



**SAE E-32 Committee
Aerospace Propulsion Systems
Health Management**

**Chair: Duncan Chase, Rolls-Royce
Vice-Chair: Mike James, Honeywell**

Report on Document Streamlining

SAE E-32 Committee Scope

- Addresses all aspects of fixed and rotary wing propulsion that relate to the efficiency and degradation of the systems, including life usage and helicopter drive train mechanisms.
- Technical elements include condition monitoring, diagnostics, and, more recently, prognostics which predicts failures and the anticipated necessary maintenance actions based on state awareness and anticipated system usage.
- As well as govt military and academia participation, the committee attracts active attendees from airline operators across the world, engine and airframe manufacturers, specialist equipment vendors such as sensor manufacturers, data collection device manufacturers, sub system integrators and specialized high technology companies who pursue the state of the art in propulsion health management.
- The committee meets twice yearly in the Spring and Fall, every 4th meeting is held at an International venue.

So what's the Problem? We publish!

- E-32 Committee has created many documents over the years (30 plus new issues)
- 19 of the documents need 5 year review
- 5 of those documents in process
- E-32 committee efforts being spent on reaffirmation rather than new technology or need areas.
- Help !!!!!!!!!

What's Needed ?

- Review all of the existing and in process documents
- Identify duplicates/obsolete documents.
- Group similar efforts
- Prioritize efforts with our limited manpower
- Identify gaps in the current documents.
- So Where are we?

We made significant Progress in Atlanta!

- A review of the documents was performed using the following process:
 - RIP, Sense, Acquire, Transfer, Analyze, Act and General guidance tags were put on the wall
 - Several members from the committee reviewed all of the current papers. (A total of 30)
 - The document numbers were put on stickys in the areas covered by the paper.
 - Significant amount of overlap and duplicity were identified.
 - Several papers were identified to be canceled and the content added to other papers.
 - A couple of papers will be put on hold pending domain knowledge acquisition.
 - The draft outcome of the efforts and streamlining was created.
 - The recommended streamlined path will be sent out for committee concurrence.
- Transformations will need to adopt the new SAE Document status Standard
- Here is the outcome . . .

"Sticky" Session Output

RIP ;?()	Sense	Acquire	Transfer	Analyse	Act	General Guidance
AS8054			AIR4175A Development of Ground Station	AIR4175A	AIR4175A	AIR1871C Lessons Learned
AIR1872B Lifting and parts usage	AIR5120 Reliability and Validity	AIR5120	AIR5120	AIR5120	AIR5120	ARP5987 SW approval and certification
AIR4986A Electrostatic Monitoring	AIR1828B Engine Lubrication					AIR4176 CBA - Cost Benefits Analysis
7 Thermocouple documents AIR46B, AIR65, ARP464, ARP465B, ARP485A, ARP690, ARP691 Content to AIR1900	AIR1839C All things vibration	AIR1839C		AIR1839C	AIR1839C	MERGE AIR4985 Performance metrics, AIR5909 Prognostics Metrics, ARP5783 HUM's Metrics
AIR4985 and 5909 add content to ARP5783	AIR4061B Guide to AC integrated functions	AIR4061B				ARP1587B Guide to all things EHM
AS4831A SW interface for ground base system Add content to AIR4175A			AIR1873 Limited EHM system functions	AIR1873	AIR1873	
	AIR4174 Guide to Power Train Monitoring	AIR4174	AIR4174	AIR4174	AIR4174	
	AIR5317 Guide to all things APU	AIR5317	AIR5317	AIR5317	AIR5317	
			AS5394 Adv multipoint interface spec HUMS			
			AS5395 HUMS data interface spec			
	AS5393 Blade tracker specification				AIR5871 Prognostics for health Monitoring	
	AIR1900 Temperature Measurements					
	AS5391 HUMS accelerometers					
	AS5392 Rotor System Indexing					
Recommendations:						
1 1873 and AIR4175A have significant overlap						
2 Consolidation of AIR4061B and AIR5120						
3 Consolidate the HUM's documents						
4 Is HUM's primarily drive train or other disciplines?						
5 There are 3 data documents - AS5391, AS5392, AS5395						
6 When ARP1839 is issued, needs to cancel AIR1839C						
Missing: AIR5871 Prognostics for Gas Turbine engines						

