

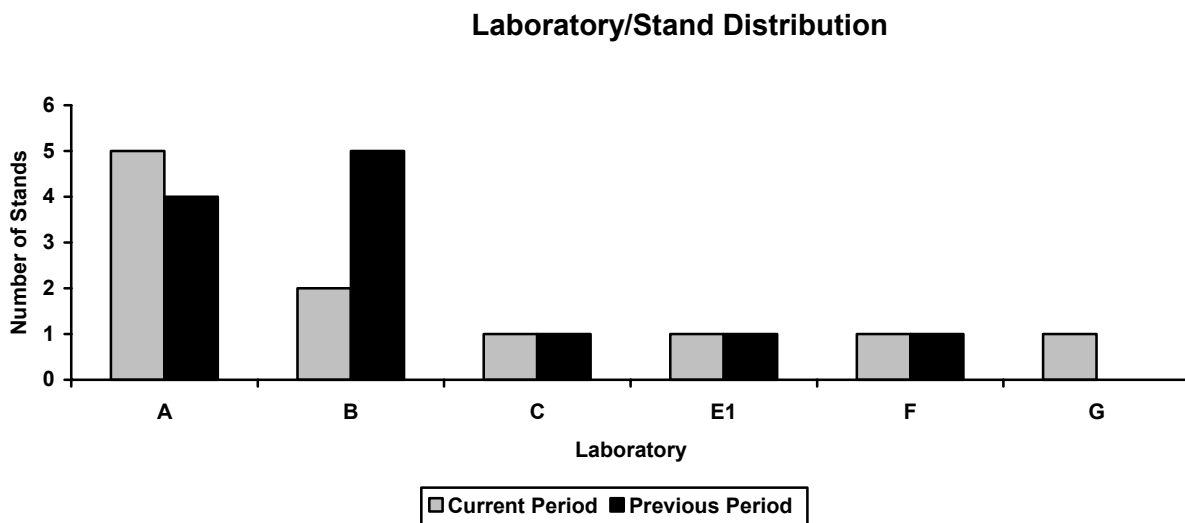
Memorandum: 01-131
 Date: October 10, 2001
 To: Larry M. Bendele, Chairman, Sequence IVA Surveillance Panel
 From: Michael T. Kasimirsky
 Subject: Sequence IVA Semiannual Report: April 1, 2001 through September 30, 2001

The following is a summary of Sequence IVA reference tests that were reported to the Test Monitoring Center during the period April 1, 2001 through September 30, 2001.

Lab/Stand Distribution

	Reporting Data	Calibrated as of September 30, 2001
Number of Laboratories:	6	4
Number of Test Stands:	11	10

The following chart shows the laboratory/stand distribution:



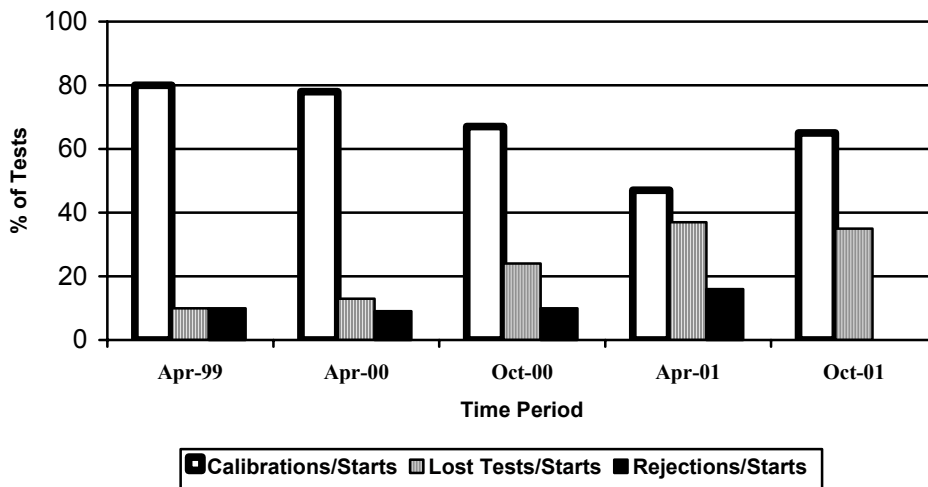
The following summarizes the status of the reference oil tests reported to the TMC:

Calibration Start Outcomes	TMC Validity Codes	No. of Tests
Operationally and Statistically Acceptable	AC	13
Failed Acceptance Criteria	OC	0
Stand Failed Reference Sequence – data pulled	MC	0
Operationally Invalid (Laboratory Judgment)	LC	7
Operationally Invalid (Lab & TMC Judgment)	RC	0
Aborted	XC	0
Total		20

