Health-Ready Components and Systems

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SAE ITC®

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Collaborative Innovation.
Trusted Implementation.

*All examples and associated numbers in this presentation are for illustrative purposes only.

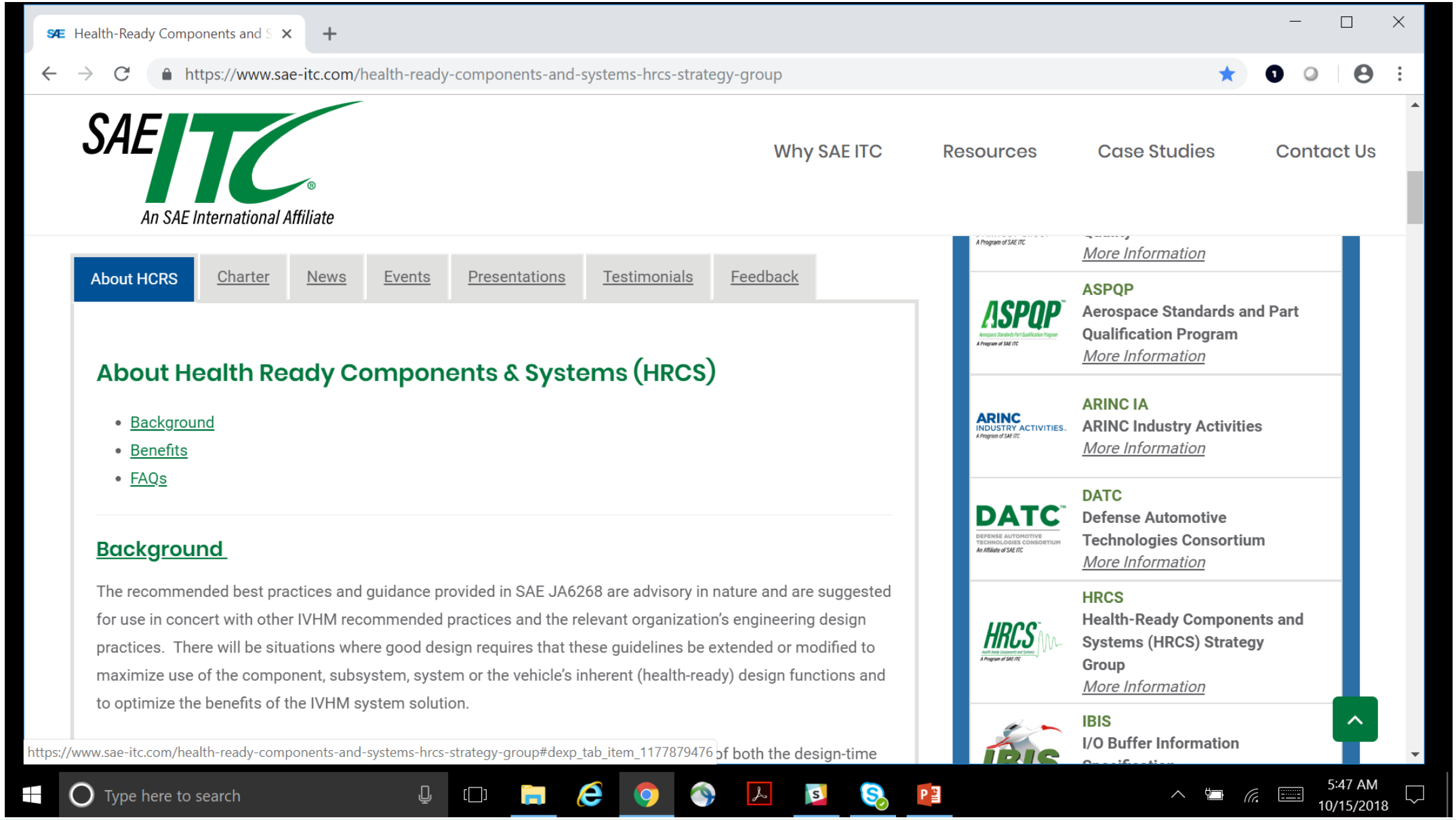
UPCOMING CONFERENCES OF INTEREST

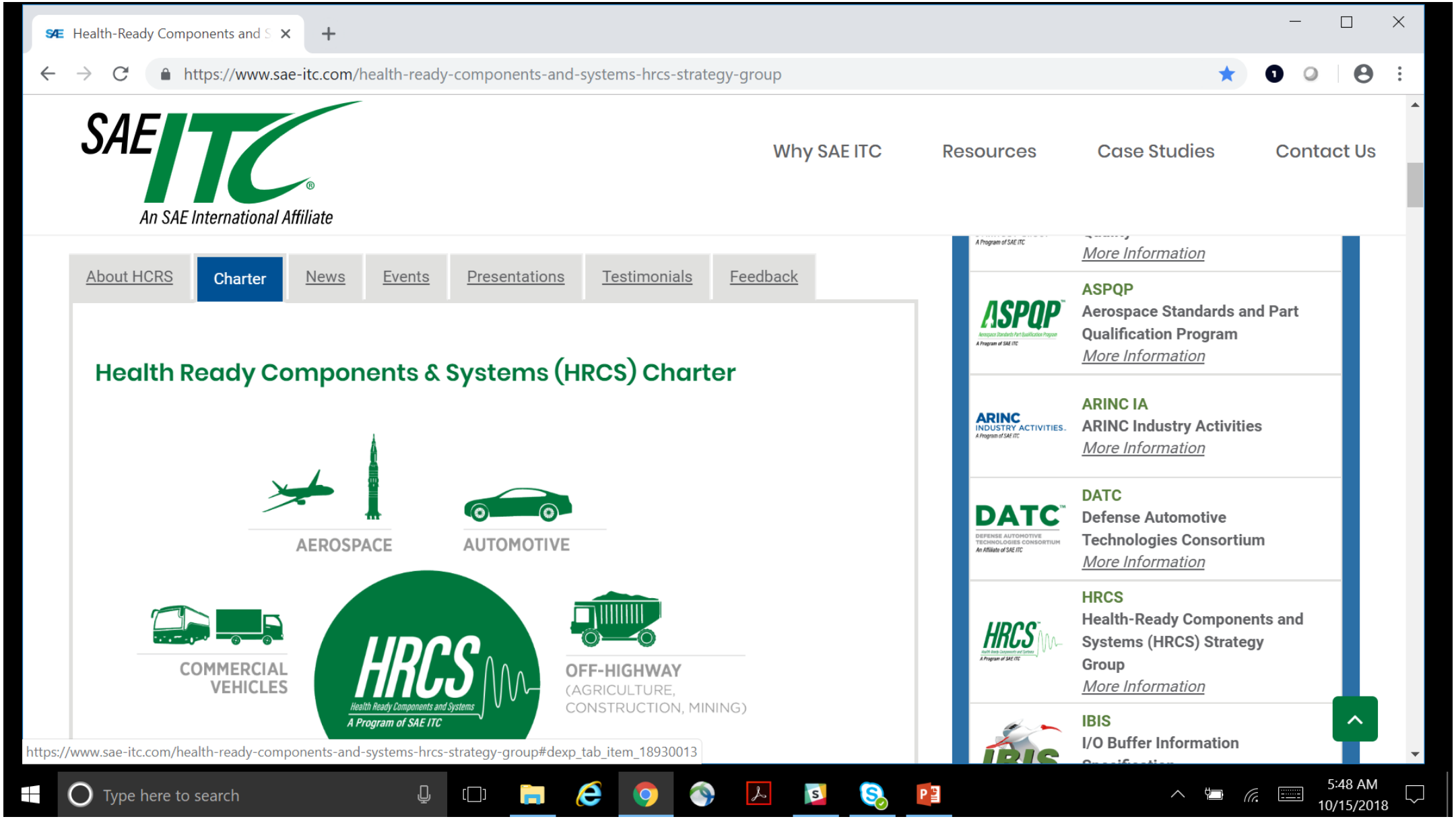
- HM-1 Committee April 2-4, 2019 (Charlotte, NC) hosted by UTC Aerospace Systems
- SAE On-Board Diagnostics Symposium March 12-14, 2019 (Stuttgart, Germany)
- SAE World Congress Experience April 9-11, 2019 (Detroit, MI)
- AMC/AEEC (Avionics Maintenance Committee/Airlines Electronic Engineering Committee) April 29-May 2, 2019 (Prague, Czech Republic)
- EFB Users Forum May/June 2019 North America

