Customer and Engineering Requirements

Spec. Number	Parameter Description	Requirements	Tolerance	Risk	Compliance
1	Electric Motor - Weight	44 oz.	MAX	L	A, T
2	Electric Motor - Size	113.2 * 57 mm (d*l)	MAX	L	A, T
3	Electric Motor - Cost	$226.06	MAX	L	T
4	Electric Motor - Power	<= 10 HP	MAX	L	A, T
5	Gas Motor - Weight	2.7 kg	MAX	L	A, T
6	Gas Motor - Size	7.6 * 8.7 * 9.1in	MAX	L	A, T
7	Gas Motor - Cost	$199.99	MAX	L	T
8	Gas Motor - Power	1.0 HP	MAX	L	A, T
11	Current Sensor - Cost	$19.73	MAX	L	T

12	Accelerometer - Cost	$17.50	MAX	L	T
13	RPM Sensor - Cost	$14.99	MAX	L	T
14	Thermal Sensor - Cost	$12.50	MAX	L	T
15	Jetson TK1 CP Board - Weight	3.4 lbs	MAX	L	A, T
16	Jetson TK1 CP Board - Size	8.8 * 8.2 * 4.8in	MAX	L	A, T
17	Jetson TK1 CP Board - Cost	$579.00	MAX	L	T
18	LabJack UE9 - Cost	$479.00	MAX	L	T

Electric Motor - http://www.castlecreations.com/en/2028-extreme-800kv-motor-060-0054-00

Gas motor - Honda GX25

Current sensor - https://www.digikey.com/product-detail/en/lem-usa-inc/LTSR-25-NP/398-1023-ND/1026514

Accelerometer - https://www.adafruit.com/product/1231

RPM Sensor - http://www.eagletreesystems.com/index.php?route=product/product&product_id=64

Thermal sensor - https://www.adafruit.com/product/2023

Use Cases

Use Case ID: 1

Use Case Name: Testing/training the system

Created by: Mitchell Myjak

Last updated by: Mitchell Myjak

Date created: 9/25/17

Date last updated: 9/26/17

Actors: ES Aero engineer, Capstone team member

Description: Train the embedded system to be able to detect possible errors

Normal flow:

1.The user starts up the engine.

2. The user introduces some unknown issue.

3. The system detects the unknown issue.

4. The system identifies the issue by finding a deviation from the expected data.

5. The deviation is used as training data by the system in order to increase the probability that it detects issues in a timely manner.

6. The issue is classified so that eventually the system will be able to report what specific problem occurred.

7. The use case ends.

Exceptions:

Alternate Course A: The system does not detect the introduced issue.

A.3. The system does not detect the unknown issue. A.4. The user flags the error.

A.5 The use case ends.

Alternate Course B: The issue is misdiagnosed.

B.6. The issue is misdiagnosed and will not aid the algorithm in learning which specific issues occur. B.7. The user flags the error. B.8. The use case ends.

Assumptions: The engine starts up. The system starts up. An issue is introduced, causing a deviation from the expected data.

Use Case ID: 2
Use Case Name: Using the system
Created by: Mitchell Myjak
Last updated by: Mitchell Myjak
Date created: 9/25/17
Date last updated: 9/26/17
Actors: ES Aero engineer
Description: Use the embedded system for PHM by finding errors and correctly diagnosing the cause
Normal flow:
1.The user starts up the engine.
2. An unknown issue occurs.
3. The system detects the unknown issue.
4. The system identifies the issue by finding a deviation from the expected data.
5. The system rapidly reports the issue and the diagnosis to the user.
6. The use case stops when the user cuts the power to the engine.
Exceptions:
Alternate Course A: The system does not detect the introduced issue.
A.3. The system does not detect the unknown issue.
A.4. The engine keeps running, if possible, until the user cuts power to the engine.
A.5. If it is apparent to the engineer there is an issue, the error is treated.
A.6. The use case ends.
Alternate Course B: The issue is misdiagnosed.
B.6. The issue is misdiagnosed.
B.7. The engineer cuts power to the engine and checks the validity of the issue.
B.8. If it is apparent to the engineer the issue is misdiagnosed, the error is treated.
B.9. The use case ends.

Assumptions: The engine starts up. The system starts up. An issue is present, causing a deviation from the expected data.