

☒ **Advancements and Progress in NEO Discovery**

**The Contribution Of Intermediate- And Long-Period Asteroids
To The Overall Large-Body Impact Hazard**

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ABSTRACT

The so-called 'Spaceguard Goal' entails the discovery and orbital determination of some specified fraction of near-Earth asteroids (NEAs) within a certain length of time (e.g. the original goal dating from 1992 was 90 per cent of all NEAs larger than 1 km in size within a decade). As time has progressed and a significant proportion of the NEA population has been discovered through the superlative efforts of various search and tracking teams, the goal has been adjusted (e.g. so as to set the lower size limit at around 140 meters). The future time-frame, however, has generally remained a consistent 10-12 years, and for good political reasons.

Regardless, the reality is that there are asteroids on Earth-crossing orbits with intermediate- and long-periods (adopting the conventional divisions for comet orbits of periods longer than 20 and 200 years respectively). This was suspected prior to the original goal being defined, and has been demonstrated to be the case over the past quarter-century through the remarkable success of the various NEA search programs. Clearly it is infeasible to discover any substantial fraction of NEAs with such orbital periods in any 10- or 20-year program: they simply do not return to perihelion often enough. This raises the possibility that a large asteroid (say, bigger than 1 km) might be discovered only during the apparition during which an impact on our planet is to occur; or perhaps it will not be spotted at all prior to its arrival.

In this paper I determine the terrestrial collision probabilities for known Earth-crossing asteroids with orbital periods longer than twenty years, and using those results develop an assessment of the overall contribution of such objects to the hazard posed by large impactors (including comets) capable of causing a global catastrophe. The orbital parameters (eccentricities, inclinations) for such asteroids affect the collision speeds and therefore energies of the putative impacts, meaning that the gross characteristics of the danger they present is distinct from the rest of the NEA population (with orbital periods of only a few years).
