Gaiashield Group

Comments on The Formation of the Space Mission Planing Advisory Group

Since it will always include the prospect for our random extinction by asteroid impact and because we can: Knowing which asteroid is the next asteroid on its way to strike Earth will always be the most important thing Mankind can ever know. Deflecting the next asteroid on its way to strike Earth will always be be the most important thing Mankind can ever do. Being prepared to effectively respond to the threat of the next asteroid on its way to strike Earth will always be be the most important thing Mankind can ever be.

Functions proposed by Action Team on NEOs
for the SMPAG (A/AC.105/C.1/1029)
Work to be done (in the coming years)
<http://www.cosmos.esa.int/web/smpag/documents-and-presentations>
Action Team 14 and UN recommendations (Camacho)

44. A SMPAG should be established by MS with space agencies. Its responsibilities should include: (a) Recommendation and promotion of key research required for planetary defence.

- Develop a rational and strategically relevant assessment for the risk of asteroid impact in order to assess the scope and scale of any eventual response and justify the preparation, training and vigilance necessary for the conduct of effectively implementing that response. When the risk assessment is flawed or wrong then the strategic and tactical plans to respond to the risk will likely be flawed or wrong and work only as a mater of coincidence and good luck. Then, as such, making this a man-made threat even greater than the risk of asteroid impact itself

Asteroid impact events are random: without any recursive pattern, both in their occasion and magnitude. As such, any perception of any degree of relative frequency is nothing more than an intellectual fabrication, a corruption of empirical information: false. Therefore, any assessment of the risk based in any part on Frequency/Statistical Probability will be inherently non rational and strategically irrelevant. And as merely an abstract artifact, can not in any way contribute to and inform a rational expectation for either the occasion or magnitude of the next impact event. At best, such probabilities are only a relative metric of the abstract uncertainty in randomly occurring events... and hope.

If the potential for the random impact of a 100 meter asteroid is characterized as having an annual probability of 1:1,000 and the potential for the random impact of a 1,000 meter asteroid is characterized as having an annual probability of 1:1,000,000, we can see that the prospect for the random impact of the lower probability 1,000 meter asteroid in any given year only conveys a far greater degree of uncertainty as to when the next 1,000 meter impact will occur than that of the 100 meter asteroid. How is it rational or wise to find comfort and dismiss the prospect of the lower probability threat due only to its greater uncertainty? Further, since such characterizations are generally only applied to existential conditions wherein a set of unobserved events occur at random, there is no potential for any reciprocal degree of certainty. We tend to expect certainty to be based on rational deterministic evidence: only rational information and understanding creates certainty, the absence of rational information and understanding creates only uncertainty.

In rational deterministic conditional terms, given the information we do have and what we can understand regarding when the next 100 meter or 1,000 meter or 10,000 meter impact event will occur: we do not know, we do not know, we do not know... respectively. Our ignorance for all is absolute and any rational expectation for which of these events will occur next must be equal. We should prepare accordingly.

If we are going to be rational here, as the Space Mission Planing Advisory Group, what level of this threat will you recommend we become prepared to respond to?

- Theoretical research in A) the operation of thermonuclear explosive devices in space and B) their effectiveness in terms of generating force. A precursor to a series of conformational empirical tests: reference missions.

If we are going to plan on using Nukes at any point we must have a reasonable expectation for their performance and effect. A) None of the world's current nuclear arsenal is designed for operating in the environs of space. B) Reconcile the current 2,000 times differential in the theoretical yield-to-force ratio (Holsapple/Dearborn).

- Margins of Error required for designing the tactical aspects of asteroid deflection missions:

Probability Ellipse: If we detect a large asteroid that is in fact on an impending Earth impact trajectory, at 30 years before impact we will be lucky to be able to appreciate this event as anything more than a 1 in 1,000 probability. At 20 years, 1 in 100 and at 10 years (the point at which we must apply force) perhaps 1 in 10. To confidently deflect with such a probability our goal should be to displace the asteroid beyond the 10% probability ellipse: 3.5 times the required displacement using 1 Earth radius. And consequentially, 3.5 times the force at 10 years.