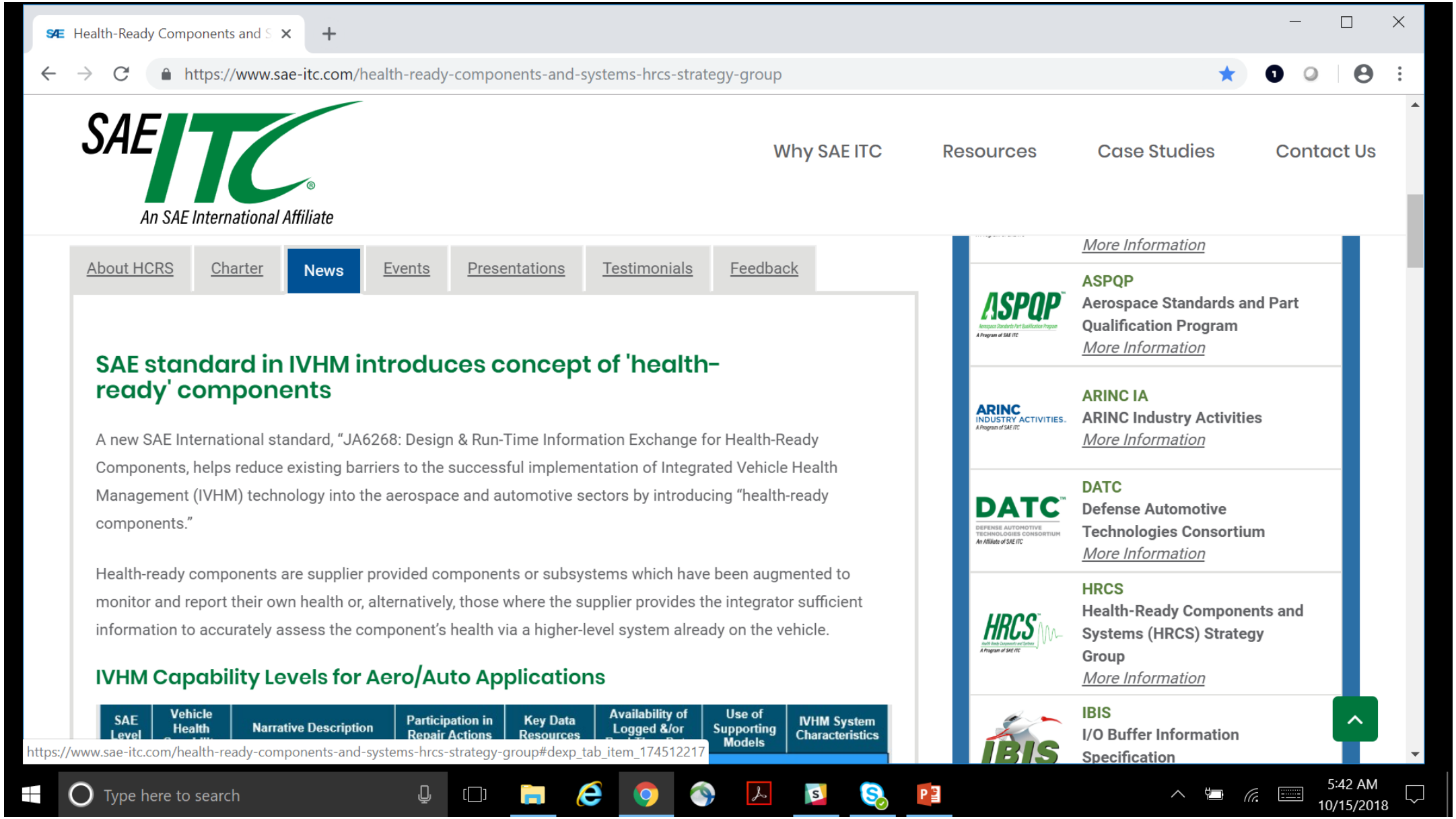
WEBSITE DEVELOPMENT

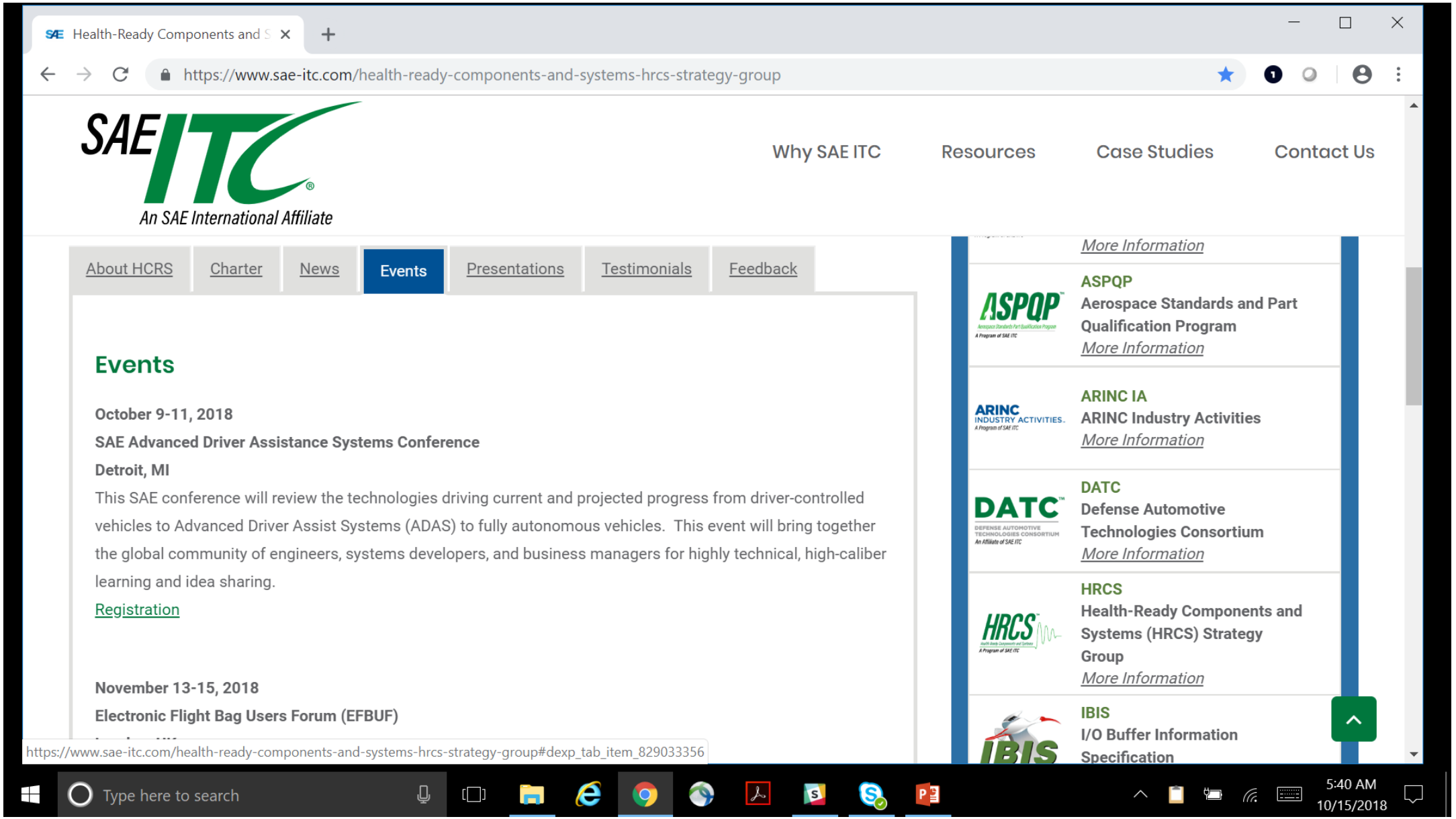
- Website is the main landing page, with tabs for:
  - About HRCS
  - Charter (draft)
  - News
  - Events
  - Presentations
  - Testimonials
  - Feedback
  - Anticipated future tabs for members and sponsors

