

# *Gaiashield Group*



## *Leave Nothing To Chance*

When we appeal to Chance with an Expectation of Good Luck the only tool at our disposal to achieve a desirable outcome is Hope. And Hope has never been a reliable survival trait. We can only ever afford to Hope for the best after we have prepared for the worst.

As Engineers, developing a defense against the dire and existential prospect of asteroid impact, whether we are Engineers of technology or of method, we should only settle for leaving anything to Chance and Hope once we have gamed the system: stacked every deck, fixed every race, loaded every die, spent every dime, taken every minute, thought outside every box, pushed the edge of every envelope and breached every synaptic firewall in our collective brains. A response, as a product of anything less, would make the Cosmic prospect of asteroid impact a Man-Made threat by design.

The Next Large Asteroid on its way to strike Earth will always be our proximate fear. But make no mistake, the real enemy here is Chance... If we choose to play its game, sooner or later, we lose.

In the face of Chance, as Engineers, we bring order and predictability. We are the modern evolutionary equivalent of Mankind's opposable thumb. Better then, as Engineers, we hold to a perpetual Expectation of Bad Luck as a matter of Vigilance, and tempered only by value and capability, endeavor always to Leave Nothing To Chance....

As a Touchstone, what else could better serve to define Wisdom.

# ***MURPHY'S NEO LAWS***

Disclaimer: An inherent principle of Murphy's Law is that any list of its manifestations will be a perpetual work-in-progress and dynamic to any response to manage them. Consequentially, no list of Murphy's Laws can ever be taken to be comprehensive or immutable.

TITLE XIII NEAR EARTH OBJECTS: Left to Chance, things that can go wrong when the time comes to deflect The Next Large Asteroid on its way to strike Earth...

## SEC 101 - Failure to see it coming

- a. No dedicated space based full spectrum surveillance methodology ever employed
- b. Undetected dramatic perturbation of known NEO due to asteroid/asteroid impact
- c. Undetected dramatic perturbation of Main Belt object due to asteroid/asteroid impact
- d. Object never discovered due to reduced or terminated funding for search/observation
- e. Object never discovered due to random-chance and bad luck
- f. Object never discovered due to low albedo
- g. Object never discovered due to limited or no incidental radar or infrared capability
- h. Object never discovered due to bad weather/full moon/astronomer late for work

## SEC 102 - Failure to see it coming in time to build/implement a response

- a. Detection-to-impact window too short for a response to any size threat
- b. Asteroid too large for any size detection-to-impact window
- c. No standing tested deflection tactic
- d. Threat characterization too slow
- e. Threat characterization non definitive
- f. Long Period Comet interception point too far away

## SEC 103 - Failure of deflection even if we see it coming in time to build/implement a response

- a. Insufficient or no suitable launch windows available
- b. No time to afford to build in any margin of error allowance
- c. No target rendezvous window
- d. Inadequate or no heavy launch capability
- e. Insufficient or no mission qualified personnel
- f. Technology: design failures\*
- g. Technology: production failures\*
- h. Technology: launch failures\*
- i. Technology: staging failures\*
- j. Technology: telemetry failures\*
- k. Technology: rendezvous failures\*
- l. Technology: interception failures\*
- m. Technology: deflection execution failures\*
- n. Asteroid integrity failure
- o. Threat characterization error
- p. Threat specific characterization not comprehensive
- q. Bad weather on launch day
- r. Failure to design for and afford a manned mission response
- s. Post-deflection return of threat at a later date

\* Specific details, the failure of any of which may be constructive to a catastrophic cascade and subsequent mission failure, are far too numerous to mention. Any nut or bolt or circuit board or O-ring, all supplied by the lowest bidder, would do...

