

## INVESTIGATION

About 1500, on February 16, 1980, the National Transportation Safety Board was notified of the accident by the FAA Communications Centre in Washington, D C. An investigation team was dispatched immediately to Billerica, Massachusetts, and working groups were established for operations, human factors, structures, systems, powerplants, air traffic control, weather and aircraft records. Working groups for cockpit voice recorder, flight data recorder, and performance were formed in the Safety Board's headquarters.

The FAA; British Aerospace Industries; Rolls Royce Ltd; and the Professional Air Traffic Controllers Organisation participated as parties to the investigation. The United Kingdom Department of Trade, Accidents Investigation Branch sent an accredited representative with advisors, including representatives from Redcoat Air Cargo Ltd. These persons also participated in the investigation.

## AIRCRAFT INFORMATION

A Certificate of Registration (No G-BRAC) was issued by the United Kingdom Civil Aviation Authority (CAA) on June 8, 1978, for Bristol Britannia 253F, serial No 13448. A Certificate of Airworthiness for G-BRAC was issued by the CAA on June 30, 1978; it was renewed on June 30, 1979, and was valid until June 29, 1980.

As of February 15, 1980, after G-BRAC landed at Boston, the airframe had accumulated 21,963.54 hours with a total of 8,310 landings.

The powerplants were Rolls-Royce Proteus 790 series propeller turbine engines rated at 3,960 shaft horsepower plus 1,265 lbs jet thrust. The propellers were de Havilland model PD 208-466-2, four blade, constant speed, full feathering and reversible. Engine and propeller times were as follows:

ENGINE POSITION	SERIAL NUMBER	OVERHAUL LIFE (HRS)	REMAINING TIME (HRS)
1	79516	10,000	868.05
2	79110	10,000	1051.05
3	79509	6,500	63.05
4	75029	6,800	146.05

PROPELLER POSITION	SERIAL NUMBER	OVERHAUL LIFE (HRS)	REMAINING TIME (HRS)
1	4A70706	4,000	280.05
2	4A70693	4,000	1799.05
3	4A70827	4,205	133.05
4	4A70875	5,554	1169.05

The CAA approved the maintenance schedule in use by Redcoat Air Cargo Ltd. Examination of the records revealed that all periodic maintenance checks were being accomplished properly with the exception that the last check 'A' (before each departure) was not signed off in the captain's technical report log sheet. A review of the records revealed five items of deferred maintenance still open as of the date of the accident flight. None of the deferred items were systems which could have affected the safety of this flight.

## ADDITIONAL WEATHER INFORMATION

### General

A low-pressure area passed south of Boston on an east-north-easterly track during the afternoon of February 16, 1980. At 1300, the low was south of Connecticut with a cold front extending southwest along the New Jersey coast through eastern Virginia and to the Gulf Coast along the Alabama coast. A warm front extended south-east into the Atlantic Ocean.

Between 0700 and 1900, a trough aloft had moved eastward into the Boston area. At the 5,000 ft level (850 mb), the trough had moved from a position over the Appalachian ridge to a position running through New England and just east of the Atlantic coast south of Long Island.

### Precipitation

The following are the hourly precipitation records for Boston, Logan for the hour ending at the time specified. The precipitation records are in inches of water equivalent. Included are the hourly observations of weather and restrictions to visibility observed at the same time.

<i>Time</i>	<i>Hourly Precipitation</i>	<i>Weather</i>
0551	trace	light snow
0650	0.01	light snow
0752	0.03	light snow and fog
0853	0.05	light snow and fog
0954	0.07	light snow and fog
1054	0.05	light snow and fog
1153	0.05	light snow and fog
1256	0.06	light snow and fog
1354	0.08	light snow and fog
1451	0.05	light snow and fog

The following are the synoptic observations of snow accumulation and the water equivalent for Boston, Logan:

<i>Period</i>	<i>Snow Accumulation (inches)</i>	<i>Water Equivalent</i>
0000 to 0050	0	0
0050 to 0650	0.1	0.01
0650 to 1250	3.2	0.31
1250 to 1850	2.0	0.24

### Maximum and Minimum Temperatures

The following are the maximum and minimum temperatures recorded at Logan International Airport for February 16:

<i>Period</i>	<i>Maximum (degrees F)</i>	<i>Minimum (degrees F)</i>
0000 to 0050	28	26
0050 to 0650	28	26
0650 to 1250	32	26
1250 to 1850	31	23

### *Soundings*

The following is a description of the 0700 and 1900 radiosonde soundings at Chatham, Massachusetts, and Portland, Maine, to 18,000 feet (500 mb). Altitudes are subject to correction for density.

