

PROJECT 10073 RECORD CARD

1. DATE 25 March 1963	2. LOCATION Chevy Chase, Maryland		12. CONCLUSIONS <input type="checkbox"/> Was Balloon <input type="checkbox"/> Probably Balloon <input type="checkbox"/> Possibly Balloon
3. DATE-TIME GROUP Local 1930 GMT 26/0030Z	4. TYPE OF OBSERVATION <input checked="" type="checkbox"/> Ground-Visual <input type="checkbox"/> Ground-Radar <input type="checkbox"/> Air-Visual <input type="checkbox"/> Air-Intercept Radar		<input type="checkbox"/> Was Aircraft <input type="checkbox"/> Probably Aircraft <input type="checkbox"/> Possibly Aircraft
5. PHOTOS <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	6. SOURCE Civilian		<input checked="" type="checkbox"/> Was Astronomical Meteor <input type="checkbox"/> Probably Astronomical <input type="checkbox"/> Possibly Astronomical
7. LENGTH OF OBSERVATION 2 seconds	8. NUMBER OF OBJECTS nine	9. COURSE West/down	<input type="checkbox"/> Other _____ <input type="checkbox"/> Insufficient Data for Evaluation <input type="checkbox"/> Unknown
10. BRIEF SUMMARY OF SIGHTING Outside observing ECHO. Shortly after ECHO passed obj observed at 40-50 dgr elevation in flight fm East to West. Several obj trailed that were bright red. Total duration reported now as 3 seconds. Detailed description furnished DOD of the nine objects.		11. COMMENTS Witness contacted by L/Col Friend and discussion of event indicates that object was a bolide, which exploded into nine pieces.	

The Path of the March Bolide

CHARLES P. OLIVIER, *Director, American Meteor Society*

A VERY BRIGHT fireball was seen at 10:12 p.m. Eastern standard time March 25, 1963, over the Middle Atlantic states. It was reported from Pennsylvania, New Jersey, Maryland, Delaware, District of Columbia, West Virginia, Virginia, and North Carolina. Unfortunately, no reports have come from ships in Chesapeake Bay and neighboring waters, where the meteor must have been seen.

At the time, the writer was near Washington, D. C., and the *Star* carried his request for observations by the public. A number of reports came directly to the American Meteor Society; many were received at the Franklin Institute in Philadelphia and at the Smithsonian Institution in Washington. Finally, a few readers of *SKY AND TELESCOPE* responded to my request in the June issue (page 313), though some of their reports were received too late for inclusion here.

The bolide was large, brilliant, and spectacular, arousing the attention of many people who were indoors, some even in bed. It undoubtedly showed an apparent disk, estimates ranging from 30 minutes of arc (the moon's size) downward. One trained observer at a considerable distance from the meteor gave its magnitude as -4 , but persons nearer the path made it -8 or -10 . The colors reported differed greatly, the preponderance being green, blue, and white. Some observers called the main body orange or red, but they probably saw it low in the sky, hence through greater amounts of the atmosphere.

Behind the head of the fireball there followed a short appendage or tail. A long-enduring train was reported by only one observer, who was in West Virginia near the higher part of the path where such a train might develop. He said the "smoke" lasted 10 to 15 seconds.

This study of AMS fireball No. 2376 is based upon about 66 reports, of which at least 28 contained data permitting me to calculate the meteor's path through the atmosphere, and its orbit in space before encountering the earth. Due to

the wide geographical distribution of observers and the fact that some were American Meteor Society members trained in such observations, I believe the calculated results are much more reliable than usual.

Note, however, that the beginning and ending of a bright meteor are seldom observed. Instead, we derive points along the path that are short of each extremity. Fortunately, this makes little difference in the path's downward slope or in the orbit, which we assume to be a parabola around the sun. To compute an elliptical or hyperbolic orbit seems a waste of time in this case, even though we have some estimates of the meteor's duration of flight.

When the orbit was calculated, the first sighting of the March 25th fireball seemed to be over central Pennsylvania, at a height of 53 miles above point B_1 on the map. Since then I have received an excellent report that extends the path 33 miles northwestward, where the height was 57 miles. The calculated orbit is not affected, however.

The end point was 23 miles over E_1 in the Atlantic Ocean. As the table shows, the atmospheric track from B to E extended 254 miles (the new report increases this to 287 miles). Projected on the ground, the path from B_1 to E_1 is 252 miles (total length 285).

Most observers did not estimate how long the meteor was visible, and many who did saw but part of the path. Several used the word "slow" in describing the motion. Three of the best, who seem to have witnessed the whole path, gave 7-8, 8-10, and 10 seconds. Perhaps nine seconds is about correct, indicating very uncertainly an atmospheric velocity of 28 miles per second.

A striking explosion of the fireball occurred above point X_1 , as the main body partially disintegrated. Apparently there were at least two more flares farther along, but not so great or brilliant. The "sparks" from the explosion were orange or red. An observer at Newport News, Virginia, said that a dozen or more fragments followed the meteor. There is good



The fireball of March 25, 1963, passed southeastward from Pennsylvania across Maryland to end over E_1 , after exploding above X_1 . Diagram by the author.

reason to believe that some fragments went beyond the meteor's last observed position, and if they were large enough they may have fallen into the ocean.