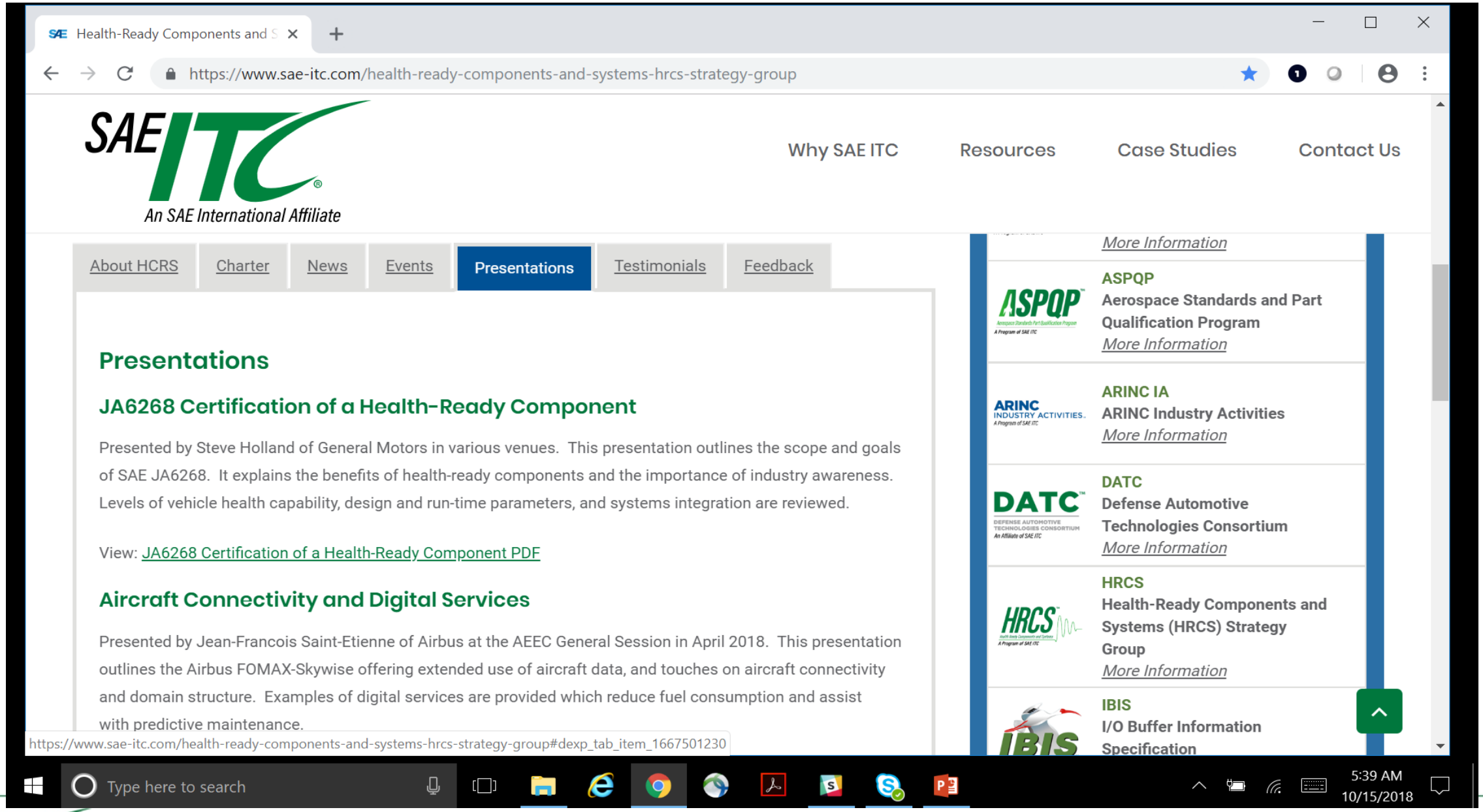
- https://www.sae-itc.com/health-ready-components-and-systems-hrcs-strategy-group