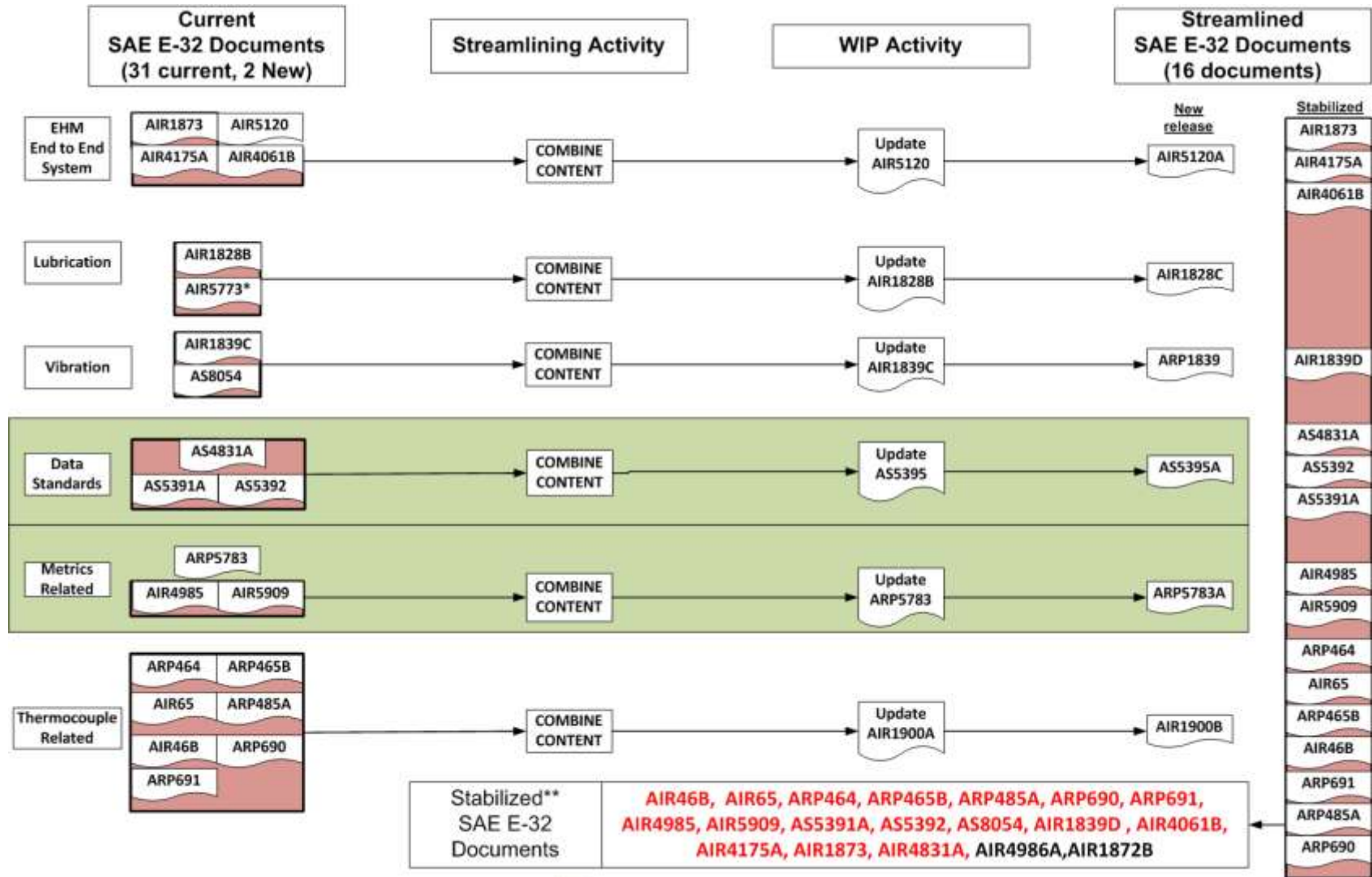
Initial review showed significant document overlap in content and application – Several TC documents and many end to end process papers.

