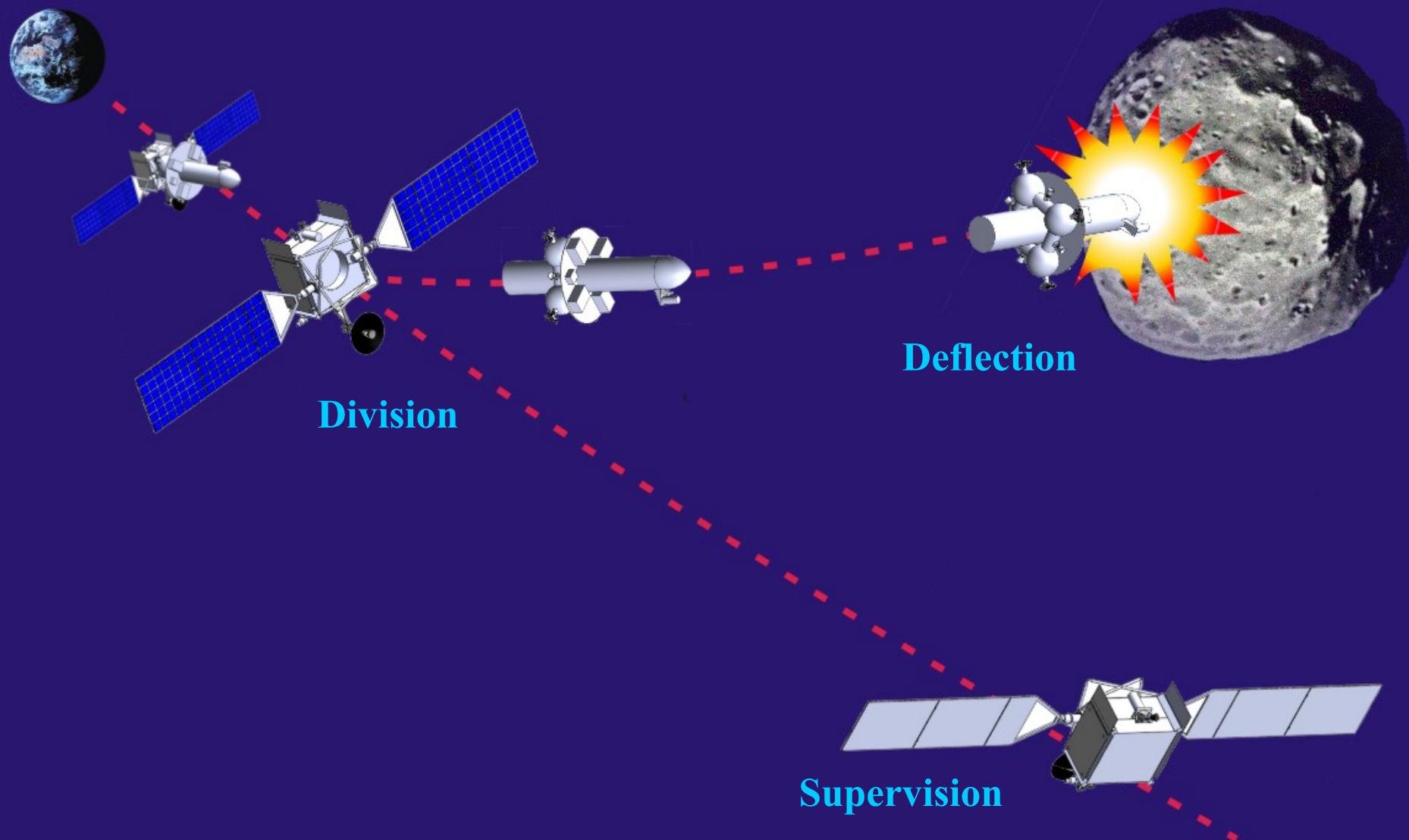
Nuclear device  
or Hypervelocity  
impactor



