Re: 100 megaton bombs atop Saturn V rockets

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From: Henry Spencer (*henry_at_spsystems.net*)
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In article <cd1out$4jl$1@spock.usc.edu>,
John Schilling <schillin@spock.usc.edu> wrote:
*>>of course, we don't *yet* have the near−Earth asteroids and short−period*
>>comets mapped well enough to be sure we'd have plenty of warning for them.
>
>Is it even possible to map those well enough to have decades of warning
>with enough precision to warrant and plan for a diversion effort?

Yes, definitely. It may not be possible, decades in advance, to say firmly that an object *will* strike Earth, but the precision of tracking and orbit prediction is sufficient to say whether there's a significant probability of it. If I recall correctly, currently there is only one well−tracked object with any noticeable chance of an Earth impact, and that's a fairly small chance during an encounter eight or nine centuries from now.

(The remaining uncertainty for that one is because of a common problem: it makes several more−distant Earth encounters in the intervening centuries, and those magnify the current tracking errors.)

>If you can't pin down the CEP to an Earth radius or so, any attempt at
>diversion is as likely to cause an impact as prevent one...

Only if the error ellipse of the encounter is so large that the diversion can't shift it much. If it's currently centered on Earth and you move the center off Earth by a fraction of the ellipse's width, then you haven't really improved things. But if you move it by double its width, then Earth is no longer inside the range of likely trajectories at all. And these ellipses are often quite long and narrow −− much of the uncertainty is usually on one axis −− so if you move it in the right direction, the move doesn't have to be large.

>And even with
>arbitrarily good data, computers, and models, there's a chaotic element
>to perturbation effects on asteroid orbits that will prevent you from
>predicting the trajectory to within 1 Re arbitrarily far into the future.

Correct, but at least for the currently known objects, the realm of
reasonably accurate prediction −− given good tracking data −− extends out
a century at least.

>...the question of whether one can then actually say, "We've
>now undertaken further study of asteroid XYZ−123 and determined that yes,
>it would be a Good Thing to nudge it by 1 Re thataway", reliably, twenty
>years in advance, has not to the best of my knowledge been rigorously
>addressed.
>Have you seen anything in that regard?

Not a general study, no (with the caveat that I haven't really gone
looking). Conceivably there are orbits which are sufficiently disturbed
by the planets, on a short time scale, that good prediction for such an
object would be impractical. But numerical error assessments for specific
objects are done quite routinely, and to date (as far as I know) nothing
has been found whose behavior is difficult to extrapolate on that scale.

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"Think outside the box −− the box isn't our friend." | Henry Spencer
                                −− George Herbert | henry@spsystems.net