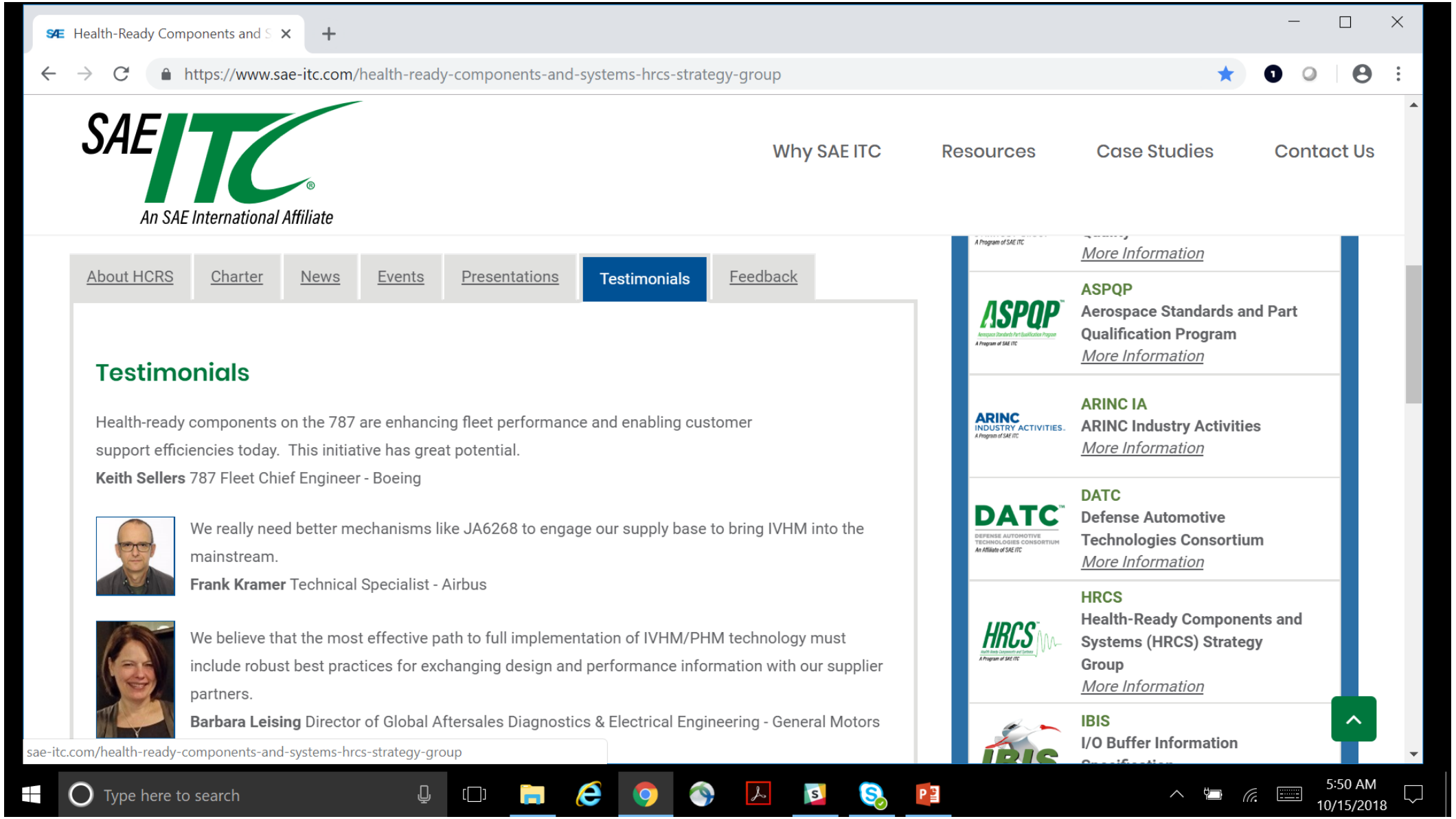


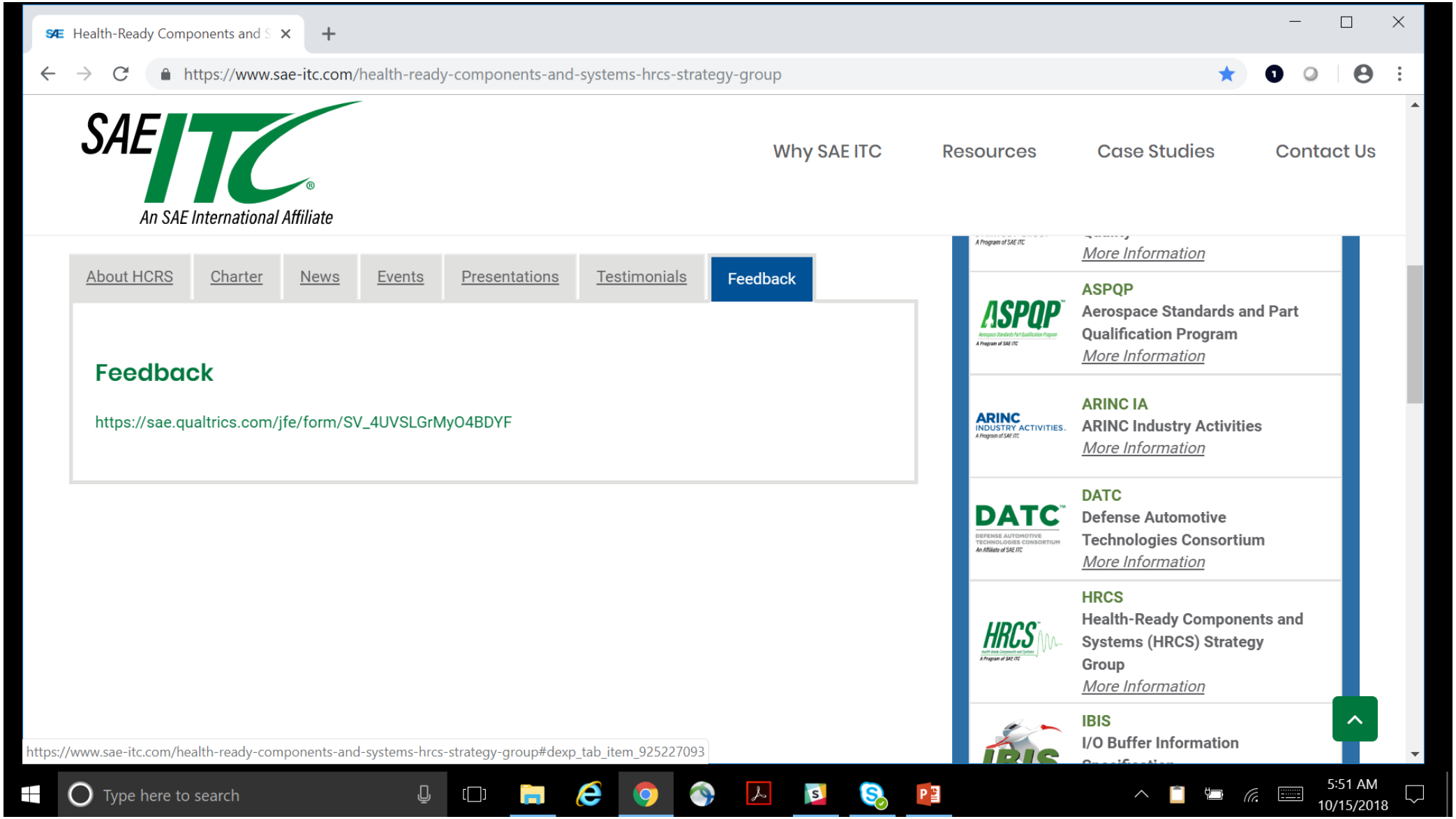












WHY WE PROVIDE REGISTRIES AND DATABASES

- Provide assurance that a consistent process was followed and information is correct.
- Enable participants to find information they are seeking in a cost effective manner.
- Ensure a neutral, unbiased approach.
- Provide contacts for more information or issue resolution.
- Share costs.
- Leverage shared knowledge and technology

HRCS DATABASE

SAE JA6268™ CERTIFICATION PROCESS

IVHM CAPABILITY *(VEHICLE LEVEL)* (SOURCE: SAE JA6268™)

Illustrating industry evolution in use of diagnosis & prognosis for vehicle maintenance

SAE Level	Vehicle Health Capability	Narrative Description	Participation in Repair Actions	Key Data Resources	Availability of Logged &/or Real-Time Data	Use of Supporting Models	IVHM System Characteristics
Manual Diagnosis & Repair Process performed by Technician							
0	Limited On-Vehicle Warning Indicators	Service actions for scheduled maintenance or when Operator notices problems or is alerted by indicator lights or simple gages.	**Operator/Driver & Service Tech**	On-Vehicle Measurements & Observation	N/A	Paper-based Manuals	Only Manual Diagnostic Tools & No Condition-Based Services
1	Enhanced Diagnostics Using Scan Tools	Service techs gain added diagnostic insight using automated scanners to extract vehicle operating parameters & diagnostic codes.	Operator/Driver & Service Tech	**On-Vehicle & Service Bay/ Depot Tools**	Logged Diagnostic Codes & Parameters available to Service Tech	Paper-based Manuals	On-Board Diagnostics Available
2	Telematics Providing Real-Time Data	Service techs gain real-time vehicle data via remote monitoring of vehicle to more completely capture issues.	Operator/Driver, Service Tech & Remote Support Center Advisor	On-Vehicle, Service Bay / Depot & Cloud Data	**Telematic Data Available to Service Tech with Diagnostics Info**	Paper-based Manuals	On-Board & Remote Data Available
Diagnosis & Repair Augmented by Prognosis & Predictive Analytics							
3	Component Level Proactive Alerts	Operator and service techs are provided with component health status (R/Y/G) before problem occurs . Limited condition-based maintenance.	Operator/Driver, Service Tech & Cloud-Based Services	On-Vehicle, Service Bay & Cloud Data	Telematic Data Available to Service Tech with Diagnostics Info	**Addition of Component-Level Health Models**	Component-Level Health Predictions
4	Integrated Vehicle Health Mgmt.	Operator and service techs are provided with system or vehicle level health indicators before problems occur with remaining useful life estimated. Condition-based maintenance.	Operator/Driver, Service Tech & Cloud-Based Services	On-Vehicle, Service Bay & Cloud Data	Telematic Data Available to Service Tech with Diagnostics Info	Addition of Vehicle-Level Health Models	**Vehicle-Level Health Management**
5	Self-Adaptive Health Mgmt.	Self-adaptive control and optimization to extend vehicle operation and enhance safety in presence of potential or actual failures.	Operator/Driver, Service Tech & Cloud-Based Services	On-Vehicle, Service Bay & Cloud Data	Telematic Data Available to Service Tech with Diagnostics Info	Addition of Vehicle-Level Health Models	**IVHM Capability Integrated into Vehicle Controls**