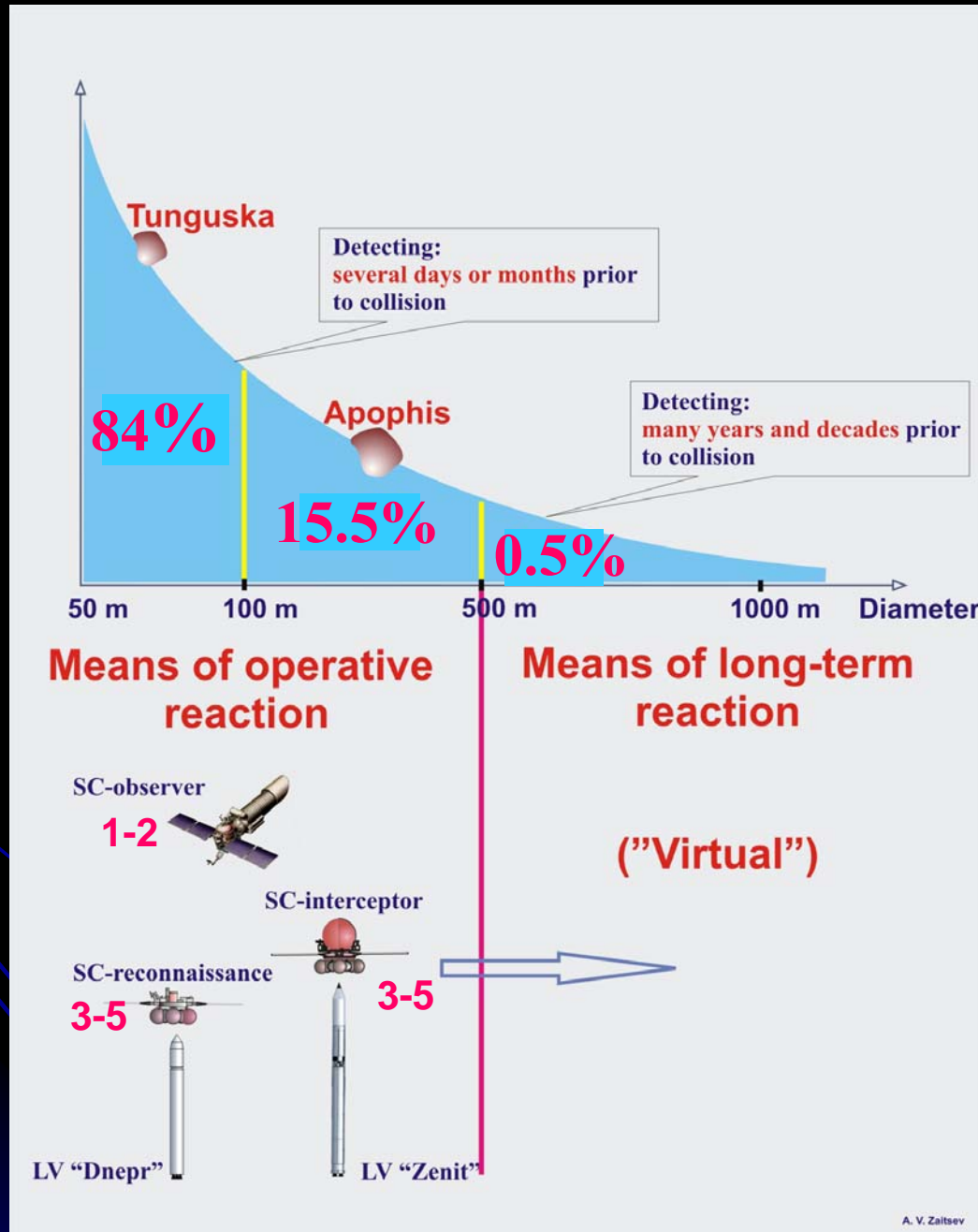
S/C mass - 4000 kg  
Including  
The block of interception - 3500 kg  
(Power nuclear device - 1-2 MT)



# Intercept of the DCB



# Means of the "CITADEL-1" System



**PLANETARY DEFENSE CENTER**

**PROPOSAL  
on creation of  
“CITADEL” PLANETARY DEFENSE SYSTEM**

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of Babakin Space Research Center  
an Academician



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Director of Institute of Mechanics,  
Lomonosov Moscow State University  
Doctor



