Space Breakup Events Modeling and Analysis

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The model is based on well-observed on-orbit explosions of launch vehicle upper stages

(characteristic size vs cumulative number graph)

(NASA: Ncum=6 Lc^-1.6) (Johnson et al., ASR, 2001)
The model is based on limited on-orbit data and laboratory-based impact experiments.
New Laboratory Impact Experiments

- To better understand the outcome of an on-orbit collision, such as the accidental collision between Iridium 33 and Cosmos 2251 in 2009, NASA is leading a US-based consortium on new laboratory impact experiments
  - The goal is to collect new data to improve the satellite breakup model

598 g projectile @ 6.9 km/sec

570 g projectile @ 6.8 km/sec

(Liou et al., ODQN, 2014)
The NASA Satellite Breakup Model is used by the international space community to support various applications:

- Space Situational Awareness
- Short- and long-term OD impact risks from a new breakup event to critical space assets, including the International Space Station
- Short- and long-term effects from major breakup events to the OD population increase in the environment