

NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division
Washington, D.C. 20594

September 3, 2013

17 – Engine Monitor Report

Specialist's Factual Report
by Bill Tuccio

A. EVENT

Location: Atlanta, GA
Date: May 23, 2013
Aircraft: Hawker Beechcraft A36
Registration: N8225T
Operator: Private
NTSB Number: ERA13LA252

B. GROUP - No Group

C. SUMMARY

On May 23, 2013, about 1456 eastern daylight time a Beech A36, N8225T, was substantially damaged when it had an aerodynamic stall and impacted terrain shortly after takeoff at DeKalb-Peachtree Airport (PDK), Atlanta, Georgia. The private pilot and four passengers were not injured. Visual meteorological conditions prevailed, and an IFR flight plan had been filed for the personal flight destined for Venice Municipal Airport (VNC), Venice, Florida, which was conducted under Title 14 Code of Federal Regulations Part 91.

D. DETAILS OF INVESTIGATION

The NTSB Vehicle Recorder Laboratory received the following device:

GPS Manufacturer/Model: JPI EDM-700
Serial Number: 15754

JPI EDM-700 Device Description

The J.P. Instruments (JPI) EDM-700 is a panel mounted instrument enabling the operator to monitor and record up to 24 parameters related to engine operations. Depending on the installation, engine parameters monitored can include: exhaust gas temperature (EGT), cylinder head temperature (CHT), oil pressure and temperature, manifold pressure, outside air temperature, turbine inlet temperature (TIT), engine

revolutions per minute, compressor discharge temperature, fuel flow, carburetor temperature, and battery voltage.

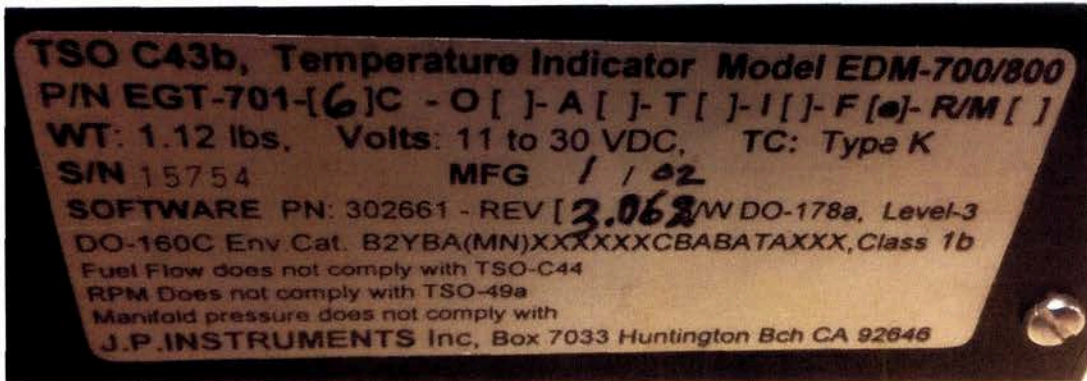
The unit can also calculate, in real-time, horsepower, fuel used, shock cooling rate and EGT differentials between the highest and lowest cylinder temperatures. The calculations are also based on the aircraft installation.

The unit contains non-volatile memory¹ for data storage of the parameters recorded and calculated. The rate at which the data is stored is selectable by the operator from 2 to 500 seconds per sample. The memory can store up to 20 hours of data at a 6 second sample rate. The data can then be downloaded by the operator using the J.P. Instruments software.

Data Recovery

The unit was in good condition and the data were extracted normally. Figure 1 shows a picture of the unit data plate, indicating the firmware revision of 3.062, the number "6" inscribed next to the letter "C," and a dot next to the letter "F." There were no entries on the data plate adjacent to the letters "O," "A," "T," "I," or "R/M." The number inscribed adjacent to "MFG" was "1/02".

Figure 1. Unit data plate.



Data Description

The unit contained recorded data over 13 power cycles, recorded at a sample rate of once every 6 seconds. The recorded data spanned dates of April 27, 2013 through the accident flight on May 23, 2013, as recorded by the unit internal clock. The parameters recorded were EGT, CHT, voltage, and fuel flow. Additionally, the calculated shock cooling rate and maximum difference between EGT sensors was also recorded. No other parameters were recorded by the unit.

¹ Non-volatile memory is semiconductor memory that does not require external power for data retention.

When the unit was powered on, it displayed 71 gallons of fuel remaining and 2 gallons of fuel used. Both of these values are affected by pilot inputs usually made when the unit initially receives power.

This report examined the last flight on the recording on May 23, 2013 and the flight prior to the accident flight on May 21, 2013.

Engineering Units Conversion

The engineering units conversions used for the data contained in this report are based on documentation from the manufacturer of the EDM-700, J.P. Instruments.

Appendix A lists the EDM-700 parameters verified and provided in this report.

Time Correlation

The EDM-700 records time with the first data sample based on the unit's internal clock. This clock is set and updated by the operator. Examination of the recorded data, and comparison with the reported accident time provided by the IIC, indicated the EDM-700 internal clock was set to Coordinated Universal Time (UTC), but was 10 minutes ahead of actual UTC. As such, 10 minutes was subtracted from all EDM-700 recorded times to correct for the error.