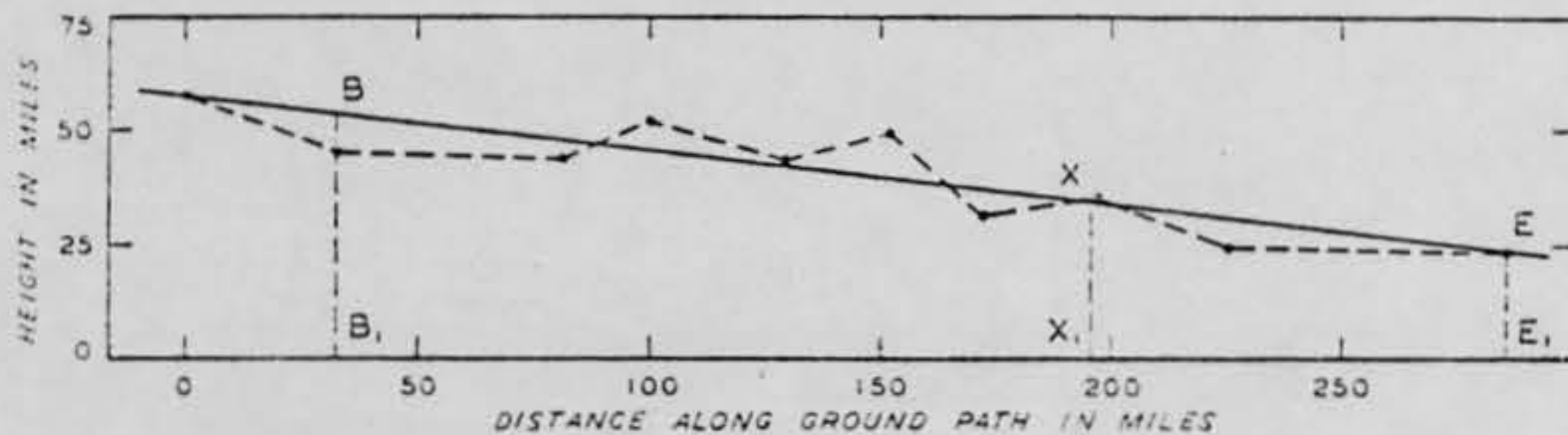
I was able to determine quite accurately the main explosion's subpoint, X_1 , at longitude $75^\circ 58'$ west, latitude $38^\circ 21'$ north, near Elliott, Maryland. The explosion height of 34 miles seems too great for meteorites to descend from, judging by previous cases. Nevertheless, three staff members of the Smithsonian Institution made an immediate search along the assumed path, but could find no authentic reports of debris having fallen.

Whenever a well-observed fireball appears, our procedure is to prepare a map on which each sighting station is plotted. The latitude-longitude grid in this case had a scale of one millimeter to one minute of latitude, with properly converging longitude circles. From each station the observed azimuth lines are drawn, and their convergences define approximate points on the meteor's projected path. In addition to angular estimates, we have reports from observers who saw the fireball cross the zenith or pass east or west of them. Combining all these data permits drawing the ground trace through B, E_1 .

We then draw a graph relating distance along the projected path and the meteor's height, which is obtained from the trigonometric formula $H = D \tan h$. In each case D is the distance from the observer's station to the respective point on B, E_1 for which an altitude (h) of the meteor was reported (and corrected for curvature). The adopted path in space is the line that best represents the average of the heights.

In this case, it came out well. After applying certain corrections, the altitud

(Continued on page 270)



In Dr. Olivier's preliminary chart of the gradual descent of the fireball, dots indicate groups of height determinations, and the letters along the ground path correspond to those in the map above.

THE PATH OF THE MARCH BOLIDE
(Continued from page 263)

and azimuth of the meteor's radiant in the sky are obtained. Knowing the sidereal time of the event, we then compute the coordinates of the radiant, in this case near Upsilon Andromedae. The table gives the orbital elements of the meteor as a member of the solar system before it struck the earth.

The elements show that the fireball overtook the earth and moved in a plane inclined only $13^{\circ}.5$ to the ecliptic. This is low enough to indicate that the meteor belonged to the group that is believed to come from the asteroid zone. Its perihelion point, as is almost always the case, lies inside our orbit. The velocity given is the vector sum of the meteor's heliocentric velocity and that of the earth — in other words, its speed relative to our atmosphere.

It is probable that another bright meteor appeared at nearly the same time as this fireball. Its motion was toward the northeast, but the few reports received

here do not permit an analysis of its path to be made.

I am indebted to the scores of observers who supplied the detailed observations

needed for this study. The *Washington Star*, Franklin Institute, and Smithsonian Institution played essential roles in gathering of reports.