New Document Status Definitions

Standards Status Definitions

Issued	First time a technical report is published. Subject to 5 year review.
Revised	An active technical report has been updated and re-published. Subject to 5 year review.
Reaffirmed	Technical report which has been reviewed by the technical committee and determined to be current with no need for immediate revision. Subject to 5 year review.
Stabilized	A technical report that has been 'frozen' at the last active revision level. 5 year review is not required. (ANSI nationally adopted standards subject to 10 year review.)
Cancelled	<p>If published prior to December 31, 2010 defined as: a technical report that is no longer actively being used. A cancelled technical report may be superseded by another technical report.</p> <p>A cancelled action requires Committee and Council level ballot.</p> <p>If published after January 1, 2011 defined as: a technical report that is deemed 'not fit for use' due to technical reasons or when its technical requirements are totally superseded by another document.</p> <p>5 year review is not required.</p>
Amended	<p>Grandfathered status code available for classifying technical reports published prior to December 2010.</p> <p>Used for Aerospace standards only when a minor change that did not affect fit, form, function or interchangeability.</p> <p>Used when an expedited process was needed for procurement or acceptance of parts.</p> <p>Users should refer to both the amendment(s) and originally published standard to obtain the complete text.</p>
Noncurrent	Grandfathered status code which may appear on technical reports published prior to December 2010. A technical report that is inactive for new design or reflects dated technology.
Reissued	Grandfathered status code which may appear on technical reports published prior to December 2010. A technical report that had been re-instated after being cancelled.
WIP	Work in progress