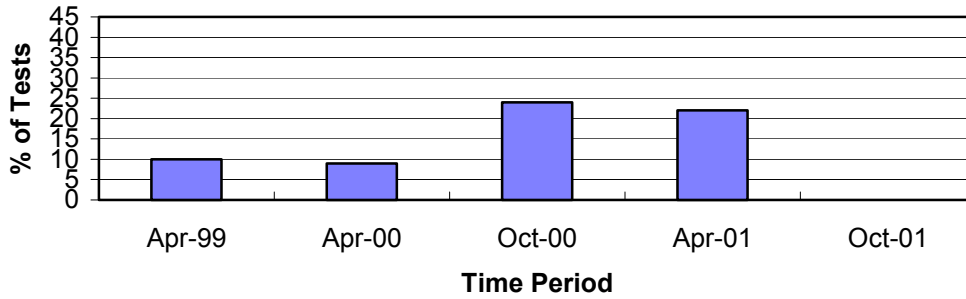
Donated & Industry Support Outcomes	TMC Validity Codes	No. of Tests
Acceptable Decoded Runs	AG	1
Unacceptable Decoded Runs	OG	1
Invalid Decoded Runs	LG	0
Total		2

Calibrations per start, lost tests per start and rejection rates are summarized below:

Calibration Attempt Summary



Rejected Test Rate



There were no failing tests for the period.

There were no LTMS Deviations written this period. There has been one deviation from the LTMS since its introduction in 1999.

There were no QI Deviations written this period.

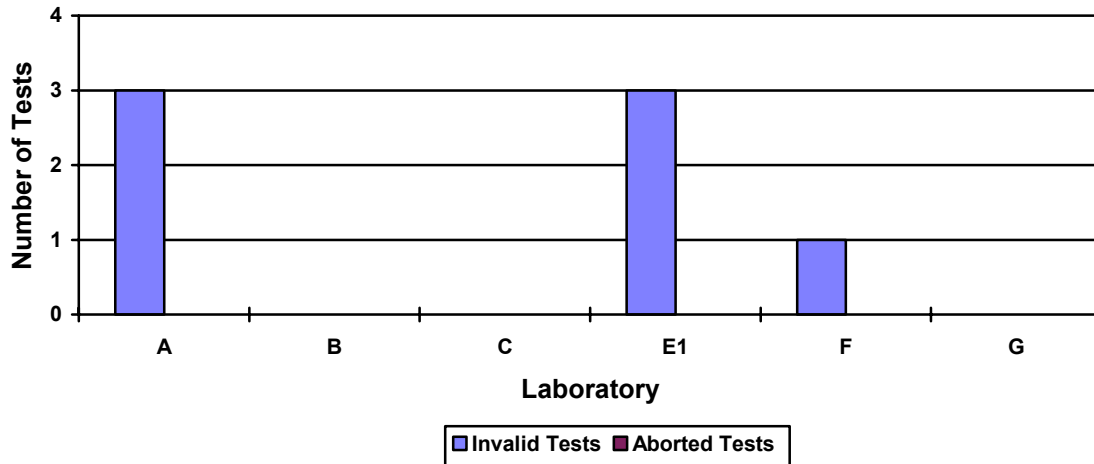
During the period, the TMC visited four laboratories. Any discrepancies noted during these visits were identified to the laboratory and corrective action is being taken.

Lost Test Summary

Seven tests were lost this period. The causes are summarized in the following chart:

Lab	Reason for Lost Test	Number of Tests	Breakdown of Tests (LC/RC/XC)
A	Speed QI & Coolant Heat Exchanger Plumbed Incorrectly	1	1/0/0
	Mild Cam Lot – Lot Removed From Testing.	1	1/0/0
	Data Acquisition Problems	1	1/0/0
E1	Incorrect Ignition Timing	1	1/0/0
	Camshaft Cleaning Performed Incorrectly	1	1/0/0
	Rocker Cover Air Flowmeter Failed	1	1/0/0
F	Low Oil Pressure & Engine Abandoned from Testing Due to Repeated Failures to Calibrate Successfully	1	1/0/0

Lost Test Distribution



Information Letters

Sequence IVA Information Letter No. 01-1, Sequence No. 5, dated May 22, 2001, was issued during the period and contained a method for measuring and reporting Rocker Cover Coolant Flow as well as some modifications to the Rocker Cover Coolant System.

Sequence IVA Information Letter No. 01-2, Sequence No. 6, dated July 25, 2001, was issued during the period and contained revised cylinder head and test engine replacement requirements and also a revised test numbering definition.

Severity and Precision Analysis

Below is a summary of the average Δ/s , pooled standard deviation, and average Δ in reported units for the tests reported during this period. Also below is a summary of the average Δ/s value, by parameter, for all laboratories reporting data during this period.