Correlation of the EDM-700 data to the event local time, EDT, was established by using the corrected UTC recorded time and then subtracting a 4 hour offset to change UTC to EDT. Therefore, for the rest of this report, all times are referenced as EDT, not recorded time.

Plots and Corresponding Tabular Data

Figure 2 shows a plot of the entire accident flight recording. Figure 3 focuses on the accident flight period from fuel flow increase until the end of the recording. The fuel flow began to increase above 5 gph at about 1447:08 EDT, achieving a value of about 26 gph by 1447:20 EDT. Coincident with the fuel flow increase, the EGT and CHTs also increased. At about 1447:44 EDT, the fuel flow began to decrease from 26 gph, reaching 5 gph by 1447:56 EDT and then 0 gph by the end of the recording at 1448:08 EDT. Throughout the recording, CHT-5 was the coolest recorded cylinder.

Figure 4 shows the takeoff portion of the prior recorded flight. The fuel flow began to increase above 5 gph at about 1528:14 EDT, achieving a value of about 26 gph by 1528:20 EDT. Coincident with the fuel flow increase, the EGT and CHTs also increased. The fuel flow remained at about 26 gph until about 1530:26 EDT, when the fuel flow initially reduced to about 23 gph. CHT-5 was the coolest recorded cylinder from the start of the May 21 recording through the first 60 seconds of fuel flow values above 25 gph.

The corresponding tabular data used to create figures 2 and 3 are provided in electronic (*.csv²) format as Attachment 1 to this report. The tabular data used to create figure 4 are provided in electronic (*.csv) format as Attachment 2 to this report.

² Comma Separated Value format.

Figure 2. Plot of entire accident flight recording.

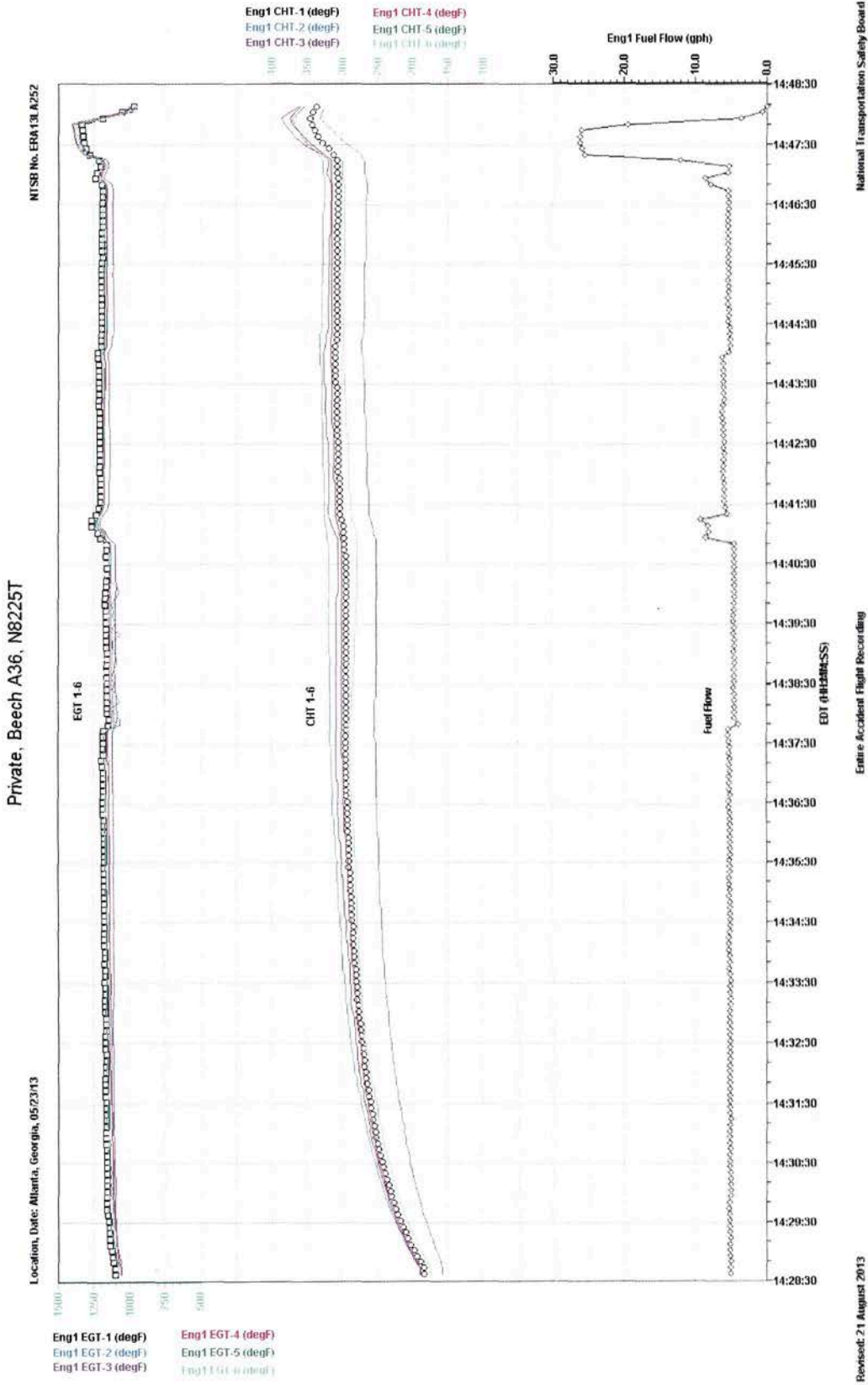


Figure 3. Plot of accident flight from fuel flow increase to end of recording.