#### *Chatham 0700*

There was a mixed, moist surface layer up to 2,000 feet, with a stable moist layer up to the base of a shallow inversion at 3,000 feet. From the top of the inversion at 3,300 feet to 18,000 feet, the atmosphere was stable and saturated. The freezing level was at 200 feet.

#### *Portland 0700*

There was a mixed surface layer with increasing moisture content up to 1,600 feet. Above the surface layer, the column was stable and saturated with inversions between 1,600 and 3,200, 5,600 and 6,300 feet, and 12,200 and 12,400 feet.

#### *Chatham 1900*

There was a shallow, saturated surface inversion approximately 300 feet deep with a moist, stable layer above to 3,600 feet. Between 3,600 and 13,700 feet, the atmosphere was stable, saturated and homogeneous. Between 13,700 feet and 18,000 feet, the atmosphere was stable with a rapidly decreasing moisture content.

#### *Portland 1900*

There was a mixed surface layer to 2,000 feet. Between 2,000 feet and 3,600 feet there was a strong inversion. From 3,600 to 18,000 feet, the atmosphere was stable and homogeneous. The air was dry at the surface with an increasing moisture content to 2,800 feet where it became saturated. Between 2,800 feet and 13,300 feet, the atmosphere was saturated and near saturated to 18,000 feet.

### *Winds Aloft*

The following upper wind information was obtained on February 16, 1980:



<i>Altitude (feet above sea level)</i>	<i>Direction (degrees true)</i>	<i>Speed (knots)</i>	<i>Direction (degrees true)</i>	<i>Speed (knots)</i>
	Chatham, MA 0700		Portland, ME 0700	
sfc	180	7	030	6
1,000	160	12	070	11
2,000	175	15	130	13
3,000	215	19	165	15
4,000	240	25	200	15
5,000	245	28	210	16
6,000	250	34	230	25
7,000	250	43	235	28
8,000	250	46	235	32
9,000	245	47	240	39
10,000	240	48	245	48
	1900		1900	
sfc	230	10	350	14
1,000	255	22	005	26
2,000	210	38	045	21
3,000	210	40	080	15
4,000	215	46	225	17
5,000	215	46	245	19
6,000	210	48	245	18
7,000	210	49	225	24
8,000	210	57	225	32
9,000	210	53	225	36
10,000	210	53	210	27

#### *Area Forecast*

The area forecast for the Boston area issued by the NWS Forecast Office at Boston at 0740 on February 16, 1980, and valid from 0800 on February 16 through 0200 on February 17, 1980, was in part, as follows:

#### Flight precautions:

Forecast: Ceiling and visibility below 1,000 feet and 3 statute miles in stratus, snow, rain and freezing rain over all but south-east and northwest Main, but will spread into this area between 0800 and 1300.

Forecast: Occasional moderate turbulence below 16,000 feet and frequent moderate turbulence below 9,000 feet, over Lake Erie, Lake Ontario, Pennsylvania, New Jersey, New York, and adjacent coastal waters spreading north-east over eastern New England, Maine, and adjacent coastal waters by 1300.

Forecast: Possible low-level wind shear within 50 nautical miles of low pressure centre and trough north of the low.

Forecast: Occasional severe icing in clouds and in precipitation areas over eastern and central Pennsylvania, New Jersey, south-eastern New York, southern New England, and adjacent coastal waters. Icing will gradually diminish to moderate behind low. Otherwise frequent moderate icing in clouds and in precipitation over entire forecast area.

#### Significant Clouds and Weather:

... , New England, and adjacent coastal waters: 10,000 feet scattered over south-east and north-west Maine, otherwise ceilings and visibilities variable at or below 1,000 feet and 3 miles in snow spreading north-east through Maine by 1300. Higher terrain obscured. Tops layered to 20,000 feet. Snow will occasionally mix with sleet or freezing rain over interior Main, interior Connecticut, ... . Snow will change to or mix with rain or freezing rain over coastal Maine, Rhode Island, coastal New York, ... and adjacent coastal waters.

