Trajectory to 40-40-20?

-- Dennis Gilbert, testimony for OEIB meeting 5-8-12

The discussion of a trajectory, how we actually get from here to 40-40-20, is a key question. A constant message in my testimony is that it is *the* key question. The point of this brief testimony is that the values of important metrics expected over time until 2025 is not the "trajectory" needed to express how we will actually get to 40-40-20.

This distinction can be clarified by considering the trajectory of the 10 year, 3 billion mile journey of the New Horizons spacecraft set to reach Pluto in 2015, a simulation of which is available at http://www.youtube.com/watch?v=78U0_XcFP_I

This trajectory is not a graph over time of the distance between the launch position and the position of the planned encounter with Pluto. As interesting as that graph may be, it does not provide much information on the path attempted and thus feedback for mid-course corrections. It does not provide an adequate common language for understanding progress to align commitment and resources for all the elements of the voyage, or even provide a basis for confidence that the mission is possible.

In contrast, the actual trajectory has a close relation to the strategy and analysis underlying the voyage. The curvature of the trajectory is closely related to the strength and direction of the rocket thrust and fuel use and the strength and direction of the gravitational attraction between the spacecraft and the sun and planets. In particular, the trajectory is closely related to, and depends for its success on, the spacecraft's close encounter and attraction to Jupiter, which provides the essential means to "slingshot" the vehicle to the outer edges of the solar system.

It is from this sort of understanding that useful interventions for mid-course corrections can be accomplished. It is from this sort of understanding that confidence in the feasibility of the mission can be developed, which is necessary to mobilize necessary resources. And it is from this understanding that different parts of the mission are understood, aligned and supported.

It could be useful to imagine the futility – and foolishness – of a planning discussion of the New Horizons mission based on the graph of some simple distance metric without regard to the path and dynamics of the long voyage. This imagined folly can give us some sensitivity to avoid taking a similar approach to a similarly long voyage to 40-40-20, which is far more complicated, in the analogue of a spacecraft that is being constructed along the way by people who must have a common strategic framework and analysis.

The real trajectory to 40-40-20 won't be set in a single meeting, but the need for a real trajectory can be better appreciated. The modest purpose of this testimony is to provide an analogy that can support such an appreciation.