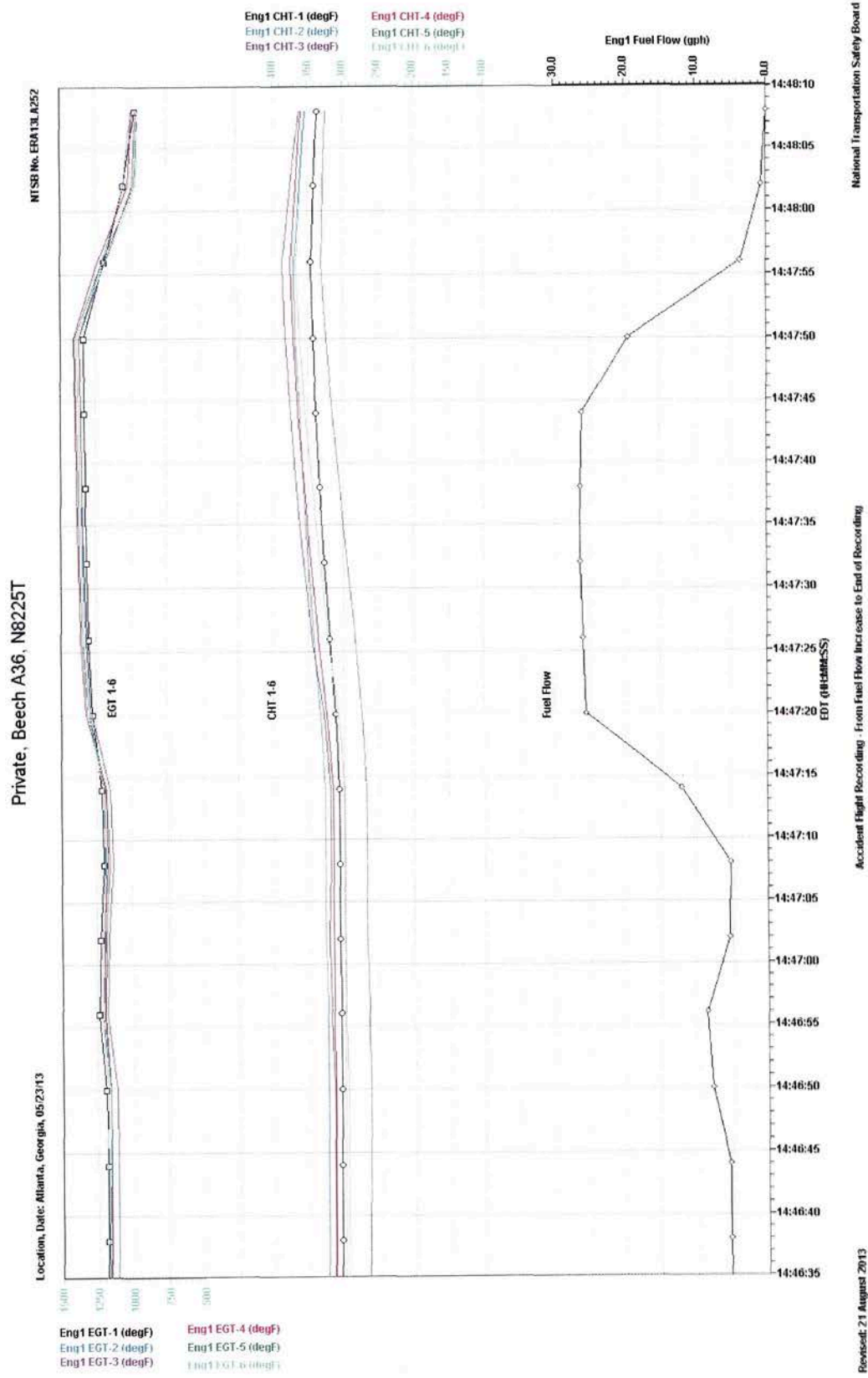
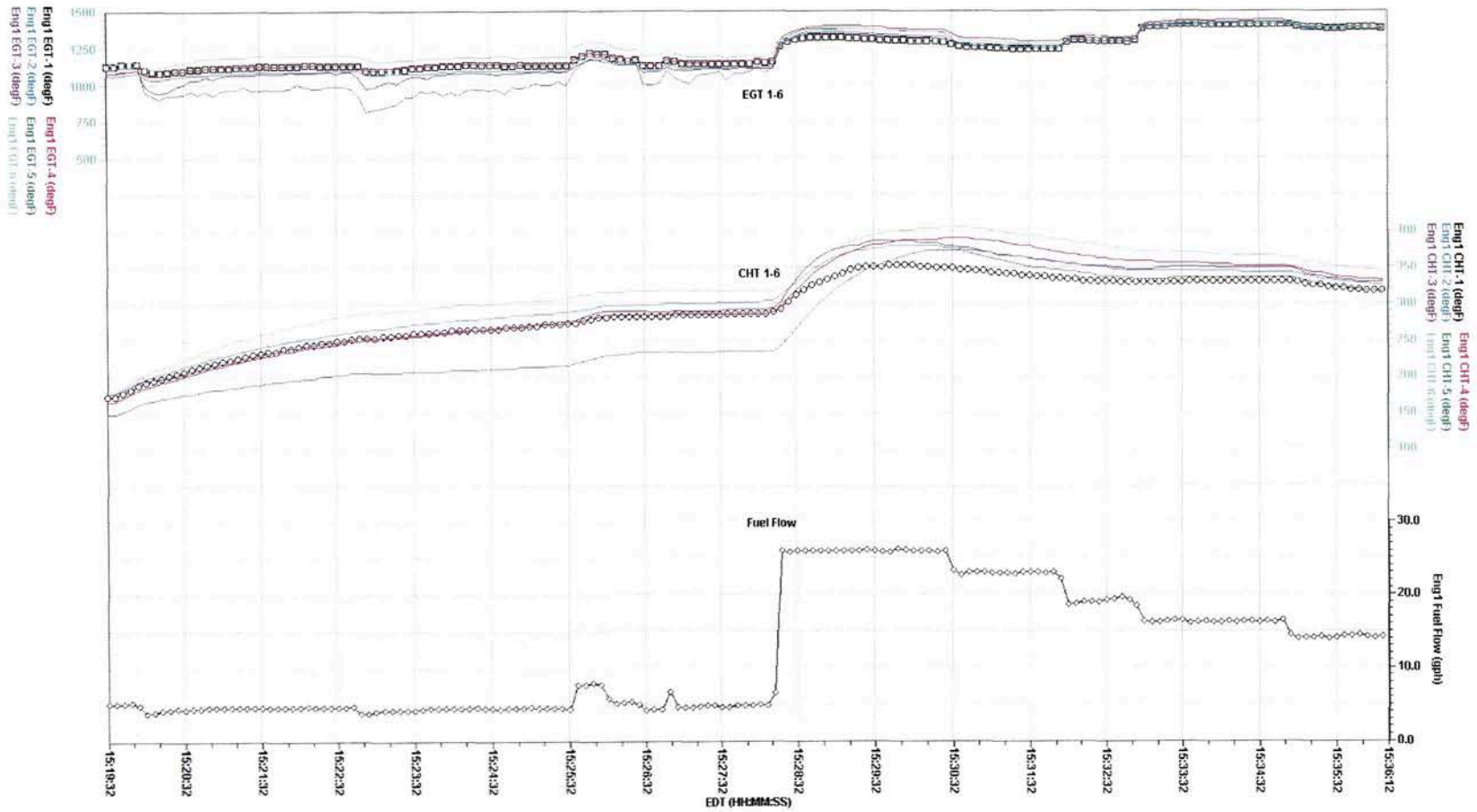