#### Icing and Freezing Level:

Occasional severe icing in clouds and in precipitation areas of southern and north-eastern Pennsylvania, New Jersey, south-eastern New York, southern New England, and adjacent coastal waters, gradually diminishing to moderate about 100 nautical miles behind the low. Otherwise, frequent moderate rime icing in clouds and in precipitation over entire forecast area. Freezing level at surface in northern New England, western New York, western Pennsylvania, ...

#### Turbulence:

Occasional moderate turbulence below 16,000 feet and frequent moderate with a chance of severe below 9,000 feet over Lake Erie, Lake Ontario, Pennsylvania, New Jersey, New York, and adjacent coastal waters spreading north-east over New England and adjacent coastal waters by 1300.

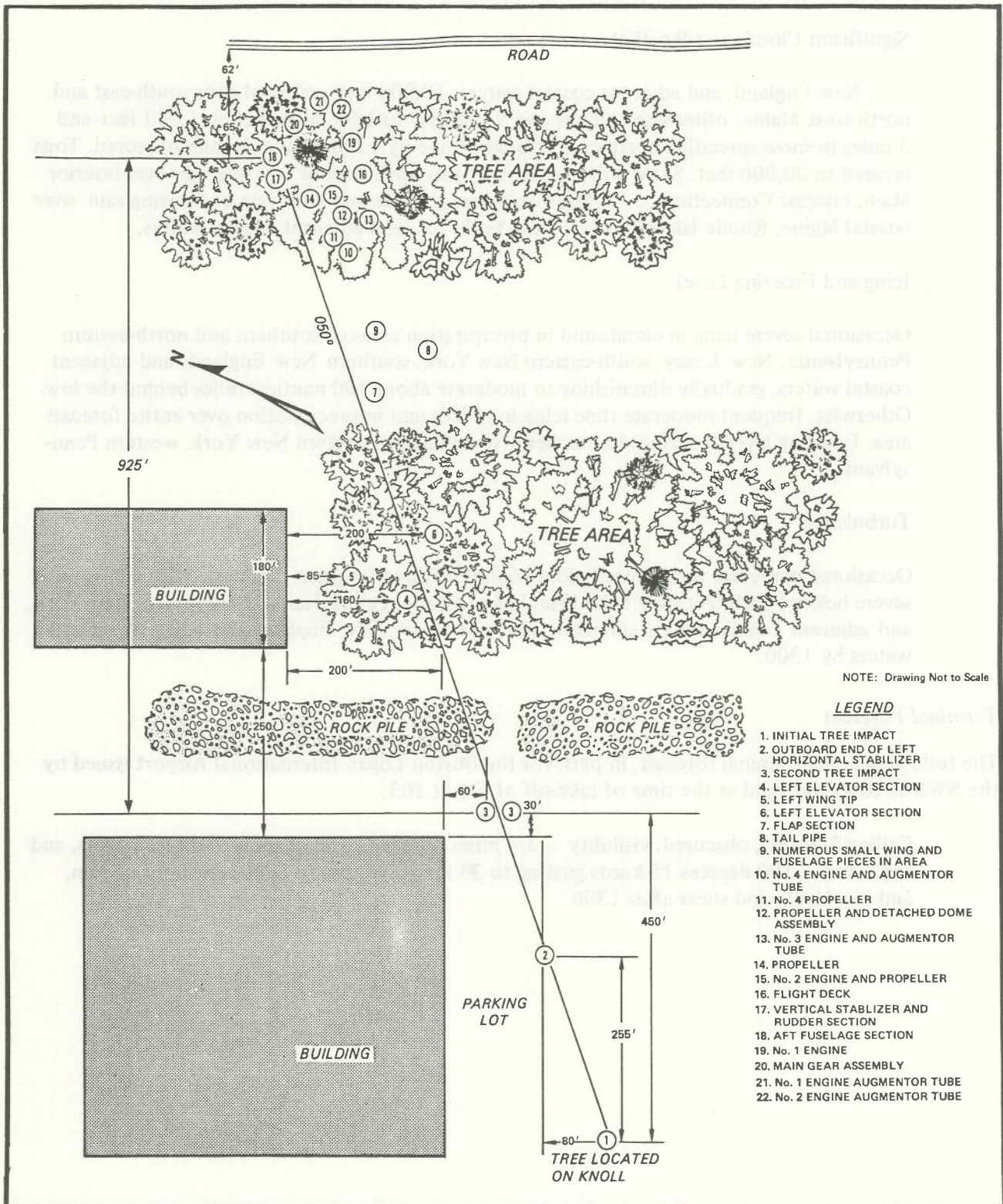
#### Terminal Forecast

The following is the terminal forecast, in part, for the Boston Logan International Airport issued by the NWS at 1000 and valid at the time of take-off of Flight 103:

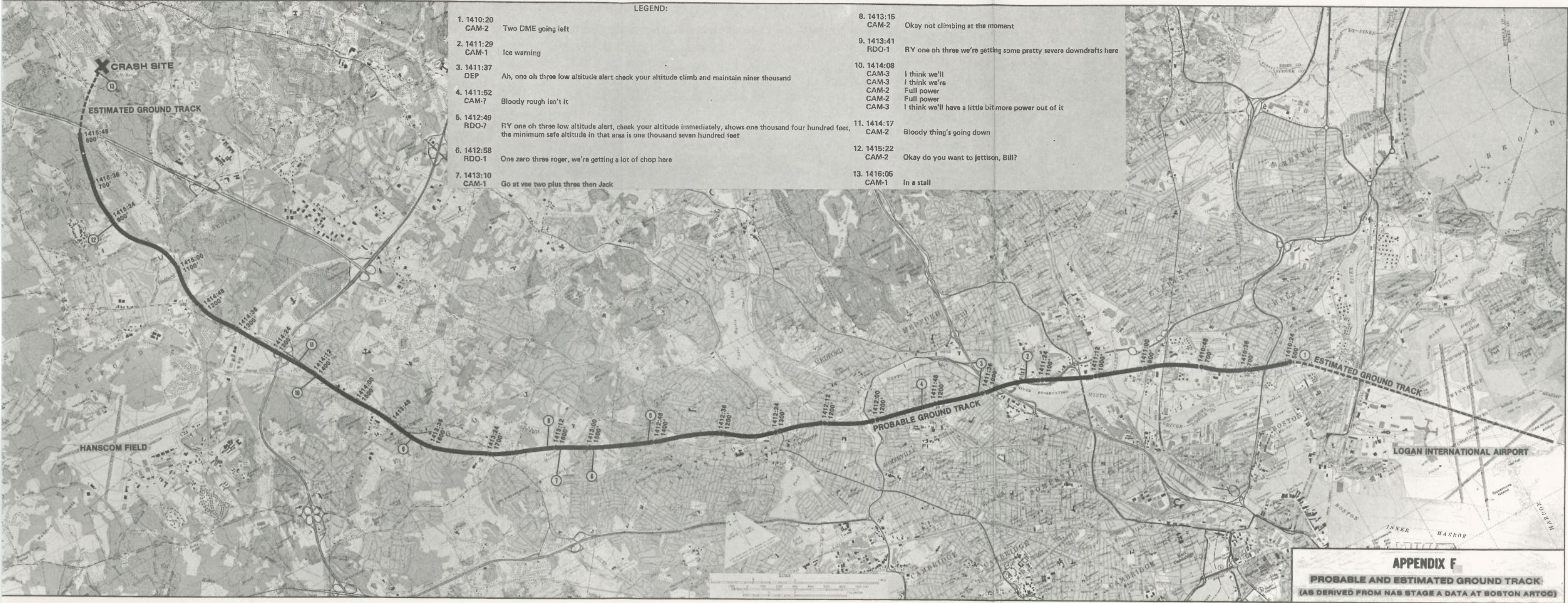
Ceiling 500 feet, obscured, visibility — 3/4 miles reduced by light snow, light ice pellets, and fog; wind — 100 degrees 15 knots gusting to 25 knots; chance of light rain, freezing rain, and low level wind shear after 1300.



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