Technological Failure: Every rocket we launch into space is a product of millions of moving parts supplied by the lowest bidder and as things stand, guided and operated by people who have never done this before. If we absolutely/positively have to deliver one payload on target and have it work as advertised we need to employ system redundancy and send at least 3.

Target Mass: Since the mass of an asteroid likely to be assumed to be 2 tons per cubic meter but could range to over 4 tons per meter we need to error on the side of caution and address the possibility of 4 tons per meter and design accordingly. Which would multiply the force required by a factor of 2 from the standard best case assumption usually offered in the theoretical.

Since all these margins of error compound each other, the collective margin of error would exceed 20 times and therefore 20 times the force built into the mission over what the ideal based engineering estimates would suggest. In short, if we are to address all margins of error potential in a deflection mission and would expect the net effect of 1 rocket we would need to launch 20.

However, although a precursor mission (at the expense of likely reducing our displacement window on the back end) could mitigate the uncertainty in the impact probability and target mass, only practice/practice/practice can generate confidence in our technology.

- Suitable Launch-Window availability and interception/transit probability analysis.

When we detect an impending impact threat and have a manifest detection-to-impact window, if and/or when we will have an optimum (or any) launch window or feasible interception/transit course will be a matter of random chance. Assess the diminishing probability for suitability for either the larger the asteroid and/or the smaller the detection-to-impact window.

(b) Identification of research opportunities for international collaboration on technologies and techniques for NEO deflection.

- Increased (modern/post Cold War treaty) yield efficiency and operation of thermonuclear explosive devices in space: develop a Space Capable Nuclear NEO Mine.

(c) Development and adoption of a set of reference missions addressing a variety of potential NEO impact scenarios and deflection and disruption possibilities.

- Confirm the effectiveness of Nukes empirically. At least 3 missions: test for total vaporization, exploding and deflecting asteroids through ablation. Even the opponents of Nukes cede the necessity for Nukes after 200 meters and as a 'last resort' if the Detection-To-Impact Window is small: a Plan B. Despite any reservation for their use, what we look for in a Plan B is a high degree of certainty it will work.

Since at its lowest theoretical effectiveness Nukes can be seen to be at least 10,000 times more effective then any of the Second Best Alternatives, consider that one Atlas V can convey a 5 ton 25 Mt yield thermonuclear device to heliocentric orbit. Such a system should afford complete vaporization of anything up to a 75 meter asteroid requiring execution only days before impact; safely explode up to a 500 m threat as close as 18 months before impact; and given 10 years before impact, with a 10 times margin of error easily deflect up to a 1,250 m threat. However, with a 10,000 m threat it would require 500 such nuclear payloaded Atlas Vs to save the planet from asteroid impact... and Mankind from its Extinction by NEO.

Let the diplomats at the UN chew on that... Smart money would bet on their grasping at any straw that affords them a high degree of dissociative denial. After all, they are expert at believing their own lies. Part of the job description.

(d) Development of decision and event timelines for a variety of potential Earth impactors and trajectories identified for mitigation campaign analysis;

Although 'event timelines' will always be event specific in detail there are minimal categorical assumptions we will have to live with in any Detection-To-Impact Window.

From the back end, as things stand:
A) Displacement Window: 10 years (working number for deflection), 18 months (intentional explosion), 10 days (vaporization).
B) Execution of Force Window: 10 days (multiple Nukes or Kinetic Impactors)
C) Transit Window: 3 to 5 years (subject to target orbital elements)
D) Launch Window Window: 3 to 5 years (random chance probability subject to target orbital elements, Murphy's Law and weather permitting... Good Luck)
E) Design/Build Window: 5 years (select, develop, design, build, test, train payload/launch vehicle/team)
F) Political Window: 5 to 10 years (educating decision makers, Policy/Agency/Funding and likely a reconnaissance/precursor characterization mission.)

From a Risk Management (pessimistic) perspective that would be 35 years... for one rocket. Add a couple years for each rocket after that. And at some point start adding launch facilities as well.