Figure 4. Plot of takeoff portion of May 21 flight.

Private, Beech A36, N8225T

Location, Date: Atlanta, Georgia, 05/23/13

NTSB No. ERA13LA252



Revised: 21 August 2013

Take-Off Portion of Flight On May 21

National Transportation Safety Board

APPENDIX A

This appendix describes the parameters provided and verified in this report. Table A-1 lists the parameters and table A-2 describes the unit abbreviations used in this report.

Table A-1. Verified and provided JPI parameters.

Parameter Name	Parameter Description
1. Eng1 CHT-1 (degF)	Cylinder Head Temperature Cylinder 1
2. Eng1 CHT-2 (degF)	Cylinder Head Temperature Cylinder 2
3. Eng1 CHT-3 (degF)	Cylinder Head Temperature Cylinder 3
4. Eng1 CHT-4 (degF)	Cylinder Head Temperature Cylinder 4
5. Eng1 EGT-1 (degF)	Exhaust Gas Temperature Cylinder 1
6. Eng1 EGT-2 (degF)	Exhaust Gas Temperature Cylinder 2
7. Eng1 EGT-3 (degF)	Exhaust Gas Temperature Cylinder 3
8. Eng1 EGT-4 (degF)	Exhaust Gas Temperature Cylinder 4
9. Eng1 Fuel Flow (gph)	Fuel Flow

Table A-2. Unit abbreviations.

