

Fireball report

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Date : December 27, 1994.

Time : 4h17m ± 0.02 UT (December 26 ca. 20:15 PST, ca. 20.20, ca. 20.30, around 20:20) First calls came in at 20.23 PST. 20:17±0.02 - Wagner)

Lightcurve : Von Hanford, from a location in Arizona, first observed a "sparkling" like a firework sparkler. There did not appear to be a center or a central body at that point. Seemed very far. Extinguished after half a second or so : it seemed to blink out. Reappeared as a solid bright -2 magn. body. Shuman (Yoshua Tree National Monument) observed the meteor first as fairly bright regular meteor for half a second, then became bigger and bigger, went out relatively fast, and immediately *after* it extinguished there was a bright flash. This flash was reported from five locations.

Peak brightness : 100 km distance magnitude of -16 ± 4 (estimate of -7 to -10 from Santa Cruz (McDonald), twilight for several seconds, lit up mountain range : "I could see all the peaks, the snowfields, the Palisade glacier. All these geographical features were 5 - 6 miles away from me, but I could see them easily in the brief couple of seconds of the flash (Stapelfeldt)". Scenery was as bright of a cloudy day (Pucci), purple blue dawn sky like daybreak (Steel). "As soon as it dropped out of sight I realized that my central vision had a big spot (Von Hanford)."

Shape : 2 degree sized ball of fire, tail that lasted a bit longer than meteor and fizzled out.

Colors : Started as white glow (Von Hanford). When it became brighter, the first colors appeared : Blue or purple while the meteor left a short

trail. Later in trajectory it appeared to give off green flames shooting off to the sides and at end it was white. Other observers report orange body with bright green tail behind it, vivid green with orange in front of coned shape, and something dark in front of head (Tevis), very green, bluish-green, blue/orange, yellowish with fluorescent green tail, neon green tail with fire red center, green in beginning of appearance, light blue, meteor started white, became greenish white and disappeared being white (Shuman).

Fragmentation : Von Hanford noted a small piece arc down from main body just before passing Las Vegas. No fragmentation reported at end of trajectory. However, note the large distance to meteor to observers at that point.

Duration meteor : Most observers report a relatively short duration : 2.7 ± 0.8 seconds (2.2, 2.0, 1.5, 2.5, 2.5, 3.0, 1.5, 3.5, 4.0, 6.0 and 3.3) Von Hanford counted 8 seconds while observing the meteor.

Speed : $70 \pm 2 / -15$ km/s. As regular meteor perhaps slightly slower than normal shooting star, pretty fast, estimate of about $15^\circ/\text{second}$ from Santa Cruz amounts to some 110 km/s. Count of 8 seconds (Von Hanford) amounts to about 70 km/s.

Sounds : Sonic boom heard in Bishop (8 seconds, 28 seconds, "about a minute"). Big Pine -rattled the house (100 ± 15 sec.), Onyx ("2-3 minutes"), Arizona (8-10 minutes, weak boom and weak rumbling) and Carson City. In Onyx sound was like a "boom". Outdoors in Big Pine (Stapelfeldt) there were "two very sharp booms, followed by a continued rumbling that died away over the next 10 seconds.

The booms were so loud that they rattled the cottage and caused my wife (who was indoors) to wonder if a small earthquake was going on. They were not so loud as a space shuttle's sonic booms." Near Bishop, indoors, sound was like rumbling banging sound as if someone was downstairs (Pucci) or (from car) a loud boom and rumble sound (Steel).

Trajectory : All observers agree on East to West movement. Steepest path on the horizon reported in Bay Area with slight tendency to go right to left. Azimuth WNW : $100^\circ \pm 8^\circ$. Indications of angle on the horizon (see plot) suggest a $8^\circ \pm 3^\circ$ entry angle and a total path of 750 km. Pilots NE of Beatty saw the meteor extinguish at an estimated height (?) of 10 km. Plane was at 6 km ? End point was a few miles west of Bishop and at altitude less than 15 km because of short time span between light flash and explosion at that location.

Details : The bright flash at the end of trajectory and the large brightens caused many to believe that the meteor hit nearby. Search parties were held by several people including a search in a local park by the fire department and five police cars in Thousand Oaks. No find of remnants has been reported.

Conclusion : A fast object that penetrated surprisingly deep into the atmosphere. a catastrophic fragmentation (explosion) occurred at the end of trajectory at an altitude below 15 km. Chance of survival of fragments at location few miles E-SE of Bishop minimal.

This report was compiled from reports by : Andrea Pucci, Bishop; Marie Tevis, Solvang; Dave Benner,

Thousand Oaks; Catherine Steel, Santa Cruz; Mike Butle, Dublin; Frank Bowen, Grenada Hills; Karl Stapelfeldt, Pasadena; John McDonald, Santa Cruz; Derek Shuman, Esmerlyville; Mamite Rathi, Los Angeles; Rubin Fernandez, North Hollywood; Laury Olseesky, Sherman Oaks; Joseph Powers, Vacaville; Ted Dudziak, Pleasanton; James Von Hanford, Stanford; Carl Wagner, Lancaster.

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