Time and Chance can never be taken to be on our side here. Only rational pessimistic foresight (the core of Risk Management) leading to far more Preparation, Training and Vigilance than we are currently considering will dramatically reduce both the strategic and tactical challenges we will face on the day we discover The Next Large Asteroid on its way to strike Earth.

(e) Evaluation of technical maturity and consequences of deflection techniques;

Since Nukes, in terms of payload mass to Work/DV, in an ablation approach can be seen to be theoretically at least 10,000 times more effective than any of the Second Best Alternatives; can be used to either decelerate or accelerate an asteroid; can be employed in standoff or surface or subsurface approach; can be applied incrementally over time or at once; can be delivered in either a high velocity flyby or gradually deployed from a co-orbit rendezvous; can be employed to vaporize or explode asteroids as needed; and would be the only alternative for asteroids over 200 meters or loosely bound rubble piles of any dimension... what more could we possibly want in a tool to deflect asteroids? One Tactic fits all size threats! It's like what Oppenheimer should really have had in mind when he invented the things. 'Behold, I have become Oppenheimer, Saver of Words'...

However, the thousands of thermonuclear devices presently stored around the world were only designed to be launched into the upper atmosphere to fall harmfully back to Earth. As is, they are *devices*, they likely will not tolerate being launched to heliocentric orbital velocities or capable of operating as advertised outside Earth's Magnetosphere, at -240C, in hard vacuum, at Zero G for what may be more than 4 or 5 years... SMPAG should recommend we research and develop Space Capable Nuclear NEO Mines. Which may even include the prospect for making them Earth Friendly: incapable of detonation on or near Earth.

In the shadow of the threat of Extinction by Asteroid Impact what really needs to mature here is Mankind's love of Nukes. And that can begin with SMPAG. You need to stop treating Nukes like they were the Devil's own tools. You are engineers of technology. How can you allow the irrational fear of high energy systems to dictate reasoning based in the laws of physics? How can you allow weakness based Politically Correct ideology influence your math? Nukes are not Evil. Nukes don't kill people. People kill people. And asteroids. Asteroids kill people. Plan A: Use Nukes to kill Asteroids! Win/Win.

(f) Recommendations to the appropriate decision-makers, in collaboration with IAWN, on criteria and thresholds for action

It needs to be understood by decision-makers that with most foreseeable worst-case scenarios wherein the asteroid is either large or the Detection-to-Impact Window is small, or both, to hold any reasonable expectation of success 'action' (as much as possible) must be taken before we see it coming... Now! Such action would include Politics: Policy Determination, Agency Delegation, Funding, training; tactical selection and development; mission design, construction and even predeployment to some strategically advantageous position in heliocentric orbit. If our strategy does not include a prepared response to the worst-case scenarios, then the question here should be what would be the threshold where we abandon managing this risk and choose to take it, choose to gamble, and leave our fate to an expectation of continued good luck... Hope.

Otherwise, the notion of a 'threshold for action' will always be event specific with too many variables to try and determine any formulaic certainty before the fact. As things stand, these considerations will at least include:
- Size of the Detection-To-Impact Window
- Size of the Asteroid
- Composition, cohesion and structure of the Asteroid
- Orbital Elements of the Asteroid: Launch Window and Mission Transit time

- Tactic available for response: Nukes or Not Nukes
- Effectiveness of Nukes
- Degree of readiness: Preparation/Training/Predeployment
- Precursor Characterization mission results
- Political Will: Policy/Agency/Funding effectiveness decisions post detection.

(g) Recommendation of a minimum acceptable Earth-miss distance and/or other criteria for deflection targeting;

One meter would work... at least for large asteroids. But for the smaller Window Buster bolides: keep them out of the atmosphere, say LEO. However, realistically, anyone charged with the responsibility for defending the planet is going to want to cram all the Nukes they can get into all the rockets they can commandeer and Alpha Strike the rock. After all, there is no such thing as deflecting it to much... The notion of 'a minimum acceptable Earth-miss distance' is strategically irrelevant and only interesting on paper to academics as Rocket Surgery. This question does beg a determination for how much Margin of Error we should build into our response mission in order to afford a reasonable expectation of success... even if success is only by one meter.