Units Abbreviation	Description
degF	degrees Fahrenheit
gph	gallons per hour

NTSB ERA1 Attachment 1 to Specialist's Factual Report (Accident Recording)

Operator: Private

Registration: N8225T

Source of Data: Beech A36 JPI EDM-700

Date of Event: 05/23/13

Location: A Georgia

DATA

EDT	Eng1 CHT-1 (degF)	Eng1 CHT-2 (degF)	Eng1 CHT-3 (degF)	Eng1 CHT-4 (degF)	Eng1 CHT-5 (degF)	Eng1 CHT-6 (degF)	Eng1 EGT-1 (degF)	Eng1 EGT-2 (degF)
(HH:MM:SS)	NUMBER	NUMBER	NUMBER	NUMBER	NUMBER	NUMBER	NUMBER	NUMBER
14:28:38	183	190	189	188	157	173	1100	1051
14:28:44	183	190	189	188	157	175	1100	1051
14:28:50	189	196	195	193	160	179	1112	1062
14:28:56	193	200	200	198	163	183	1118	1070
14:29:02	198	205	204	202	166	188	1124	1079
14:29:08	202	209	208	206	169	192	1134	1084
14:29:14	206	214	212	210	172	196	1134	1084
14:29:20	209	217	216	214	175	200	1139	1093
14:29:26	213	221	219	217	178	204	1139	1101
14:29:32	217	225	223	221	181	207	1144	1101
14:29:38	220	228	226	224	184	211	1149	1107
14:29:44	223	232	229	227	186	214	1154	1107
14:29:50	226	235	232	230	189	217	1154	1107
14:29:56	229	238	235	233	191	220	1154	1112
14:30:02	231	241	237	236	193	222	1154	1112
14:30:08	234	244	240	238	196	224	1154	1112
14:30:14	236	246	242	240	198	227	1154	1112
14:30:20	238	249	245	243	200	229	1154	1112
14:30:26	241	251	247	245	202	231	1154	1112
14:30:32	243	253	249	247	204	233	1154	1112
14:30:38	245	256	251	249	204	236	1154	1118
14:30:44	247	258	253	251	207	238	1154	1118
14:30:50	249	260	256	253	209	240	1162	1118
14:30:56	251	262	258	253	209	242	1162	1125
14:31:02	251	264	260	256	212	242	1162	1120
14:31:08	254	266	260	258	212	245	1162	1120
14:31:14	256	268	263	258	215	247	1162	1120
14:31:20	256	270	263	261	215	249	1162	1120
14:31:26	259	272	266	263	217	249	1162	1125
14:31:32	259	274	268	263	219	252	1162	1125
14:31:38	262	274	270	265	221	254	1169	1125
14:31:44	262	277	270	267	221	254	1169	1125
14:31:50	264	279	273	267	223	257	1169	1125
14:31:56	266	279	273	269	223	259	1169	1125
14:32:02	266	282	276	269	226	259	1164	1125
14:32:08	268	282	276	272	226	261	1164	1125
14:32:14	268	285	278	272	228	263	1164	1125

14:32:20	270	285	278	272	228	263	1164	1125
14:32:26	270	287	278	274	230	266	1169	1125
14:32:32	272	287	281	274	230	266	1169	1125
14:32:38	272	289	281	276	232	268	1169	1125
14:32:44	274	289	281	276	232	268	1164	1125
14:32:50	274	291	283	278	234	268	1164	1130
14:32:56	276	291	283	278	234	270	1164	1130
14:33:02	276	293	285	278	234	270	1171	1130
14:33:08	276	293	287	280	236	272	1171	1130
14:33:14	278	295	287	280	236	272	1171	1130
14:33:20	278	295	287	282	238	272	1171	1135
14:33:26	278	295	287	282	238	274	1171	1135
14:33:32	280	297	289	284	238	274	1176	1135
14:33:38	280	297	289	284	240	274	1169	1135
14:33:44	280	299	289	284	240	274	1169	1135
14:33:50	282	299	289	286	240	276	1174	1135
14:33:56	282	299	292	286	242	276	1169	1135
14:34:02	282	301	292	286	242	276	1169	1135
14:34:08	284	301	292	286	242	276	1174	1135
14:34:14	284	301	294	288	242	276	1174	1135
14:34:20	284	301	294	288	242	278	1174	1135
14:34:26	284	303	294	288	244	278	1174	1135
14:34:32	286	303	294	288	244	278	1174	1135
14:34:38	286	303	296	290	244	278	1174	1135
14:34:44	286	305	296	290	244	278	1174	1135
14:34:50	286	305	296	290	246	278	1174	1135
14:34:56	286	305	298	290	246	278	1174	1135
14:35:02	288	305	298	290	246	280	1174	1141
14:35:08	288	305	298	292	246	280	1174	1141
14:35:14	288	307	298	292	246	280	1174	1141
14:35:20	288	307	300	292	246	280	1174	1141
14:35:26	290	307	300	292	248	280	1174	1141
14:35:32	290	307	300	292	248	280	1174	1141
14:35:38	290	309	302	294	248	282	1174	1141
14:35:44	290	309	302	294	248	282	1174	1141
14:35:50	290	309	302	294	248	282	1174	1141
14:35:56	290	309	304	294	248	282	1174	1141
14:36:02	292	311	304	296	250	282	1174	1141
14:36:08	292	311	304	296	250	284	1174	1141
14:36:14	292	311	304	296	250	284	1174	1141
14:36:20	292	313	306	296	250	284	1180	1141
14:36:26	292	313	306	296	250	286	1180	1141
14:36:32	292	313	306	298	250	286	1180	1141
14:36:38	294	313	306	298	252	286	1180	1141
14:36:44	294	313	306	298	252	288	1180	1141
14:36:50	294	315	306	298	252	288	1180	1141
14:36:56	294	315	308	298	252	288	1180	1148