SEC 104 - Failure of political will or strategic foresight

- a. Absence of a responsible definition of the Threat
- b. Absence of any rational assessment of the Risk
- c. Absence of any Policy determination in advance of threat detection
- d. Absence of any Agency delegation in advance of threat detection
- e. Absence of any Strategic planning in advance of threat detection
- f. Absence of any Tactical selection in advance of threat detection
- g. Absence of any Infrastructure development in advance of threat detection
- h. Absence of any Tactical testing in advance of threat detection
- i. Absence of any Tactical construction in advance of threat detection
- j. Absence of any Tactical training in advance of threat detection
- k. Absence of any Tactical deployment in advance of threat detection

SEC 105 - Failure of extant economic capability to build/execute an effective ad hoc response

- a. US/Global recession/depression
- b. Global Warming
- c. Pandemic
- d. Philosophical paradigm shift
- e. War
- f. National/International economic short-term-self-interest

SEC 106 - Critically flawed and irrelevant perception of the threat/risk

- a. Unqualified academic threat/risk assessment
- b. Statistical probabilistic logics generating an expectation of good luck.
- c. Successful extemporaneous deflection of Apophis and false sense of capability
- d. Absence of military grade security minded strategic diligence

SEC 107 - Insufficient nuclear energy resources

- a. Nuclear weapons non proliferation diminished weapons grade plutonium fuel stocks
- b. Irrational fear of nuclear energy
- c. Insufficient weapons grade plutonium fuel production capability
- d. No experienced nuclear weapons designers available
- e. Nuclear device ad hoc space-capability unknown

SEC 109 - Irrational absence of fear in public/government perception of the threat

- a. Failure to appreciate that this threat is forever imminent
- b. Fear is not electorally Politically Correct
- c. Cowardice/Fear of Fear Itself
- d. Hope
- e. Religion
- f. Ignorance
- g. Stupidity

SEC 110 – Failure of the scientific community to relinquish authority in this issue and promote its evolution from objective academic research into the hands and minds of those qualified to develop and implement a subjective and actionable strategic response.

SEC 111 - Mankind simply may not yet be smart enough to do this right and despite all our best efforts and technological abilities, still, nonetheless fail: Chance One, Mankind... Gone.

SEC 112 - Resolution of Response: To eliminate or at least mitigate all the above we must: (A) tolerate nothing less than a conditional and empirically rational and rigorously deterministic perception of this threat, (B) codify our intent and collective political will to endeavor to deflect these objects as they become impending impact threats, first, as a National Security Policy determination at the Executive level then promoted globally as precedent, (C) delegate a qualified and experienced security-minded agency to be responsible for implementing this policy; and most importantly, (D) Leave Nothing To Chance. At any cost/by any means necessary, select, design, develop, build, test, train, launch and pre deploy the most effective and reliable means we can imagine to deflect The Next Large Asteroid on its way to strike Earth *before* we see it coming. If we choose instead to wait until *after* we see it coming (or fail to choose and effectively default to *after*) before we build a response then not all the money in the world - not all the hubris, not all the resolve, not all the hope, not all the genius, not all the 11<sup>th</sup> hour road-to-hell-paving political good intentions mankind can bring to bear, altogether - will buy us more time. And many of those things that can go wrong will do so and We The Species may well become extinct as a consequence. And *Before* we see it coming begins... *Now!*

## ***Asteroid Impact Risk Table***

### I. Existential Risk (probability of loss):

Is there one asteroid on course to strike Earth in the next 100 years

Mutually Exclusive Resolutions:

A) Determine/Find Imminent Impact Threat

B) Determine/Find Every Asteroid in our Solar System to be Safe

### II. Strategic Risk (probability of failure):

Will we successfully deflect the next asteroid impact threat?

Elements Essential to the Conduct of Implementing a Successful Response:

A) Deflection of Impending Asteroid Threat

B) Characterization of Impending Asteroid Threat

C) Detection of Impending Asteroid Threat

D) Adequate Dedicated Funding

E) National/Global Economic Conditions

F) Relevant Technological Evolution

G) Socio/Political Will to Respond to this Threat

H) Irrational Absence of Fear

For detailed aspects of the elements of the Strategic Risk category see Murphy's NEO Laws.