AMERICAN METEOR SOCIETY FIREBALL NO. 2376

Date	1963 March 26.13
Sidereal time at end point E	155 ^m .8 (10 ^h 23 ^m)
First determined point, B	Long. $-77^{\circ} 39'$, lat. $-40^{\circ} 23'$, height 85 km
Point of main explosion, X	Long. $+75^{\circ} 58'$, lat. $-38^{\circ} 24'$, height 55 km
Last determined point, E	Long. $+75^{\circ} 02'$, lat. $-37^{\circ} 21'$, height 37 km
Projected length of path, B,E.	405 km.
Length of actual path, BE	408 km.
Duration of visible meteor	9 seconds (very uncertain)
Observed velocity	45 kilometers per second (very uncertain)
Radiant uncorrected	Altitude (h) $6^{\circ} 44'$, azimuth 147°
Curvature correction	$+1^{\circ} 50'$
Zenith correction, parabolic	$-8^{\circ} 32'$
Radiant corrected	Altitude (h) $0^{\circ} 02'$, azimuth 147°
Equatorial coordinates	R. A. $22^{\circ}.8$, dec. $-41^{\circ}.8$
Ecliptic coordinates	Long. $37^{\circ}.7$, lat. $-29^{\circ}.8$
Orbital elements:	
Inclination to the ecliptic	$13^{\circ}.5$
Longitude of ascending node	$4^{\circ}.5$
Longitude of perihelion	$145^{\circ}.8$
Perihelion distance	0.09 astronomical unit

No Case (Information Only)

26 March 1963
Norfolk, Virginia to
Long Island Sound, New York

Shy and Telescope June 1963 Issue page 343 has request from Dr Olivier for data on this meteor. Reported time was 1012 PM.

PITTSBURG POST-GAZETTE-3/27/63

Mar 26, 1963-A meteor which gave a glowing sky show was seen by hundreds of persons from Norfolk, Va to Long Island Sound in N.Y. It was seen shortly after 10 PM. "At first I thought it was a plane in trouble!" related one Washington-area woman. "Then it looked like a flare, or a sky-rocket. It had a reddish glow to it!" Georgetown U astronomers said the object was a "fireball meteor."

...A strange glowing object, which may have been a meteor, was seen in many parts of Long Island on the night of March 25th. One witness described it as "a circular object that appeared like a fluorescent greenish light." It seemed to throw off white fire streaks from a tail as it disappeared behind a cloud and then reappeared. The object was also seen as far away as Norfolk, Virginia..

SIGHTSEEING SAUCER VISITS STATUE OF LIBERTY: Many of the East Coast papers carried stories of a "meteor" which was seen traveling south on the night of March 25th. It seems strange that no seismographic reports of shock waves or any other reports of the meteor's impact were ever made. Even though the meteor traveled from the coast of Maine to Norfolk, Va. at extremely low altitudes, it evidently did not strike the earth. For those readers who find the antics of such an unusual meteor strange or hard to believe, we give the story of one of the witnesses, who was personally interviewed by SAUCER NEWS Assistant Editor John J. Robinson.

On March 25th Dudley C. Troy, who lives in Staten Island, N.Y. and works in Jersey City, N.J., was driving south on Halliday St. in Bayonne, N.J. at 10:10 p.m., when he suddenly saw a large object come sloping down out of the sky. The object was above Caven Point, which is on the Jersey shore of New York Bay, directly opposite the Statue of Liberty. The descending UFO leveled off and proceeded southward at an elevation Troy estimated to be about 200 feet, at a distance of nearly a half mile away. It seemed to be traveling

about 40 miles per hour. Troy stated that the object was so low that houses sometimes obscured it from view as it passed behind them.

He freely admitted that the UFO frightened him, even though he had served in the seaboats in Africa as well as on submarine patrol in Port Scotland. Mr. Troy said that it was as big as a house and resembled a giant pinwheel which pulsed with a yellowish-red glow. Somehow the object also reminded him of a Staten Island ferry boat, for it seemed to have some sort of lighted windows. The disc-like UFO soon turned its edge on him and receded from view, presenting only a thin cigar-shaped shadow in the slightly overcast starlit sky, for the night was a moonless one. - During his observation, Mr. Troy was also aware of a peculiar swishing sound as the object slowly revolved through the air.

Fireball Over Eastern Seaboard

The night of March 25, 1963 produced a brilliant fireball at about 10:00 p.m., which was seen by thousands of observers as it passed over important cities along the Eastern seaboard of the U.S.

Coming from the north, the object passed over Allentown, Pottstown and Philadelphia, Pa., Washington, D. C., and Richmond, Va. It was also seen as far off this path as Harrisburg, Pa., Long Island, N. Y., and Newark, N. J.

The fireball was flying low when it passed over Pottstown, Pa., and along Maryland's eastern shore. Most experts felt that the object was a meteor. However, Mr. Christie Urvack, an electronics engineer for the Air Force at the Camden-Moorestown RCA plant, felt that the object's trajectory was not correct for a meteor.

The object appeared white with a long orange tail and turned a luminous blue green toward the latter part of its flight. Pieces appeared to break off from the tail and appeared as reddish-orange sparks. The main object also emitted flashes of light which were very brilliant. Hunting parties were organized to search for the object as some witnesses felt it had fallen to earth. However, no trace of the object was found.