(h) Recommendation of operational responsibilities for a mitigation campaign;

Ideally, as a security issue, the strategic C3 responsibilities would be best delegated to the world's military agencies that already have an evolved culture and mindset for going in harm's way, responding to dire threats, discretionary authority for the disposition of Nukes and already represent half the world's space capabilities. The world's civillian space agencies, given their experience in heliocentric orbit and manned space flight would endeavor to evolve and develop a more tactical role responsible for the execution, logistical, maintenance and eventually, the manned elements of our Planetary Defense capabilities.

(i) Preparation to coordinate with the relevant actors involved in the implementation of the threat response;

At this point, SMPAG will likely seen by Decision Makers and any 'relevant actors involved' as just another impotent UN diplomatic gesture. Lip service. No teeth. At best, no more than bringing the idea of a knife to an actual gunfight.

To fix this, at any cost, by any means necessary: Be the smartest guys in the room. Be the first to tell truth to power. Remind them that failure is not an option... And before the fact endeavor to make sure that *'the relevant actors involved in the implementation of the threat response'* are well informed and wise enough to do what *works*. Do not leave the quality and capability of the 'relevant actors' only up to Chance and the vagaries of Politics. Then, they will not even think about leaving home to Save the World without you.

Of course with the current strategy of waiting before we see it coming before we prepare a response, SMPAG will have to develop and maintain itself to actually *be* the smartest and actually *know* the truth and actually *see* what all the paths to failure look like and how to actually scare 'the relevant actors involved' enough to desperately want to become informed and wise... Forever. Of course this would also require somehow qualifying and approving the Member States' delegates to SMPAG... then take them to school. A rigorous and comprehensive Masters Course in Planetary Defense. A delegate to SMPAG should be a very high paying full time job... a career objective. Only the best and the brightest need apply. This is, after all, about defending the planet and the survival of our species.

However, if you can get the powers-that-be to build and deploy a Planetary Defense in response to the worst case scenario *before* they see it coming, then all they will ever have to decide to do is just point and shoot. KISS. Once you do that you can declare victory and go home.

Or you can take the path of least resistance and just suck up to the Decision Makers and 'relevant actors involved' by telling them all the cheap and easy/Don't Worry Be Happy optimistic things they want to hear. And when the Smoke and Mirrors and Good Luck sophistry fit only for public consumption fails, and we are about to see our civilization and culture and half the world's population exterminated by some 5,000 meter asteroid, they can cover their political ass and point to the international collection of fools at SMPAG as their expert scape goat... Your Bad.

(j) Identification of any potential legal issues (e.g. liabilities) that may arise in undertaking NEO mitigation actions or selecting any likely mitigation option;

It should be illegal that the Executive Officer of any nation on the planet disregard or fail to appropriately respond to the threat of asteroid impact with a Codified Policy and delegation of a well funded National Planetary Defense Agency. A Dereliction of Duty. A Failure of Fiduciary... and make it a Capital Offense. Otherwise, the notion of using Nukes in space is a treaty issue. Technically not a legal issue. No penalties or punishments attach. And treaties can be abrogated simply by breaking them. The consequence being allowing the other parties to do the same. They get to Nukes asteroids too.

In the event of a failure to respond or a flawed response wherein either results in harm to a sovereign state, since the effect can always be seen to be the product of insufficient funding, the fault and liability shall fall back to the sponsoring member states: ideally, everyone. And as in most disaster and emergency situations dedicated first responders should be saved and held harmless from any specific liability. In that it is already a convention for the nations of the Earth to render assistance and facilitate recovery to each other in the event of natural or man made disasters it should not be conceptually difficult to codify by treaty such response in this case. Since this issue seems to be logically heading for an international mutual Planetary Defense Treaty, fold in an ad hoc exception for Nukes, disaster relief and protection for first responders.

(k) Communication of its activities to the international community;

Complete transparency. Real time and recorded online video and posted English transcripts of all meetings. And complete reciprocity. Easy e.access to our nation's delegates and all officers of SMPAG. Real email addresses! not those double damned email utility forms.

(l) Provision of a yearly briefing to the Committee on the Peaceful Uses of Outer Space on the status of its activities.