# ***Ten Steps to a Planetary Defense:***

Rational Appreciation of the Fear

Responsible Definition of the Threat

Conditional Assessment of the Risk

Determination of a Policy

Delegation of a Responsible Agency

Engineer a Strategy in principles

Select the Most Effective Tactic

Develop the Strategic Infrastructure

Deploy the Tactical Response

Execute Deflection of The Next Asteroid on its way to strike Earth

All but the last taken *before* we detect an impending impact threat... *Now!*

## ***Seven Strategic First principles:***

If, because we can, it is resolved that We The Species shall endeavor to defend the planet and thereby ourselves from the dire and potentially terminal consequences of asteroid impact we must then ask ourselves:

Will Earth be struck by an asteroid again?

How many asteroids does it take to constitute The Next Asteroid impact event?

How many undiscovered asteroids does it take to constitute the full and unmitigated risk of The Next Asteroid impact event anytime soon?

Which asteroid is The Next Asteroid on its way to strike Earth?

When will The Next Asteroid on its way to strike Earth strike?

How Large is The Next Asteroid on its way to strike Earth?

When will we know which/when/how large?

# *Asteroid Impact Threat Facts*

## **Ten Existential/Objective Facts:**

- 1) The dynamic geometry and existential condition of asteroids in our Solar System has been, is, and always will be such that stable Main Asteroid Belt and other asteroid populations, by either gradual gravitational perturbation by major planets or dramatic perturbation by collisions with comets and other asteroids, contribute to generate and maintain a population of rogue asteroids in relatively unstable degenerating orbits.
- 2) This rogue population, ranging in size from meters to tens of kilometers reflecting the constitution of the Main Belt, contains a subset population the orbits of which near or cross the orbit of Earth constituting Earth impact threats... punctuated mass accretion of the Solar System.
- 3) In that the orbits of these rogue asteroids in any subset are completely unique and discrete from each other in all their specific orbital elements any event of their impact with Earth will be wholly aperiodic and random both in occasion and magnitude.
- 4) Given that the averaged relative frequency of these events is subjectively large and in the abstract not likely to occur in any collective event over any short period of time, and that the empirical nature of these events includes the random prospect for our extinction, then our rational proximate fear would always be for the expression of the next asteroid impact event.
- 5) All that is required for the the next asteroid impact event is one asteroid.
- 6) In that all asteroids are existent objects with existent orbits, then all 'the next' asteroid impact events, including the next extinction level event, is existent and an event in progress.
- 7) Given that there is no imaginable systemic response to this threat, the rationally manifest tactical definition of this existential threat would be the next asteroid on its way to strike Earth.
- 8) The existential risk here would be that we do not know which asteroid is the next asteroid on its way to strike Earth. Therefore we do not know when it will impact or how large it is.
- 9) The strategic risk here would be that we do not know when we will know which, when or how large and can not know until we see it coming... If we see it coming. Therefore we do not know if we will have the capability available to successfully respond to the threat.
- 10) The existential and strategic risk in any increment of time, which includes the prospect for our extinction, is complete and persists unmitigated with the mere possibility of one and only one undiscovered asteroid and the absence of a standing, tested Planetary Defense capable of responding to the next asteroid on its way to strike Earth in its worst case scenario.

Conclusion: Begin to build and deploy a Planetary Defense capable of responding to any worst case scenario before we detect an impending asteroid impact threat. And before begins... Now!

## **Ten Strategic/Subjective Facts:**

- 1) In that this threat includes the prospect for our extinction: all there is, forever... gone, success in this endeavor must be supported and ensured By Any Means Necessary and At Any Cost.
- 2) It may be that the threat here is best defined as the next asteroid on its way to strike Earth, however make no mistake, the name of the enemy here is Chance. The more we leave to Chance the less the likelihood we will survive this cosmic promise.
- 3) A “Silver Bullet”: one-tactic-fits-all-size-threats, would be the logistical and executable ideal approach to deflecting impending asteroid impact threats.
- 4) As a tactic for deflecting asteroids, in terms of net force to mission mass, nuclear ablation has been determined to be 2,000 times more effective than any second best alternative.
- 5) There is no rational engineering basis to dismiss the use nuclear ablation to deflect asteroids.
- 6) All things considered, even with nuclear ablation, deflecting an asteroid threats in the 1,000 meter range may require building, and the chance of having suitable launch windows for, tens of heavy Ares V class missions. For threats of 10,000 meters: building and the commensurate chance of having suitable launch windows for tens of thousands of such missions.
- 7) Waiting until after we identify an impending impact threat of 1,000 to 10,000 meters before we engineer and build an effective response will likely fail. And failure is not an option here.
- 8) Waiting until after we identify an impending impact threat of 1,000 to 10,000 meters before we launch and deploy an effective response will likely fail. And failure is not an option here.
- 9) The most strategically advantageous location to preposition and maintain an effective standing Planetary Defense may be the orbit of Mars: specifically Sun/Mars L3, L4 and L5, serviced and supported by a manned forward Planetary Defense outpost/colony on the surface of Mars.
- 10) All things considered, current world nuclear arsenals combined would likely be insufficient to execute a response against a 10,000 meter threat with any reasonable expectation of success. That capability is diminishing under non proliferation protocols.