**J. OKUNEV**

Ad interim of President  
of "Vimpel", interstate  
joint-stock corporation



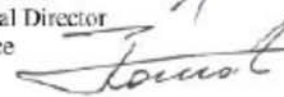
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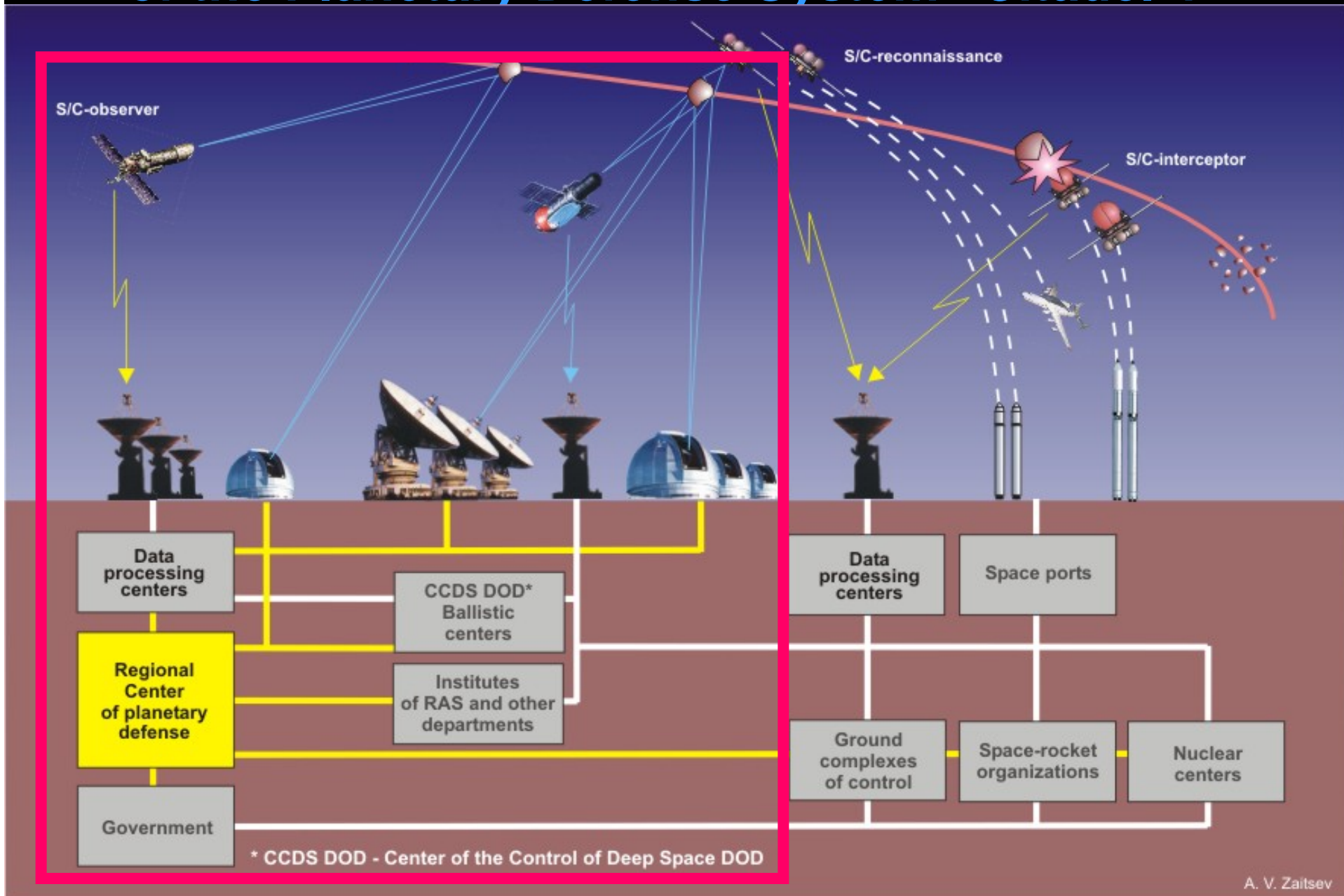
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**In Russia, owing to support of the Ministry of Emergency Measures, serious steps to creation of Service of forecasting of possible areas of falling DCB.**

