The Great Daylight 1972 Fireball

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The Great Daylight 1972 Fireball (or **US19720810**) was an Earth-grazing meteoroid which passed within 57 kilometres (35.4 miles) of the surface of the Earth at 20:29 UTC on August 10, 1972. It entered the Earth's atmosphere in daylight over Utah, United States (14:30 local time) and passed northwards leaving the atmosphere over Alberta, Canada. It was seen by many people and recorded on film and by space-borne sensors.[2]

External images

Earthgrazer: The Great Daylight Fireball of 1972 (Credit & Copyright: Antarctic Search for Meteorites program, Case Western Reserve University, James M. Baker)[1]

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Description [edit]

Analysis of its appearance and trajectory showed it was a meteoroid about 3 metres (9.8 ft) (if a carbonaceous chondrite) to 14 metres (46 ft) (if made of cometary ices)[3][4] in diameter in the Apollo asteroid class in an Earth-crossing orbit that would make a subsequent close approach to Earth in August 1997.[2] In 1994, Czech astronomer Zdenek Ceplecha re-analysed the data and suggested the passage would have reduced the meteoroid's mass to about a third or half of its original mass (reducing its diameter to 2 to 10 metres).[3]

The meteoroid's 100-second passage through the atmosphere reduced its velocity by about 800 metres per second (2,600 ft/s) and the whole encounter significantly changed its orbital inclination from 15 degrees to 8 degrees.[4]

The fireball was filmed by a tourist at the Grand Teton National Park in Wyoming using an 8-millimeter color movie camera.[5]

What if it had collided? [edit]

If it had not entered at such a grazing angle, this meteoroid would have lost all its velocity in the upper atmosphere, possibly ending in an airburst, and any remnant would have fallen at terminal velocity. Atmospheric entry of meteoroids is complex and a full calculation requires a full simulation, but a highly simplified calculation can be made using the web-based program[6] by Collins et al.[7] This table shows how sensitive the result is to the entry angle and composition:

Diameter	Density				

		Entry angle	Energy lost	Airburst altitude	Airburst energy
3	3.4	1 degree	1.3 kiloton	43 km	0.7 kiloton
3	3.4	45 degrees	1.3 kiloton	39 km	0.4 kiloton
8	0.9	1 degree	6 kiloton	80 km	0.4 kiloton
8	0.9	45 degrees	6 kiloton	45 km	2 kiloton

All known Earth-grazing fireballs [edit]

See Earth-grazing fireball

See also [edit]

- Meteor procession
- Record-setting close approaches by asteroids to Earth

References [edit]

1. ^ Astronomy Picture of the Day. 2009 March 2.
2. ^ a b Observation of Meteoroid Impacts by Space-Based Sensors Astronomical Society of the Pacific, Edward Tagliaferri, 2003, 'It was first detected by satellite at an altitude of about 73 km, tracked as it descended to about 53 km, and then tracked as it climbed back out of the atmosphere', 'object is still in an Earth-crossing orbit around the Sun and passed close to the Earth again in August 1997'
3. ^ a b Daylight Fireball of August 10, 1972 C. Kronberg, Munich Astro Archive, archived summary by Gary W. Kronk of early analysis and of Zdenek Ceplecha's paper for Astronomy and Astrophysics in 1994, '3 meters, if a carbonaceous chondrite, or as large as 14 meters, if composed of cometary materials', 'post-encounter ... 2 or 10 meters'
4. ^ a b US19720810 (Daylight Earth grazer) Global Superbolic Network Archive, 2000, 'Size: 5 to 10 m'
5. ^ Grand Teton Meteor Video, Youtube
6. ^ Robert Marcus, H. Jay Melosh, and Gareth Collins. Computing Effects of an Impact on Earth
7. ^ Collins, Gareth S. et al. Earth Impact Effects Program: A Web-based computer program for calculating the regional environmental consequences of a meteoroid impact on Earth Meteoritics & Planetary Science 40, Nr 6, 817–840 (2005) "The curvature of the Earth is also ignored."

- Abe, S. et al. (abstract) Earth-grazing fireball on March 29, 2006 European Planetary Science Congress 2006. Berlin, Germany, 18 - 22 September 2006., p.486. code:2006epsc.conf..486A, 'the first and second Earth-grazing fireballs observed on August 10, 1972(Jacchia, 1974; Ceplecha, 1979) and on October 13, 1990(Borovicka and Ceplecha, 1992)'
- Abe, Shinsuke; et al. 2006. (PDF). Earth-grazing fireball on March 29, 2006 (full details: orbit, charts, spectra, composition) Retrieved 2008-07-07

External links [edit]

- US19720810 (Daylight Earth grazer) orbital characteristics from Global Superbolide Network Archive, 2000
- fireball, meteorite, bolide, meteor, video and photo link to photos and cine film by Linda Baker
- Earthgrazer: The Great Daylight Fireball of 1972 overview of the event including photo by NASA's Astronomy Picture of the Day
- Astronomical Society of the Pacific: *Observation of Meteoroid Impacts by Space-Based Sensors* - one of several similar events; includes ground track

v • d • e **Small Solar System bodies** [hide]

Asteroids (Centaurs · Damocloids · Families · Groups · Moons · Jupiter trojans · Main belt · Near-Earth · Neptune trojans · Spectral types) · Comets · Meteoroids · Minor planets · Trans-Neptunians (Detached objects ·

Hills cloud · Kuiper belt · Oort cloud · Scattered disc objects)

Lists: Asteroid groups and families · Asteroid moons · Binary asteroids · Minor planets
See also: *List of minor planets*, *Meanings of minor planet names*, *Pronunciation of asteroid names*, and *Solar System*

Categories: Apollo asteroids | Meteoroids | 1972 in the United States | 1972 in science