COPUOS can send someone to the meetings and write their own report. Or follow it online. Unless of course they are going to come up with some funding... UN/COPUOS just put the band together. Thank you. We needed that. But unless they are going to help finance writing the songs and building the show they can buy the CD like everyone else. Diplomats! All gall no geterdone.

More work for SMPAG:

(m) Given our current state of science and technology, recommend the level of predetection preparation required to address this threat in its worst respondable case manifestation .

The recommendations of COPUOS presented here all seem to be based on the assumption that the next asteroid on its way to strike Earth will be small and that the Detection-To-Impact Window will be large and that the elements of our response can be extemporaneously developed post detection. A product of optimistic and critically flawed risk assessments. If SMPAG is to shape and inform a global strategy for responding to this threat, this responsibility should include recommendations for ex ante preparations and standing deployments in response to this threat in the event that the next asteroid to strike Earth is in fact *not* small and/or the Detection-To-Impact Window is *not* large... and expectations of Good Luck are proven *wrong*.

After all, the last thing you should want any SMPAG recommendation to begin with would be “First, build a time machine and go back 50 years and start building...” It has taken our species a long time to evolve and develop a high level of foresight. Use It... or Go Extinct!

(n) Recommend a level of training, experience and expertise for the 'relevant actors' to develop and maintain in their dedicated Planetary Defense personnel.

This can only be effectively achieved by practice. We should be deflecting an asteroid every 5 to 10 years. Longer than that and expert personnel move up and out to different jobs.

(o) Recommend that criterion for IAWN in terms of what constitutes early detection, as an integral element of our deflection response should be determined by and subordinate to SMPAG.

Surveillance not Survey. The Stargazer battle cry of 'Find them early, Find them early, Find them early' sounds good... to them. But the Rocketboys, who are ultimately going to be responsible for doing the heavy lifting and actually doing the Work of moving these cosmic mountains, should be concerned about the Stargazers Finding them early *enough*! It's bad enough that they are only tasked with finding only 90% but then 90% of an estimate... *their* estimate. After all, all that is required for one asteroid impact is the behavior of one asteroid. Then, once they find them they track them only long enough to determine their current orbital elements then move on to find another one. As if these rocks never bump into each other or become perturbed in close keyhole passages and change their orbits. And why only NEOs? Is there any reason that the next asteroid on its way to strike Earth can not come directly from the Main Asteroid Belt?

Deflection must dictate the criterion for Detection. The other way around will only work as a mater of Good Luck. The Stargazers are limited only by Funding whereas the Rocketboys are limited by Time and Physics... and Funding. But when we see The Next Large Asteroid on its way to strike Earth coming, no amount of money, or human genius, or road-to-Hell paving good intentions by governments will buy us more Time... or new Laws of Physics.

In short, if we are going to detect all the asteroid impact threats to Earth we are going to have to watch all the asteroids in the Solar System all the time... Forever.

(p) To address the suggestions of COPUOS, SMPAG will need to be a collection of engineers of both technology and method.

As such, No Gods or Odds allowed. Abandon all Optimism, Hope and expectations of Good Luck. Using the laws of Physics in a Deterministic Universe it is your job to stack the deck, fix the race, load the dice... game the system. Cheat. Tempered only by value and capability Leave Nothing To Chance. Anything less would be gambling. We The Species can do that for free and without your help... and the only question then would be "Do you feel lucky... ?"

(q) SMPAG shall establish a budget and mandate an annual contribution for the general operation of SMPAG to be charged to the Member States pro rata their respective GDP.

Much of the preliminary research, educational and organizational activities will need to be able to be done by SMPAG in advance of submissions and solicitations for funding any ad hoc projects. You would think that an organization charged with the responsibility for Saving the World would at least have an office and a couple of full time employes. Otherwise the principal activity for all the delegates to SMPAG will be panhandling money from their governments.