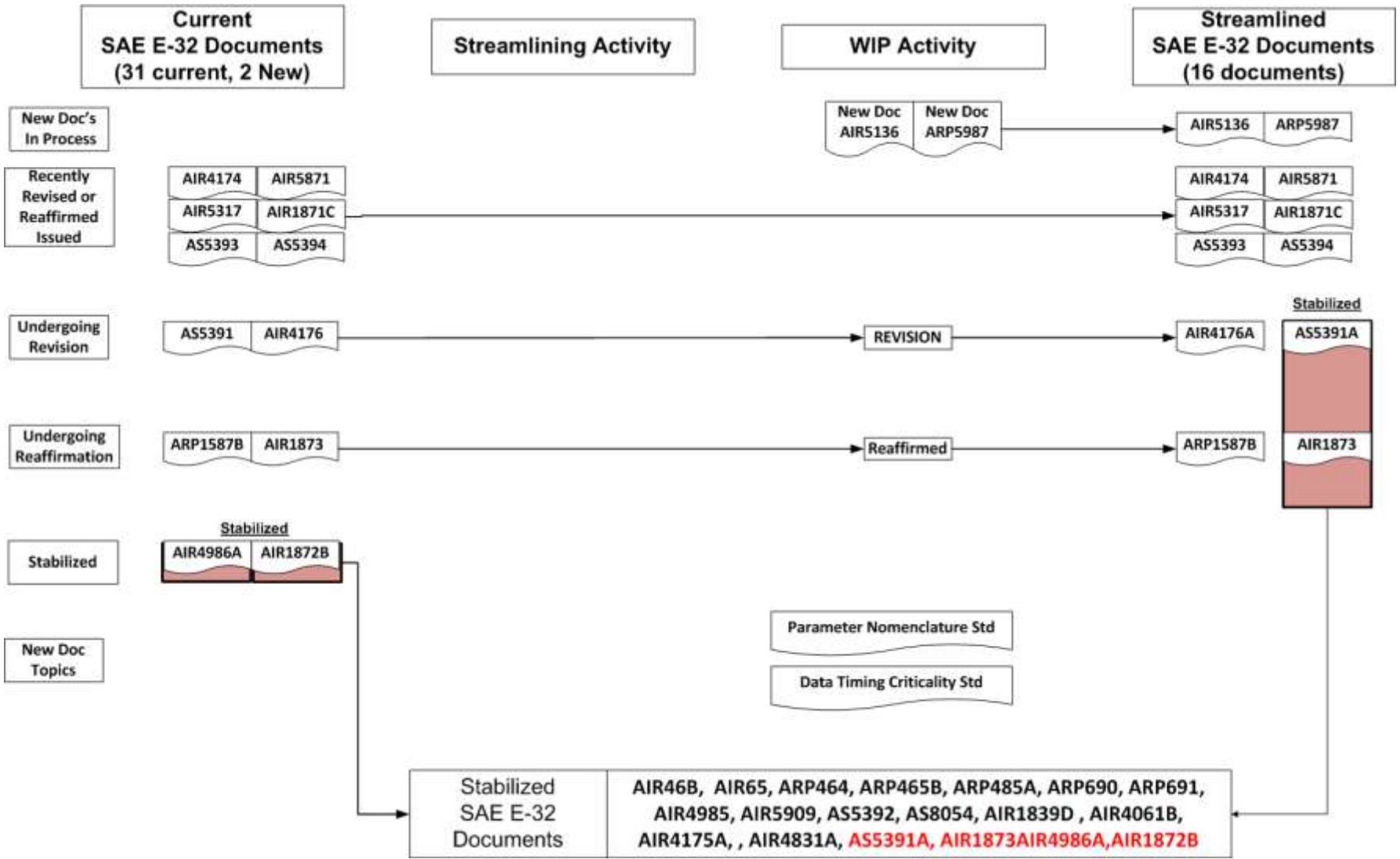
Streamlining Process Flowchart (1)



Activity to be carried out by HM-1 Committee

Revision A, June 29, 2012

Streamlining Process Flowchart (2)



Overview of Documents

Doc Number	Document Title	Current Status	Mapped	Streamlining Activity	Final Outcome
AIR1828B	Guide to Engine Lubrication System Monitoring	Revised	Yes	Lubrication	Revised
AIR1839C	A Guide to Aircraft Turbine Engine Vibration Monitoring Systems	Revised	Yes	Vibration	Revised
AIR1871C	Lessons Learned From Developing, Implementing, and Operating a Health Management System for Propulsion and Drive Train Systems	Revised	Yes	N/A	Recently revised
AIR1872B	Guide to Life Usage Monitoring and Parts Management for Aircraft Gas Turbine Engines	Cancelled	Yes	N/A	Previously Cancelled
AIR1873	Guide to Limited Engine Monitoring Systems for Aircraft Gas Turbine Engines	Reaffirmed	Yes	5 year review Combine with EHM System	Reaffirmed, Rolled to AIR5120, Stabilized
AIR1900A	Guide to Temperature Monitoring in Aircraft Gas Turbine Engines	Revised	Yes	TC Combination	Revised
AIR4061B	Guidelines for Integrating Typical Engine Health Management Functions Within Aircraft Systems	Revised	Yes	EHM System	Stabilized
AIR4174	A Guide to Aircraft Power Train Monitoring	Reaffirmed	Yes	N/A	Recently Reaffirmed
AIR4175A	A Guide to the Development of a Ground Station for Engine Condition Monitoring	Revised	Yes	EHM System	Cancel
AIR4176	Cost Versus Benefits of Engine Monitoring Systems	Reaffirmed	Yes	5 Yr Review	Revised
AIR46B	The Preparation and Use of Chromel-Alumel Thermocouples for Aircraft Gas Turbine Engines	Revised	Yes	TC Combination	Stabilized
AIR4985	A Methodology for Quantifying the Performance of An Engine Monitoring System	Issued	Yes	Metrics Commonality	Stabilized
AIR4986A	Engine Electrostatic Gas Path Monitoring	Canceled	Yes	N/A	Recently Canceled
AIR5120	Engine Monitoring Systems Reliability and Validity	Issued	Yes	EHM System	Revised
AIR5136	Airfoil Diagnostics with Blade Tip Sensors for Operating Turbomachinery	New Doc	Yes	New Doc	AIR5136
AIR5317	A Guide to Apu Health Management	Reaffirmed	Yes	N/A	Recently Reaffirmed
AIR5773	Vibration - TBD	N/A	Yes	Lubrication	Never released