SAE JA6268™ THREE CERTIFICATION STAGES (COMPONENT/SUBSYSTEM LEVEL)

Stage 1: *Functional Self Assessment*

Stage 2: *Failure Modes Assessment*

Stage 3: *Detailed Design Assessment*

Note:

- *Stage 1 is intended to provide a provisional certification with a low barrier to entry.*
- *Stages 2 & 3 are enhanced by seeking an OEM/ integrator to validate the supplier-provided assessment.*

SAE HRCS HEALTH-READY COMPONENTS REGISTRY (CORE INFO) STAGE 1, 2, & 3

(SAE JA6268™ Chapter 9)

- Component Name (and known aliases)
- Supplier's catalog reference number (or numbers)
- Suppliers contact information and DUNS number, CAGE Code or other industry standard supplier identifier (if applicable)
- Validation approach can be based upon (a) design-time information, (b) run time information or (c) both design-time and run-time information
- Format of Health Ready info which provides a mathematical model (or mathematical relationships) in a machine-readable format to allow for a proper interpretation and use of specific component parameters
- Integrator/OEM name providing the validation along with their contact information and DUNS number (if applicable)
- Dates validation was completed and date which the validation expires (if applicable)

\+ *Other items to be determined by HRCS SG (all non-proprietary)*

SAE HRCS HEALTH-READY COMPONENTS REGISTRY

Stage 1

*All examples and associated numbers in this presentation are for illustrative purposes only.

ISO FUNCTIONAL REFERENCE MODEL *(INDIVIDUAL COMPONENT LEVEL)**

*(adapted for use) ISO13374-1 (2002). Condition Monitoring and Diagnostics of Machines Geneva, Switzerland

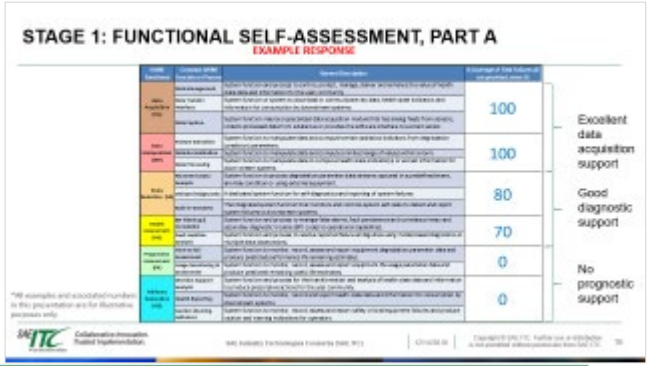
IVHM Functional Block	Description	IVHM Process Stage
Data Acquisition (DA)	This function collects the sensor data and health state information from the equipment internal monitors, the system data bus or data recorder.	Sense / Acquire
Data Manipulation (DM)	This function processes and transforms the sensor data and health state information collected by the DA.	Transfer
State Detection (SD)	This function evaluates equipment state conditions against normal operating profiles and generates normal or abnormal condition indicators.	Transfer
Health Assessment (HA)	This function provides information to determine the current state of health of equipment.	Transfer
Prognostics Assessment (PA)	This function provides future state of health, performance life remaining, or remaining useful life (usage) indicators.	Analyze
Advisory Generation (AG)	This function provides actionable information to operational and maintenance personnel or external systems.	Act

STAGE 1: FUNCTIONAL SELF-ASSESSMENT, PART A

Part A only requires 6 entries (0-100%) to estimate Health-Readiness for each of the ISO categories

IVHM Functional	Common IVHM Function or Process	General Description	% Coverage of Field Failures (if not provided, enter 0)
Data Acquisition (DA)	Data Management	System function and process to control, protect, manage, deliver and enhance the value of health state data and information for the user community.	0
	Data Transfer Interface	System function or system to download or communicate raw data, health state indicators and information for consumption by downstream systems.	
	Data Capture	System function may be a specialized data acquisition module that has analog feeds from sensors, collects processed data from a data bus or provides the software interface to a smart sensor.	
Data Manipulation (DM)	Feature Extraction	System function to manipulate data and compute certain statistical indicators from degradation (predictor) parameters.	0
	Data Normalization	System function to manipulate data and compute a limited range of values within a norm.	
	Data Processing	System function to manipulate data to compute health state indicator(s) or extract information for down stream systems.	
State Detection (SD)	Parametric Data Analysis	System function to process degradation parameter data streams captured in a predefined event, anomaly condition or using external equipment.	0
	Onboard Diagnostics	A dedicated system function for self-diagnostics and reporting of system failures.	
	Built-in-test (BIT)	The integrated system function that monitors and controls system self-tests to detect and report system failures to downstream systems.	
Health Assessment (HA)	BIT Filtering & Correlation	System function and process to manage false alarms, fault persistence and correlate primary and secondary diagnostic trouble (BIT) codes to operational capabilities.	0
	Fault Isolation Analysis	System function and process to resolve reported failure ambiguities using model-based diagnostics or multiple data observations.	
Prognostics Assessment (PA)	Time-to-fail Assessment	System function to monitor, record, assess and report equipment degradation parameter data and produce predicted performance life remaining estimates.	0
	Usage Monitoring & Assessment	System function to monitor, record, assess and report equipment life usage parameter data and produce predicted remaining useful life estimates.	
Advisory Generation (AG)	Decision Support Analysis	System function and process for the transformation and analysis of health state data and information to produce prescriptive actions for the user community.	0
	Health Reporting	System function to monitor, record and report health state data and information for consumption by downstream systems.	
	Caution Warning Indicators	System function to monitor, record, assess and report safety critical equipment failures and produce caution and warning indications for operators.	