Industry Severity Summary			
Parameter	Average Δ/s	Pooled standard deviation (degrees of freedom)	Average Δ , in micrometers
ACW	0.128	8.61 (df=11)	1.10

ACW Results, by Laboratory	
Laboratory	Average Δ/s
A	0.359
B	0.405
C	-0.554
E1	-1.462
F	-0.145
G	-

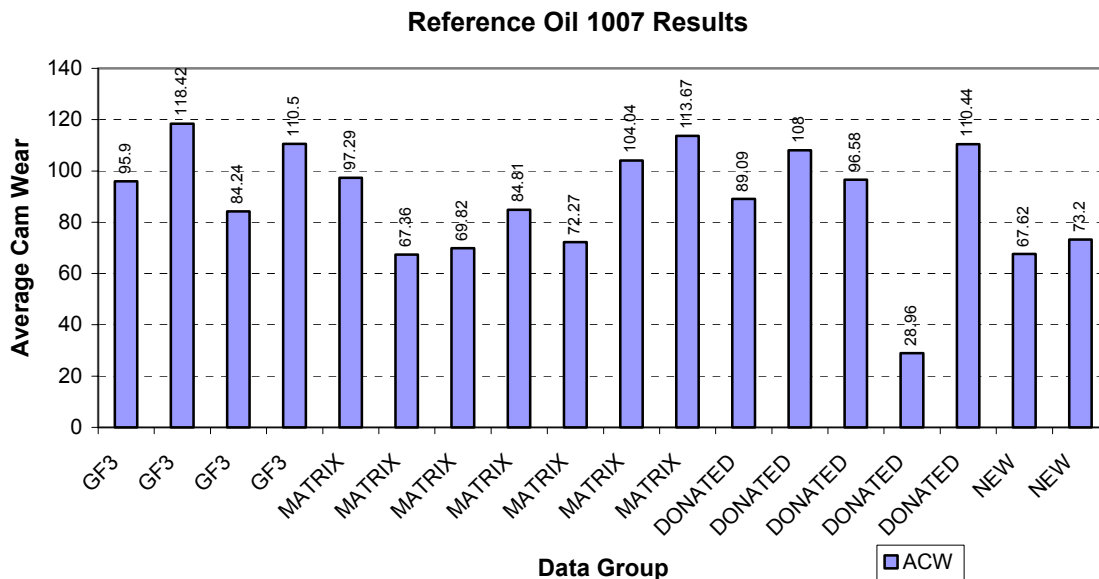
The industry began the period in a severity alarm. This alarm was originally triggered by a single test result that was severe of target. No cause for this severe result was found. The laboratory that ran this test ran a second test on the same reference oil and camshaft lot and returned a passing test result. After the alarm cleared, the industry returned to a warning alarm due to a single reference oil test that generated severe but passing results. The subsequent test cleared the alarm. Severity for the period is comparable to the results obtained last period and precision has improved compared to last period (see Figures 2 & 3).

At the May 2001 meeting of the Sequence IVA Surveillance Panel, the panel approved a motion to revise the test targets for reference oils 1006 and also approved a motion to reintroduce reference oil 1007 into the LTMS. The revised targets for reference oil 1006 and reference oil 1007 are shown in the following table:

Reference Oil	N	Mean	Standard Deviation
1006	77	121.76	12.50
1007	11	92.12	16.76

The targets for reference oil 1006 use a standard deviation pooled across laboratory to remove any laboratory biases from the targets. The reference oil 1007 targets were calculated at the meeting and as such utilize a conventional standard deviation. The reference oil 1007 targets are to be updated at 20 and 30 data points and these future updates will incorporate a standard deviation pooled across laboratory. The reference oil 1006 targets will not be updated without further Surveillance Panel action. The targets for reference oil 1006 are effective for all tests completed on or after May 25, 2001, and the reference oil 1007 targets are effective for all tests completed on or after May 24, 2001.

The panel also asked the TMC to review any new data on reference oil 1007 after it's reintroduction and compare it to the existing set of data on this reference oil. This comparison is shown in the following plot:



Both of the data points generated on reference oil 1007 (labeled *NEW* above) since it was reintroduced into the system have returned passing test results.

Hardware

No hardware changes were made this period.