Conclusion: Begin to build and deploy a Planetary Defense capable of responding to any worst case scenario before we detect an impending asteroid impact threat. And before begins... Now! And to the orbit of Mars.

## **One Logic/Epistemological Fact:**

- 1) Statistical probabilities are non rational information. Any conclusion or inference drawn from a statistical probability will be a non sequitur... at best an illusion and an appeal to luck.

Conclusion: Discard statistical probabilities as abstract and irrelevant academic slights-of-mind.

## **Ten Socio/Economic/Political Facts:**

- 1) Left in the hands of scientists, the prospect of asteroid impact suffers an irrational absence of **Fear**. Any rational perception is mitigated and often dismissed entirely by statistical probabilistic sophistry and academic slights-of- mind. First and foremost, the prospect of asteroid impact is about the extinction of mankind... Nothing less.
- 2) Left in the hands of scientists, and in the absence of specific empirical conditional information to define the responsible manifestation of this **Threat**, we have been placated with systemic observations and artifactual interpretations rationalized as if they were somehow relevant.
- 3) Left in the hands of scientists, statistical probabilistic assessments of the **Risk** have served to only occlude and distract from the strategically rational binary assessment of whether there is or is not one asteroid on its way to strike Earth any time in the next 100 years.
- 4) Left in the hands of scientists, this threat to national security has never been presented to the Executive Office for any **Policy** determination. For the same reason Willie Sutton robbed banks they have only brought this to the attention of Congress... because that's where the money is.
- 5) Left in the hands of scientists, there would be no **Agency** tasked with responding to this threat. This issue would instead be left in the hands of scientists and their academic abstract response... Until it is actually time to do something. Then... not their problem.
- 6) Left in the hands of scientists, the **Strategy in principles** would remain what it has been for 40 years. Wait until we see The Next Asteroid on its way to strike Earth coming before we actually do anything to deflect it... Vigilance only. No Preparation or Training necessary.
- 7) Left in the hands of scientists, technology would somehow evolve in a vacuum of demand. The necessity for selecting a specific **Tactic** to be developed and exercised in order to implement our response is supplanted with the hope of some yet-to-be-invented technology we can employ. And it will work as imagined because we are Mankind and we went to the Moon...
- 8) Left in the hands of scientists, the allocated funding would be far from commensurate with the potential magnitude of any effective real world response. And the dedication of resources and the Development of **Strategic Infrastructure** and industry essential to the conduct of implementing a desirable outcome, also... not their problem.
- 9) Left in the hands of scientists, successfully **Deploying our Tactical Response** after we see it coming will be a matter of chance and some engineer's problem.
- 10) Left in the hands of scientists, our effort to **Execute the Deflection of The Next Asteroid on its way to strike Earth** will be an ad hoc and extemporaneous thing and will most likely fail.

Conclusion: In the hands of scientists, there has yet to be any governmental recognition of the true scope and scale and urgency posed by this threat or any expression of sociopolitical will manifest in terms of a codified National Policy or delegation of Agency in response, to justify even having a Strategic perspective. This is not about Science. This is about Security. It is time to remove the Risk Assessment and Threat Management and Strategic Decision Making from the hands of Scientists and put it into those with far more qualified security minds: DoD.