CLICK BELOW FOR EXAMPLE



STAGE 1: FUNCTIONAL SELF-ASSESSMENT, PART A

EXAMPLE RESPONSE

IVHM Functional	Common IVHM Function or Process	General Description	% Coverage of Field Failures (if not provided, enter 0)
Data Acquisition (DA)	Data Management	System function and process to control, protect, manage, deliver and enhance the value of health state data and information for the user community.	100
	Data Transfer Interface	System function or system to download or communicate raw data, health state indicators and information for consumption by downstream systems.	
	Data Capture	System function may be a specialized data acquisition module that has analog feeds from sensors, collects processed data from a data bus or provides the software interface to a smart sensor.	
Data Manipulation (DM)	Feature Extraction	System function to manipulate data and compute certain statistical indicators from degradation (predictor) parameters.	100
	Data Normalization	System function to manipulate data and compute a limited range of values within a norm.	
	Data Processing	System function to manipulate data to compute health state indicator(s) or extract information for down stream systems.	
State Detection (SD)	Parametric Data Analysis	System function to process degradation parameter data streams captured in a predefined event, anomaly condition or using external equipment.	80
	Onboard Diagnostics	A dedicated system function for self-diagnostics and reporting of system failures.	
	Built-in-test (BIT)	The integrated system function that monitors and controls system self-tests to detect and report system failures to downstream systems.	
Health Assessment (HA)	BIT Filtering & Correlation	System function and process to manage false alarms, fault persistence and correlate primary and secondary diagnostic trouble (BIT) codes to operational capabilities.	70
	Fault Isolation Analysis	System function and process to resolve reported failure ambiguities using model-based diagnostics or multiple data observations.	
Prognostics Assessment (PA)	Time-to-fail Assessment	System function to monitor, record, assess and report equipment degradation parameter data and produce predicted performance life remaining estimates.	0
	Usage Monitoring & Assessment	System function to monitor, record, assess and report equipment life usage parameter data and produce predicted remaining useful life estimates.	
Advisory Generation (AG)	Decision Support Analysis	System function and process for the transformation and analysis of health state data and information to produce prescriptive actions for the user community.	0
	Health Reporting	System function to monitor, record and report health state data and information for consumption by downstream systems.	
	Caution Warning Indicators	System function to monitor, record, assess and report safety critical equipment failures and produce caution and warning indications for operators.	

Excellent data acquisition support

Good diagnostic support

No prognostic support

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STAGE 1: FUNCTIONAL SELF-ASSESSMENT, PART B

Part B asks 7 Supplemental Questions for Covered Failure Modes Identified in Part A to quantify sophistication

- **For Data Acquisition and Manipulation**
  - Machine readable description of input parameters
  - Machine readable procedure to convert raw parameter inputs into engineering units
- **For State Detection & Health Assessment**
  - Size of ambiguity group (can you identify single root cause or a list of “n” possible root causes)
  - Can you identify key parameters to assess onset of failure modes (machine readable)
  - Can you identify key relationships (or models) to interpret when those parameters indicate onset of a given failure mode (machine readable)
- **For Prognostics Assessment & Advisory Generation**
  - Average advance notice (RUL—Remaining Useful Life expressed in days)
  - Accuracy of forecasted failures (% false positives; % false negatives)

STAGE 1: FUNCTIONAL SELF-ASSESSMENT, PART B

EXAMPLE

- **For Data Acquisition and Manipulation**
  - Machine readable description of input parameters **YES**
  - Machine readable procedure to convert raw parameter inputs into engineering units **YES**
- **For State Detection and Health Assessment**
  - Size of ambiguity group (can you identify single root cause or a list of “n” possible root causes) **1-4**
  - Can you identify key parameters to assess onset of failure modes (machine readable) **YES**
  - Can you identify key relationships (or models) to interpret when those parameters indicate onset of a given failure mode (machine readable) **YES**
- **For Prognostics Assessment & Advisory Generation**
  - Average advance notice (RUL—Remaining Useful Life expressed in days) **N/A**
  - Accuracy of forecasted failures (expressed in typical % false positives; % false negatives) N/A

STAGE 1: *FUNCTIONAL SELF ASSESSMENT*

Part Name	Supplier	Sector	Supplier Part #	Supplier Contact	DUNS #	Validation: Design-Time Run-Time Both	Model: Machine Readable Format?	Validating OEM or Integrator	Date of Validation	Stage	Data Acquisition & Manipulation (DA & DM) % Coverage for Given Failure Mode	State Detection & Health Assessment (SD & HA) % Coverage for Given Failure Mode	Prognostics Assessment & Advisory Generation (PA & AG) % Coverage for Given Failure Mode
P/S													
AID													
T/C													
Starter													

SAE HRCS HEALTH-READY COMPONENTS REGISTRY

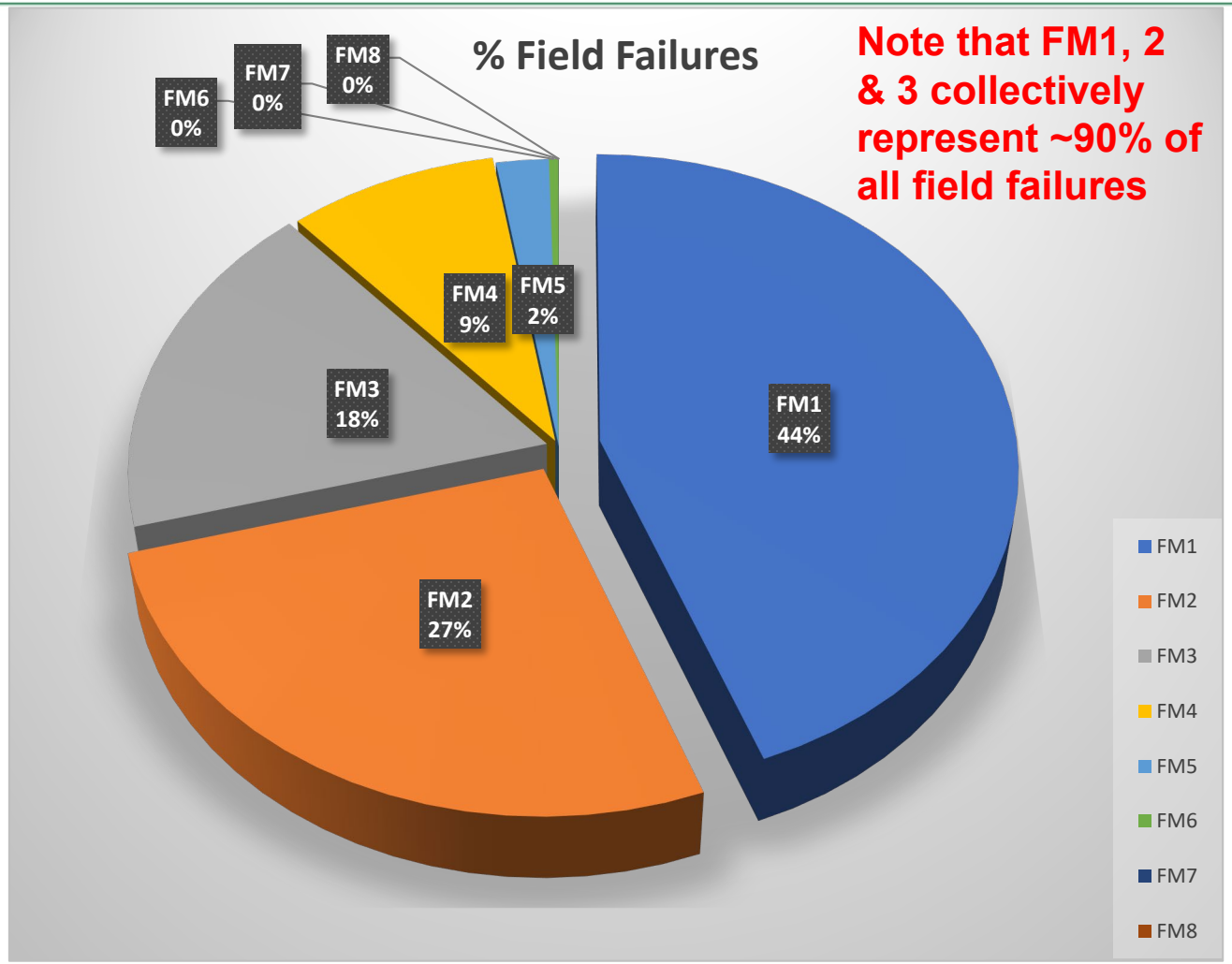
Stage 2

*All examples and associated numbers in this presentation are for illustrative purposes only.