**In 2009 year, under orders of the Ministry of Emergency Measures, our Center together with A. A. Blagonravov Mechanical Engineering Research Institute and a number of others has developed principles of construction of such Service.**

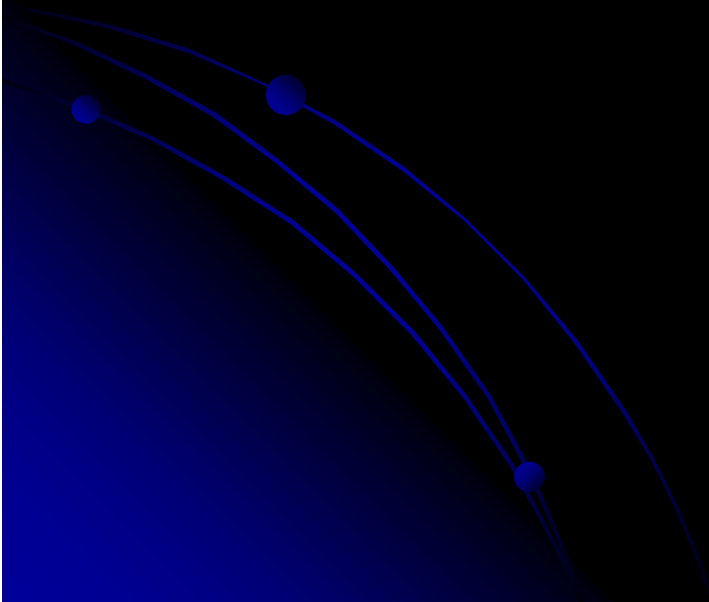
# The Service of forecasting is component of the Planetary Defense System "Citadel-1"



- 1. Russian and foreign technologies allows to building the Echelon short-term (operative) reaction of the International Planetary Defense System against the asteroid-comet hazard within 5-7 years.**
- 2. If necessary, it will be possible on the basis of he Echelon of short-term reaction to quickly form the Echelon of long-term reaction for the opposite action on larger dangerous celestial bodies which allows completely solving the problem of the Earth defense against asteroids and, in part, comet hazard (against cometary nucleuses at 0.5 to 1 km of size).**


**Creation of Short-term Echelon is  
not a task of today or tomorrow.  
This is a task of yesterday.**

**What prevents us from building it?**



**Absence of technologies? Not.  
Large expenses? Not.**

**The solution to problem neither in  
scientific and technical field nor in  
financial or politic sphere but in  
moral and ethical one.**





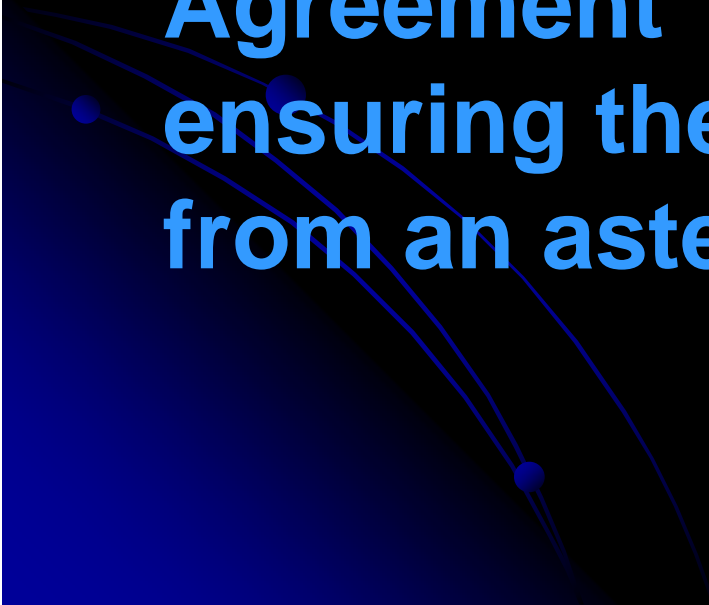
**As long as leaders of countries do not realize their responsibility for the destiny of the Earth and its inhabitants the problem will not be solved.**