(z) Since "*The primary purpose of the SMPAG is to prepare for an international response to a NEO threat through the exchange of information, development of options for collaborative research and mission opportunities, and to conduct NEO threat mitigation planning activities.*"

Then, in order to enable these ambitions and as a first rational step and strategic recommendation by SMPAG for developing an effective response to the threat of asteroid impact:

You don't get what you don't pay for... If SMPAG is to ever actually *do* anything well it must be well funded. Their first and key-stone recommendation in the direction of preparation to respond to this threat needs to be that now, before we see the next one coming, at least the Space Capable nations involved in SMPAG must independently adopt and codify a National Policy to *endeavor to deflect these objects as they present themselves to be impending Earth impact threats*. This much can not be left to be a tacit understanding.

Such a policy would inherently compel the formal delegation of a National Planetary Defense Agency to become trained, expert and ultimately responsible for executing this policy. Then, and only then, through these responsible national agencies, can funding sufficient for actually preparing to respond to this threat be solicited and appropriated. (Which would include the funding necessary for achieving the stated and implied objectives of SMPAG.) Then, with NATO as a model, these individual national agencies can come together around a codified universal 'Human' Policy to form an international agency of agencies... a practical extension of SMPAG on steroids and with sharp pointy teeth, so to speak.

A more top-down alternative approach could take the form of a UN sponsored treaty, principally addressing the space capable nations, establishing and codifying a basic 'Human' Policy and expression of Global Political Will to defend the planet from this threat. Such a treaty should necessarily oblige signatories to both delegate a dedicated responsible National Planetary Defense Agency and (like NATO) appropriate an annual percentage of their national GDP (0.1%) through this agency to cooperatively develop and maintain an effective global response to this perpetual threat.

Whether you want to have pizza for dinner or want deflect The Next Large Asteroid on its way to strike Earth, first a Decision is made to do so. Second, some Agent is tasked with the responsibility for executing the decision. Third, Money is committed in order to conduct and implement the decision's execution. This is just 'Doing things 101'.

Further, at the other end of the spectrum, in the absence of a collection of national codified policies compelling the creation of dedicated National Planetary Defense Agencies enabled by suitable levels of funding, there will be no response-able recipient to find any practical value in any of the recommendations, guidance and advice produced by SMPAG. And the work products of SMPAG will end up being just another collection of grossly underfunded academic reports and result in nothing more than the appearance of actually doing something relevant in response to this threat. You may as well just post your findings on-line under the caption of "To Whom This Should Concern".

I understand that you and your fellows want to drill down into designing new technology and developing space missions and engineering method, but unfortunately, Politics first.

Note: In the 2008 Space Act the US Congress mandated the delegation of a responsible federal agency to deal with this threat and the President signed it into law. By mid 2009 the ASE had submitted its proposal for the notions of IAWN, MPOG and MAOG to UN-COPUOS for consideration in the General Assembly. It is possible, if not likely, that given the nature and disposition of this administration the ASE/UN initiative served to deflect any momentum and blunt any political will to take the lead and codify a national policy and formally delegate a responsible agency until after the UN considerations were completed. Perhaps any political issues would be resolved or revealed or just hoping this buck would be passed... That was 5 years ago. After failing to comply with this law by the 2010 deadline this administration reiterated the mandate in the 2010 Space Act with a new 2012 deadline. However, failing to meet that deadline or doing anything to date, this administration has now failed to comply with its own law...

As such, we should consider that the US is likely primed to respond to a general recommendation from the UN/SMPAG for an expedited policy determination and agency delegation - and a reminder for the US government to do what it had already decided needed to be done 6 years ago. With such a commitment the rest of the nations of the world will quickly follow suit. And the money will flow. Some tone of urgency would be warranted. After all the next large asteroid on its way to strike Earth is closing at a million miles a day... and we are not prepared. Tic Toc.

Until such a time comes that at least the 1st World Nations have codified a policy and political will to deflect these objects, and delegated and funded qualified agencies for executing such a policy, there will be no responsible entity to benefit from the plans and advice of SMPAG.

A Million Miles A Day,

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Gaiashield Group:
<http://Gaiashield.Com>

Agency Delegation:
<http://Gaiashield.Com/NEOHearing>
<http://DearPOTUS.Com>

The Case for Funding IAWN:
<http://Gaiashield.Com/IAWN>

Leave Nothing To Chance:
<http://Gaiashield.Com/LNTC>

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