PRIORITIZE FAILURE MODES BY FREQUENCY OF OCCURRENCE

Failure Mode	IPTV Expected in 1st 5 * Years	% Field Failures
FM1	10.0000	44.2605
FM2	6.0000	26.5563
FM3	4.0000	17.7042
FM4	2.0000	8.8521
FM5	0.5000	2.2130
FM6	0.0900	0.3983
FM7	0.0030	0.0133
FM8	0.0005	0.0022
Total	22.5935	100.0000

*** or other reference period**
IPTV=Incidents Per Thousand Vehicles



OTHER CONSIDERATIONS

- Frequency of failures (expressed as IPTV) as shown prior slide is clearly important. It is unlikely different modes will have uniform likelihood of occurrence in the field but, there are also other important factors to consider:
  - **Cost Per Vehicle** (CPV) – This measure tells us how costly on average it is to repair a vehicle once a given failure mode has happened
  - **Severity** (Type) – This measure tells us how important this failure mode is in terms of loss of functionality or its impact on vehicle safety
    - 5. ***Most Severe***: Non-operational Vehicle or Safety Issue
    - 4. Urgent Vehicle Repair
    - 3. Important Repair or Customer Inconvenience
    - 2. Minor Vehicle Repairs
    - 1. ***Least Severe:*** Routine Vehicle Maintenance

Similar to Stage 1 but based on each individual failure mode instead of aggregate performance

STAGE 2: FAILURE MODES ASSESSMENT

Prognostics-related

Failure Mode Descrip -tion	% Field Failures	Avg Cost of Repairs (CPV) $	Severity of Failure (5-1)	Health Indicators ID'd (text)	Relation-ships / Models ID'd (text)	Size of Diagnostic Ambiguity Group (n)	Machine Readable Informa-tion Exchange	Typical RUL Notice (stated units)	% False Posi-tives	% False Nega -tives	Data Acquisition & Manipulation (DA & DM) % Coverage for Given Failure Mode	State Detection & Health Assesment (SD & HA) % Coverage for Given Failure Mode	Prognostics Assessment & Advisory Generation (PA & AG) % Coverage for Given Failure Mode	•••
1														
2														
3														
4														
"n"														
Sums <=100%	**0**													

Stated RUL Units:

- ○ Hours
- ● Days
- ○ Weeks
- ○ Months
- ○ Cycles (flights/trips/starts)
- ○ Engine Hrs
- ○ Operation Hrs
- ○ Other: _____

Similar to Stage 1 but based on each individual failure mode instead of aggregate performance

STAGE 2: FAILURE MODES ASSESSMENT

Prognostics-related

EXAMPLE

Failure Mode Descrip -tion	% Field Failures	Avg Cost of Repairs (CPV) $	Severity of Failure (5-1)	Health Indicators ID'd (text)	Relation-ships / Models ID'd (text)	Size of Diagnostic Ambiguity Group (n)	Machine Readable Informa-tion Exchange	Typical RUL Notice (stated units)	% False Posi-tives	% False Nega-tives	Data Acquisition & Manipulation (DA & DM) % Coverage for Given Failure Mode	State Detection & Health Assesment (SD & HA) % Coverage for Given Failure Mode	Prognostics Assessment & Advisory Generation (PA & AG) % Coverage for Given Failure Mode
1	45	50	3	YES	YES	1	YES	--	--	--	90	75	0
2	20	100	4	YES	YES	2	YES	--	--	--	100	40	0
3	15	300	5	YES	YES	1	YES	--	--	--	100	30	0
4	15	200	3	NO	NO	3	YES	--	--	--	100	25	0
5	5	100	2	NO	NO	2	YES	--	--	--	0	0	0
Sum <=100	**100**												

Stated RUL Units:

- ○ Hours
- ● Days
- ○ Weeks
- ○ Months
- ○ Cycles (flights/trips/starts)
- ○ Engine Hrs
- ○ Operation Hrs
- ○ Other: _____

*All examples and associated numbers in this presentation are for illustrative purposes only.

Similar to Stage 1 but based on each individual failure mode instead of aggregate performance

STAGE 2: *FAILURE MODES ASSESSMENT*

Part Name	Supplier	Sector	Supplier Part #	Supplier Contact	DUNS #	Validation: Design-Time Run-Time Both	Model: Machine Readable Format?	Validating OEM or Integrator	Date of Validation	Stage	Data Acquisition & Manipulation (DA & DM) % Coverage for Given Failure Mode	State Detection & Health Assessment (SD & HA) % Coverage for Given Failure Mode	Prognostics Assessment & Advisory Generation (PA & AG) % Coverage for Given Failure Mode
P/S													
AID													
T/C													
Starter													

SAE HRCS HEALTH-READY COMPONENTS REGISTRY

Stage 3

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STAGE 3: DETAILED DESIGN ASSESSMENT (16 TABLES)

Stage 3 is the most complete, providing design data. Each table has clarifying information for the covered topics.

		ISO 13374 (OSA-CBM) Implementation Level / SAE JA6268™ Interface Name	None	Data Acquisition (DA)	Data Manipulation (DM)	State Detection (SD)	Health Assessment (HA)	Prognostic Assessment (PA)	Advisory Generation (AG)
Design-Time Interfaces	1	Table of Corrective Actions	X	X	X	X	X	X	X
	2	Table of Interfaces	X	X	X	X	X		
	3	Table of Parameters	X	X					
	4	Table of Failure Modes	X	X	X	X			
	5	Table of Condition Indicators			X	X			
	6	Table of Health Indicators				X	X	X	
	7	Table of Predictive Indicators					X	X	
	8	Table of Reported State/Mode Indicators		X	X	X	X	X	
	9	Table of Loadable Software and Data Files	X	X	X	X	X	X	X
	10	Table of Automatically Reported Configuration Indicators				X	X	X	X
	11	Table of Internally Managed Data Recordings				X	X	X	X
	12	Table of Suggested, Externally Managed, Data Recordings	X	X	X				
	13	Table of Suggested, Externally Executed Algorithms	X	X	X				
	14	Table of Corrective Actions to Health Indicator Relationships	X	X	X	X	X	X	
	15	Table of Corrective Actions to Interface Anomaly Relationships	X	X	X	X			
	16	Table of Indicator to State/Mode Validity Relationships	X	X	X	X			

*All examples and associated numbers in this presentation are for illustrative purposes only.