**How can we convince them to do it?**



**It could be made by developing of international legal outer space instruments.**

**It can be presented, for example, in the format of an international Agreement "On the principles of ensuring the defense of the Earth from an asteroid-comet hazard"**



**PDS should be created by activity of all mankind including financial maintenance. For this purpose the establishment of Insurance Fund of the Mankind is necessary.**

**Principles of creation and use of this international fund should be reflected in the Agreement.**



## **Besides, the Agreement should cover:**

- tasks of UN and regional Planetary Defense Centers;**
- methods of integration of rocket, space and other components of PDS with national legal status in global international infrastructure;**
- to exclude the possibility of creating the PDS by states which are members of the joint military or political bloc;**
- to exclude the possibility of developing or testing of new kinds of weapons using as the excuse the ensuring of defense from asteroid-comet danger. For example "asteroid weapon".**

**Thus not only asteroid-comet danger, but also possibility of creation new kinds of weapons at the excuse of ensuring the defense from asteroid-comet danger threaten us.**

**It is necessary to develop the relevant international legal instruments to prevent such negative situation.**

**It's impossible to commit the same error as with nuclear weapons – at first the weapons was created and then the mankind began to think how to limit it.**

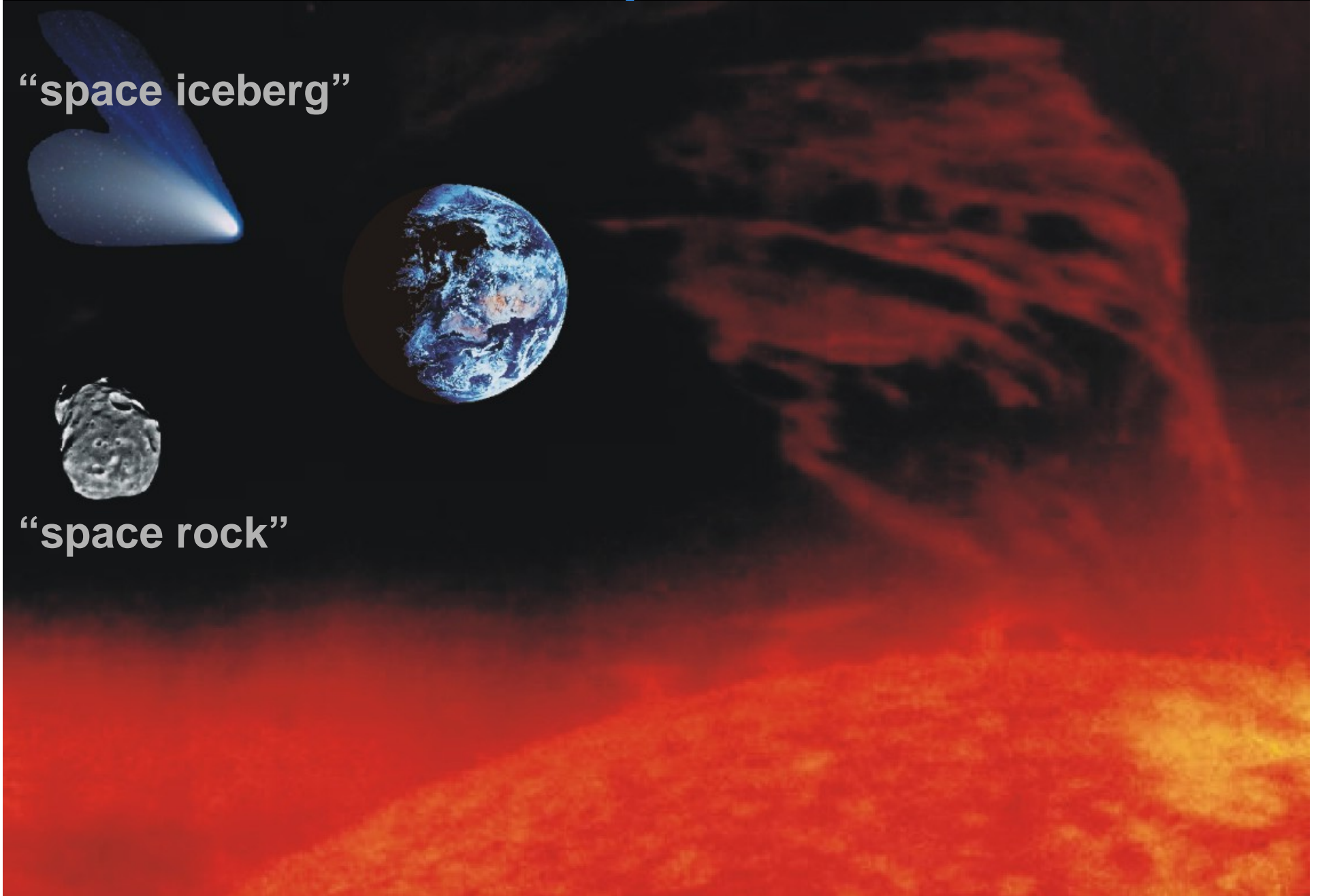
**Of course many other factors should be reflected in the Agreement.**