14:37:02	294	315	308	298	252	288	1180	1143
14:37:08	294	315	308	298	252	288	1186	1143
14:37:14	294	315	308	298	252	288	1193	1136
14:37:20	294	315	308	300	252	288	1183	1152
14:37:26	294	315	308	300	252	288	1183	1147
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14:37:38	294	317	308	300	254	288	1183	1147
14:37:44	294	317	308	300	254	290	1183	1147
14:37:50	294	317	308	300	254	290	1150	1108
14:37:56	294	317	308	300	254	288	1142	1108
14:38:02	294	317	308	300	254	288	1158	1108
14:38:08	294	317	308	300	254	286	1158	1108
14:38:14	294	317	308	300	254	286	1158	1116
14:38:20	294	317	308	300	252	286	1158	1116
14:38:26	294	317	308	300	252	286	1158	1123
14:38:32	294	317	308	300	252	284	1158	1123
14:38:38	294	317	308	300	252	284	1158	1123
14:38:44	294	317	308	300	252	284	1158	1123
14:38:50	294	317	308	300	252	284	1158	1123
14:38:56	294	317	308	300	252	282	1158	1123
14:39:02	294	319	308	300	252	282	1158	1123
14:39:08	294	319	308	300	252	282	1164	1123
14:39:14	294	319	308	300	252	282	1164	1123
14:39:20	294	319	308	300	252	282	1164	1123
14:39:26	294	319	308	300	252	280	1164	1123
14:39:32	294	319	308	300	252	280	1164	1128
14:39:38	294	319	308	300	252	280	1164	1128
14:39:44	294	319	308	300	252	280	1164	1128
14:39:50	294	319	308	300	252	280	1170	1128
14:39:56	294	319	308	300	252	278	1170	1128
14:40:02	294	319	306	300	252	278	1170	1139
14:40:08	294	319	306	300	252	278	1163	1139
14:40:14	294	319	306	300	252	278	1163	1131
14:40:20	294	319	306	300	252	278	1155	1131
14:40:26	294	319	306	300	252	278	1155	1131
14:40:32	294	319	306	300	252	278	1163	1131
14:40:38	294	319	306	300	252	278	1163	1131
14:40:44	296	319	306	300	252	278	1157	1131
14:40:50	296	319	306	300	252	278	1157	1131
14:40:56	296	321	306	302	252	278	1202	1183
14:41:02	298	321	311	304	255	280	1223	1198
14:41:08	298	323	314	306	257	283	1265	1241
14:41:14	301	325	317	308	259	286	1265	1241
14:41:20	303	325	320	310	262	288	1235	1203
14:41:26	303	325	320	310	262	288	1213	1182
14:41:32	303	325	318	310	262	288	1203	1177
14:41:38	303	325	318	310	262	288	1203	1177

14:41:44	303	325	318	310	262	290	1203	1177
14:41:50	303	325	318	310	264	290	1203	1177
14:41:56	303	325	318	312	264	290	1203	1177
14:42:02	305	325	318	312	264	290	1209	1177
14:42:08	305	327	318	312	264	290	1209	1184
14:42:14	305	327	320	312	264	292	1209	1189
14:42:20	305	327	320	312	264	292	1209	1189
14:42:26	305	327	320	312	266	292	1209	1183
14:42:32	305	327	320	312	266	292	1209	1183
14:42:38	307	327	322	312	266	292	1209	1183
14:42:44	307	327	322	312	266	294	1209	1183
14:42:50	307	327	322	314	266	294	1209	1183
14:42:56	307	329	322	314	266	294	1209	1183
14:43:02	307	329	324	314	268	294	1209	1183
14:43:08	307	329	324	314	268	294	1215	1183
14:43:14	307	329	324	314	268	294	1215	1188
14:43:20	307	329	324	314	268	296	1215	1181
14:43:26	307	329	324	314	268	296	1215	1181
14:43:32	309	329	326	314	268	296	1215	1181
14:43:38	309	329	326	314	270	296	1215	1181
14:43:44	309	329	326	314	270	298	1215	1181
14:43:50	309	331	326	316	270	298	1215	1181
14:43:56	309	331	326	316	270	298	1221	1181
14:44:02	309	331	326	316	272	298	1221	1181
14:44:08	309	331	324	316	272	298	1197	1160
14:44:14	307	331	322	316	272	298	1192	1160
14:44:20	307	331	322	314	270	298	1192	1155
14:44:26	307	329	320	314	270	298	1192	1155
14:44:32	307	329	320	314	270	298	1192	1155
14:44:38	307	329	320	314	268	298	1192	1155
14:44:44	307	329	320	314	268	298	1192	1155
14:44:50	307	329	320	314	268	298	1192	1155
14:44:56	307	329	320	314	268	298	1192	1155
14:45:02	307	329	318	314	268	298	1192	1155
14:45:08	307	329	318	314	268	298	1192	1155
14:45:14	307	327	318	314	268	298	1192	1155
14:45:20	307	327	318	314	268	298	1192	1155
14:45:26	307	327	318	314	268	296	1192	1155
14:45:32	307	327	318	314	268	296	1192	1155
14:45:38	307	327	318	314	266	296	1187	1155
14:45:44	307	327	318	314	266	296	1192	1155
14:45:50	307	327	318	314	266	296	1192	1155
14:45:56	307	327	318	314	266	296	1192	1155
14:46:02	307	327	316	314	266	296	1192	1155
14:46:08	307	327	316	314	266	296	1185	1155
14:46:14	305	327	316	314	266	296	1185	1155
14:46:20	305	327	316	314	266	296	1185	1155