Overview of Documents

Doc Number	Document Title	Current Status	Mapped	Streamlining Activity	Final Outcome
AIR5871	Prognostics for Gas Turbine Engines	Issued	Yes	N/A	Recently Issued
AIR5909	"Prognostic Metrics for Engine Health Management Systems" Never issued.	NA	Yes	Metrics Commonality	Stabilized
AIR65	Thermoelectric Circuits and the Performance of Several Aircraft Engine Thermocouples	Reaffirmed	Yes	TC Combination	Canceled
ARP1587B	Aircraft Gas Turbine Engine Health Management System Guide	Revised	Yes	5 year review	Reaffirmed
ARP464	Mount - Thermocouple	Reaffirmed	Yes	TC Combination	Stabilized
ARP465B	Flange - Thermocouple	Revised	Yes	TC Combination	Stabilized
ARP485A	Temperature Measuring Devices Nomenclature	Revised	Yes	TC Combination	Stabilized
ARP5783	Health and Usage Monitoring Metrics, Monitoring the Monitor	Issued	Yes	Metrics Commonality	Revised
ARP5987	Guidelines for software assurance levels for EHM systems	New Doc	Yes	New Doc	ARP5987
ARP690	Standard Exposed Junction Thermocouple for Controlled Conduction Errors in Measurement of Air of Exhaust Gas Temperature	Reaffirmed	Yes	TC Combination	Stabilized
ARP691	Recommended Ice Bath for Reference Junctions	Reaffirmed	Yes	TC Combination	Stabilized
AS4831A	Software Interfaces for Ground-Based Monitoring Systems	Reaffirmed	Yes	Data Interfaces	Stabilized
AS5391	Health and Usage Monitoring System Accelerometer Interface Specification	Issued	Yes	Data Interfaces	Release revision and roll into data Std then cancel.
AS5392	Health and Usage Monitoring System, Rotational System Indexing Sensor Specification	Issued	Yes	Data Interfaces	Stabilized
AS5393	Health and Usage Monitoring System, Blade Tracker Interface Specification	Reaffirmed	Yes	N/A	Recently Reaffirmed
AS5394	Health and Usage Monitoring System, Advanced Multipoint Interface Specification	Reaffirmed	Yes	N/A	Recently Reaffirmed
AS5395	Health and Usage Monitoring System Data Interchange Specification	Issued	Yes	Data Interfaces	Revised
AS8054	Airborne Engine Vibration Monitoring (Evm) System, Guidelines for Performance Standard For	Reaffirmed	Yes	Vibration	Stabilized

What is Next?

- Vetting of the work done to date
 - Assure groupings are correct/reasonable
 - Identify Gaps and new work in process or needed
 - Prioritize the go-forward plan
 - Charter teams for work based on priority
 - Assure entire E-32 team is participating
 - Set aggressive goals to get stabilized work completed
- Need team to work with committee leadership during the breakout sessions
- Present outcome for voting and end of this session