# Earth is “Space Titanic”

“space iceberg”




“space rock”



**We need to prevent accident.**

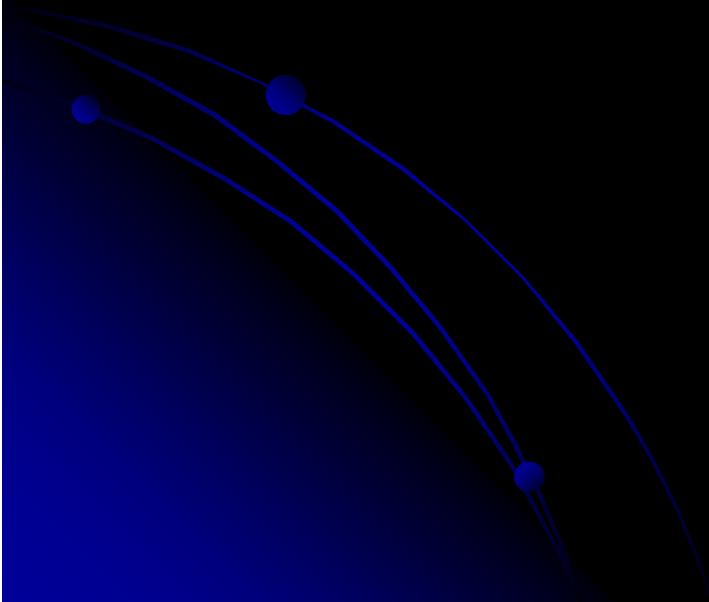
**Basis for this purpose can be development of the offered Agreement.**

**In this connection, I ask you to examine the opportunity to creation a working group with the participants of all states the interested to prepare the proposed Agreement.**



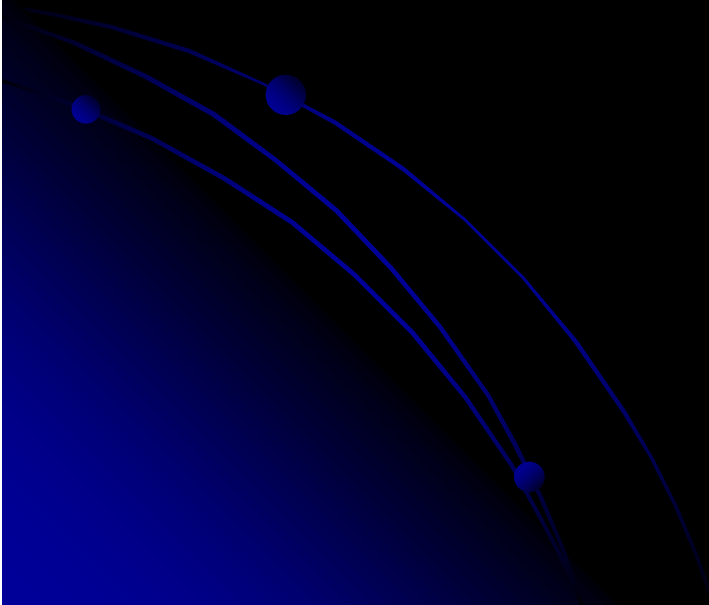
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**Thank you for attention**



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