14:46:26	305	325	316	314	266	296	1185	1155
14:46:32	305	325	316	314	266	296	1185	1155
14:46:38	305	325	316	314	266	296	1185	1155
14:46:44	305	325	316	314	264	296	1185	1155
14:46:50	305	325	316	314	264	296	1192	1162
14:46:56	305	325	319	316	266	299	1241	1217
14:47:02	307	327	322	316	268	299	1225	1196
14:47:08	307	327	320	316	268	299	1200	1190
14:47:14	307	327	320	316	268	299	1216	1199
14:47:20	312	333	328	325	274	308	1278	1298
14:47:26	319	342	345	336	284	322	1302	1325
14:47:32	327	350	357	346	295	334	1317	1340
14:47:38	334	357	367	355	305	344	1323	1349
14:47:44	339	362	375	364	315	354	1328	1356
14:47:50	343	368	382	371	324	362	1339	1369
14:47:56	345	370	386	374	331	367	1186	1201
14:48:02	341	362	374	367	329	361	1053	1053

Eng1 (degF)	EGT-3 (degF)	Eng1 (degF)	EGT-4 (degF)	Eng1 (degF)	EGT-5 (degF)	Eng1 (degF)	EGT-6 (degF)	Eng1 (degF)	Fuel Flow (gph)
NUMBER	NUMBER	NUMBER	NUMBER	NUMBER	NUMBER	NUMBER	NUMBER	NUMBER	NUMBER
1052	1062	1078	1078	1072					5
1052	1062	1078	1078	1077					5
1061	1071	1078	1078	1085					5
1072	1077	1104	1104	1085					5.1
1079	1082	1099	1099	1098					5.1
1091	1082	1112	1112	1098					5.1
1091	1094	1112	1112	1108					5
1091	1094	1123	1123	1108					5.1
1091	1102	1131	1131	1115					5.1
1091	1102	1131	1131	1115					5.1
1100	1102	1139	1139	1120					5.1
1100	1109	1147	1147	1120					5.2
1100	1109	1139	1139	1120					5.1
1095	1114	1134	1134	1134					5
1100	1114	1116	1116	1140					5
1100	1114	1127	1127	1140					5
1100	1114	1135	1135	1140					5
1106	1114	1122	1122	1140					5
1106	1114	1131	1131	1140					5.1
1106	1114	1143	1143	1140					5.1
1106	1120	1143	1143	1140					5.1
1106	1120	1150	1150	1140					5
1106	1120	1130	1130	1146					5.1
1106	1125	1144	1144	1146					5.1
1111	1125	1144	1144	1146					5.1
1111	1125	1156	1156	1152					5.1
1111	1125	1161	1161	1152					5
1111	1125	1156	1156	1152					5.1
1111	1125	1156	1156	1152					5.1
1111	1130	1149	1149	1152					5.1
1111	1130	1149	1149	1152					5.1
1111	1130	1149	1149	1146					5.1
1111	1130	1149	1149	1146					5.1
1111	1130	1159	1159	1146					5.1
1111	1130	1159	1159	1152					5.1
1111	1135	1153	1153	1152					5.1
1111	1135	1158	1158	1152					5.1

1111	1135	1158	1158	5.1
1111	1135	1158	1158	5.1
1117	1135	1158	1158	5.1
1117	1135	1153	1152	5.1
1117	1140	1161	1157	5.1
1117	1140	1161	1165	5.1
1117	1140	1161	1165	5.1
1117	1140	1168	1160	5.1
1110	1140	1163	1153	5
1110	1140	1158	1159	5
1110	1133	1158	1159	5.1
1110	1133	1158	1159	5.1
1110	1133	1158	1159	5
1110	1133	1153	1159	5.1
1110	1138	1163	1159	5.2
1110	1138	1163	1159	5.1
1110	1138	1158	1159	5.1
1110	1138	1158	1159	5.2
1110	1138	1158	1159	5.2
1110	1144	1165	1159	5.2
1110	1144	1165	1159	5.1
1110	1144	1165	1159	5.1
1110	1144	1165	1154	5.1
1110	1144	1165	1154	5.1
1110	1134	1165	1154	5.1
1110	1134	1165	1161	5.1
1110	1134	1165	1161	5.2
1110	1139	1170	1161	5.1
1110	1139	1161	1155	5.2
1110	1139	1161	1155	5.2
1110	1139	1161	1155	5.1
1110	1139	1169	1155	5.1
1110	1139	1169	1160	5.2
1110	1139	1169	1160	5.1
1110	1139	1169	1160	5.1
1110	1139	1169	1160	5.1
1110	1139	1169	1165	5.1
1110	1146	1169	1172	5.1
1110	1146	1169	1172	5.1
1110	1141	1162	1172	5.1
1110	1141	1162	1163	5.1
1110	1141	1162	1171	5.2
1110	1141	1162	1171	5.2
1110	1141	1162	1171	5.1
1115	1141	1167	1171	5.2
1115	1141	1167	1171	5.2
1115	1141	1167	1171	5.2