HRC Download Composite Audit Worksheet

Download HRC Failure Mode Audit Worksheet

Download HRC Design Data Audit

Search

New Company

New Assembly

Company (Supplier) / Part Family / Part #	Integrator Verification	Part Type	Assessment Method	ISO 13374 (OSA-CBM) Implementation Level / 6268 Interface Name: Data Acquisition (DA)	Data Manipulation (DM)	State Detection (SD)	Health Assessment (HA)	Prognostic Assessment (PA)	Advisory Generation (AG)	Total Score	Assessment Files
Garrett Automotive											
2107X		Turbo Charger	Design Data Audit	100	100	95	95	65	0	75.8	
- 2107003		Turbo Charger	Failure Mode Audit	100	100	95	98	60	0	75.5	
	GM		Design Data Audit	100	100	95	98	60	0	75.5	
	PSA		Design Data Audit	100	100	95	85.5	60	0	73.4	
+ 2107004		Turbo Charger	Failure Mode Audit	100	100	95	98	60	5	76.3	
+ 2107004A		Turbo Charger	Failure Mode Audit	100	100	95	98	70	5	78.0	
+ 2107004B		Turbo Charger	Failure Mode Audit	100	100	95	98	70	0	77.2	
+ 2107006		Turbo Charger	Failure Mode Audit	100	100	95	98	60	10	77.2	
+ 2107009		Turbo Charger	Failure Mode Audit	100	100	95	98	60	10	77.2	
2141X		e-Turbo	Design Data Audit	95	95	90	95	70	70	85.8	
+ 2141001		e-Turbo	Composite Audit	95	95	90	95	70	70	85.8	
- 2141004		e-Turbo	Composite Audit	95	95	90	95	80	70	87.5	
	GM		Design Data Audit	95	95	90	95	80	70	87.5	
	BMW		Design Data Audit	95	95	90	95	80	70	87.5	
	FCA		Design Data Audit	95	95	90	95	80	70	87.5	
+ 2141007		e-Turbo	Composite Audit	95	95	90	95	80	70	87.5	
+ 2141007A		e-Turbo	Composite Audit	95	95	90	95	80	70	87.5	
+ 2141009		e-Turbo	Composite Audit	95	95	90	95	80	70	87.5	

*All examples and associated numbers in this presentation are for illustrative purposes only.

	A	B	C	D
1	**Company Name (Supplier):**			Garrett
2	**Company DUNS Number:**			897-4456-2108
3	**Assembly Part Number:**			2107003
4	**Assembly Description:**			550 HP, G-Series Turbocharger with Electrically Actuated Bypass and Wastegate Valves.
5	**Assembly Type:**			Turbocharger
6	**Assement Method:**			Design Data Submittal
7	**Sector:**			Automotive
8				
9	**Data Acquisition (DA):**			100
10	**Data Manipulation (DM):**			100
11	**State Detection (SD):**			95
12	**Health Assessment (HA):**			98
13	**Prognostic Assessment (PA):**			60
14	**Advisory Generation (AG):**			0

	A	B	C	D	E	F	G	H
1	Allow user to download official copy of the HRC Summary Assessment Worksheet							
2	Allow user to download official copy of the HRC Failure Mode Audit Worksheet							
3	Allow user to download official copy of the HRC Design Data Worksheet							
4	Allow user to create a new company							
5	Allow user to create a new Assembly							
6	Wrting to the site requires log in ID							
7	Allow user to Search using free text, compainies and Part Types							
8	Is data posted to working area and then it is approved by Admin							
9	User clicks on cell and gets additional detail							
10	Create a Assembly Family							
11	Link Assembly to Assembly Family							
12	Integrator can report audit							

	A	B
1	**id**	**Name**
2	15	AC Motor
3	37	Acoustic Imaging Sensor
4	54	Actuated Valve
5	33	Audio Input Device
6	32	Audio Output Device
7	42	Bearing
8	47	Belt
9	45	Chain
10	72	Chemical Reaction Chamber
11	81	Circuit Breaker
12	56	Compressor
13	61	Condensor
14	65	Crankshaft
15	63	Cylinder
16	16	DC Motor
17	68	Displacement Spring
18	71	Distillation Column
19	62	Duct
20	28	Electrical Connector
21	24	Electrical Generator
22	29	Electrical Harness
23	23	Electrical Power Distribution Unit
24	26	Electrical Switch
25	25	Electrical Transformer
26	17	Electronic Controller
27	19	Electronic IO Unit
28	20	Electronic Power Supply
29	18	Electronic Processing Unit
30	60	Evaporator
31	55	Fan
32	49	Fastening Device
33	74	Filter
34	77	Flow Sensor
35	43	Gear
36	58	Heat Exchanger

*All examples and associated numbers in this presentation are for illustrative purposes only.

STAGE 3: *DETAILED DESIGN ASSESSMENT*

Similar to Stage 2 but including detailed design characteristics in addition to individual failure modes

Part Name	Supplier	Sector	Supplier Part #	Supplier Contact	DUNS #	Validation: Design-Time Run-Time Both	Model: Machine Readable Format?	Validating OEM or Integrator	Date of Validation	Stage	Data Acquisition & Manipulation (DA & DM) % Coverage for Given Failure Mode	State Detection & Health Assessment (SD & HA) % Coverage for Given Failure Mode	Prognostics Assessment & Advisory Generation (PA & AG) % Coverage for Given Failure Mode
P/S													
AID													
T/C													
Starter													

CONSORTIUM DEVELOPMENT

Mission

SAE Industry Technologies Consortia (ITC) enables organizations to connect, collaborate and positively impact global industries by empowering implementation of precompetitive solutions and innovative technologies.

Vision

We are a trusted global leader in consortia-based collaborative tools and services for highly technical industries' operations and supply chain, especially automotive and aerospace.

Collaborative Innovation. Trusted Implementation.

WHY JOIN THESE EFFORTS IN THE HRCS SG?

(HIGH LEVEL)

- Establish standard protocol(s) for information sharing between OEMs and Suppliers. Help the industry ***avoid*** multiple, expensive, and incompatible approaches
- Have a voice in HRCS development direction and priorities
- Network with other experts in the field in a legal, precompetitive and protected environment
- Suppliers gain access to performance data of components in the field, improve products
- OEMs improve product real and perceived reliability and customer satisfaction

WHY JOIN THESE EFFORTS IN THE HRCS SG?
(ADDITIONAL THOUGHTS)

- Creation of the **Health-Ready Component Registry** to give visibility to SAE JA6268™ health-ready components and to create a cross industry movement to take advantage of IVHM.
- Subcommittees to agree on **specific document interchange content and format descriptions** building on existing documents (like GM's ICD component description file and ARINC's standard documents) that could be augmented to include better support for health-ready components.
- Agreed upon **actions to put SAE JA6268™ into practice** by going down a level from the high-level content captured in JA6268™.
- Subcommittees to tackle **terminology/lexicon/vocabulary** in important industry domains
- **Shared training efforts** in support of JA6268™ application in standardized ways

ADDITIONAL BENEFITS OF MEMBERSHIP

- Protection of operating in a legally protected environment
- Establish key relationships and trusted networks
- Voting privileges for all Consortium activities
- Free access to Consortium specifications and publications
- Discounted listing fees for HRCs in the registry
- Complimentary event attendance
- Professional training courses and development
- Implement strategic business improvements and innovative technologies
- Co-develop, publish, and gain access to standards, tools, products, programs, and services

HRCS STRATEGY GROUP LETTER OF INTENT AND CHARTER

HRCS™
Health Ready Components and Systems
A Program of SAE ITC

LETTER OF INTENT BETWEEN THE

SAE ITC AND __[agency name]

1. **Parties.** This Letter of Intent (hereinafter referred to as "LOI") is made and entered into on the _____ day of _____, 201_ (the "effective date"), by and between SAE ITC, whose address is 400 Commonwealth Drive Warrendale, PA USA 15096 ("SAE ITC"), and the __[agency name]__, whose address is _____ ("_____").

HOW CAN YOU GET INVOLVED NOW?

- Alert your management of LOI intended for release in January, 2019
- Nominate components for provisional listing in registry
- Volunteer to participate in registry development
- Submit pilot program recommendations
- Suggest existing applicable standards and documents we should consider for HRCS purposes
- Please return suggestions by December 31st to Peter Grau at: peter.grau@sae-itc.org

QUESTIONS?

THANK YOU!