1115	1141	1167	1171	5.1
1115	1141	1167	1178	5.2
1115	1154	1161	1194	5.1
1115	1154	1161	1178	5.2
1115	1154	1167	1178	5.1
1115	1154	1172	1178	5.2
1115	1154	1172	1184	5.3
1120	1154	1164	1179	5.3
1095	1133	1065	1083	3.9
1087	1121	1065	1111	4.4
1087	1126	1103	1065	4.4
1092	1126	1129	1111	4.5
1092	1131	1067	1146	4.5
1092	1137	1084	1162	4.4
1097	1137	1116	1162	4.6
1097	1137	1103	1168	4.5
1097	1137	1122	1181	4.5
1103	1137	1111	1175	4.5
1103	1137	1090	1186	4.5
1097	1137	1090	1176	4.5
1097	1137	1102	1158	4.6
1097	1137	1116	1158	4.5
1097	1137	1116	1158	4.5
1097	1137	1060	1148	4.6
1097	1137	1118	1117	4.5
1097	1142	1096	1155	4.6
1097	1142	1120	1141	4.6
1097	1142	1113	1153	4.5
1097	1142	1122	1171	4.5
1097	1142	1096	1128	4.5
1097	1135	1075	1147	4.5
1088	1135	1091	1124	4.5
1097	1135	1128	1161	4.5
1097	1135	1143	1175	4.4
1097	1135	1137	1181	4.5
1097	1141	1144	1181	4.5
1097	1141	1144	1187	4.5
1097	1141	1135	1187	4.5
1097	1134	1135	1177	4.5
1143	1175	1169	1197	8.4
1160	1183	1169	1191	8
1209	1231	1220	1236	8.2
1209	1231	1227	1236	9.2
1179	1205	1209	1205	5.5
1150	1179	1198	1185	5.7
1141	1172	1189	1179	5.8
1141	1172	1183	1179	5.8

1141	1172	1183	1179	5.8
1141	1172	1183	1179	5.9
1136	1172	1178	1179	6
1136	1172	1178	1179	6
1136	1172	1184	1179	6
1136	1172	1184	1179	6
1136	1172	1184	1179	5.9
1136	1172	1184	1179	6
1136	1172	1184	1179	5.9
1136	1172	1176	1179	6
1136	1172	1176	1179	6
1141	1172	1181	1179	6
1141	1172	1181	1179	6.1
1141	1172	1181	1179	6.1
1141	1172	1181	1179	6
1141	1172	1181	1179	5.9
1141	1172	1173	1179	6
1141	1167	1178	1179	6
1141	1167	1178	1179	6
1141	1167	1178	1179	6
1141	1167	1178	1179	6
1141	1167	1183	1179	6
1148	1173	1183	1184	6.1
1148	1173	1175	1190	5.2
1121	1162	1156	1197	4.9
1121	1162	1156	1202	5
1113	1162	1156	1202	5.1
1113	1162	1163	1202	5.1
1113	1162	1163	1195	5.3
1113	1162	1163	1195	5.2
1113	1157	1163	1195	5.2
1113	1157	1169	1195	5.3
1113	1157	1169	1188	5.3
1113	1157	1164	1188	5.2
1113	1157	1159	1183	5.2
1113	1157	1159	1183	5.3
1119	1157	1165	1188	5.2
1113	1162	1165	1188	5.2
1119	1162	1165	1188	5.3
1119	1162	1165	1188	5.3
1119	1162	1173	1188	5.2
1114	1162	1164	1188	5.3
1114	1162	1176	1188	5.4
1114	1162	1176	1188	5.3
1114	1162	1171	1188	5.3
1114	1162	1166	1188	5.3
1114	1162	1171	1188	5.3

1114	1162	1171	1188	5.2
1114	1162	1165	1188	5.2
1114	1162	1174	1188	5.3
1114	1162	1166	1188	5.3
1121	1162	1166	1180	7.8
1183	1201	1198	1213	8.6
1170	1201	1186	1213	5.3
1140	1175	1160	1193	5.2
1155	1188	1182	1203	12
1282	1324	1310	1309	25.5
1319	1360	1348	1338	25.9
1338	1376	1369	1349	26.2
1349	1387	1378	1362	26.2
1356	1397	1385	1367	26
1368	1408	1398	1385	19.5
1185	1231	1204	1179	3.5
991	1022	979	961	0.6