Reference Oils

Oil	TMC Inventory, in gallons	TMC Inventory, in tests	Laboratory Inventory, in tests	Estimated life
1006	46	11	23	1 month or less ¹
1006-2 ²	5,342	1,335	12	3+ years ¹
1007 ³	550	137	17	3+ years ¹

¹ Multiple test area reference oil; total TMC inventory shown

² New Reference Oil; not yet introduced into LTMS

³ Cannot be reblended

MTK/mtk

Attachments

- c: F. M. Farber, TMC
Sequence IVA Surveillance Panel
<ftp://tmc.astm.cmri.cmu.edu/docs/gas/sequenceiv/semiannualreports/IVA-10-2001.pdf>

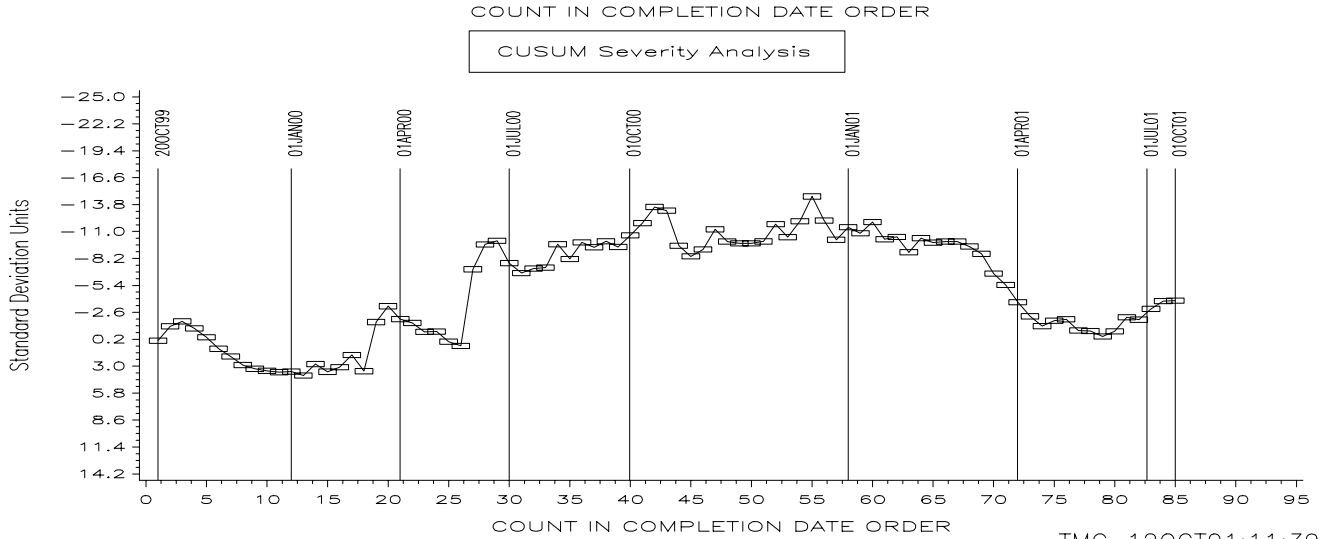
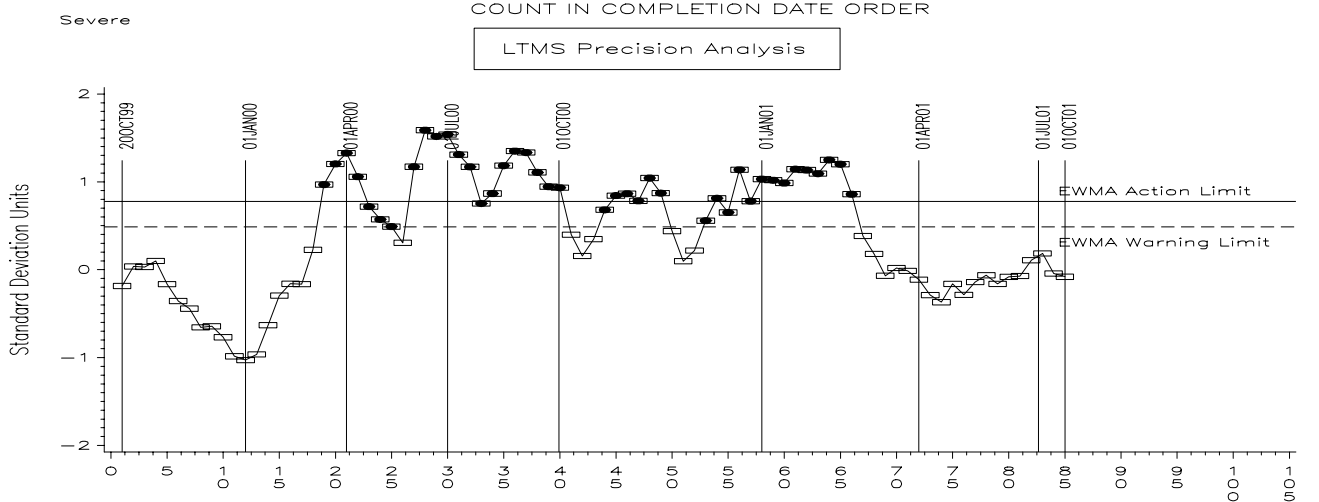
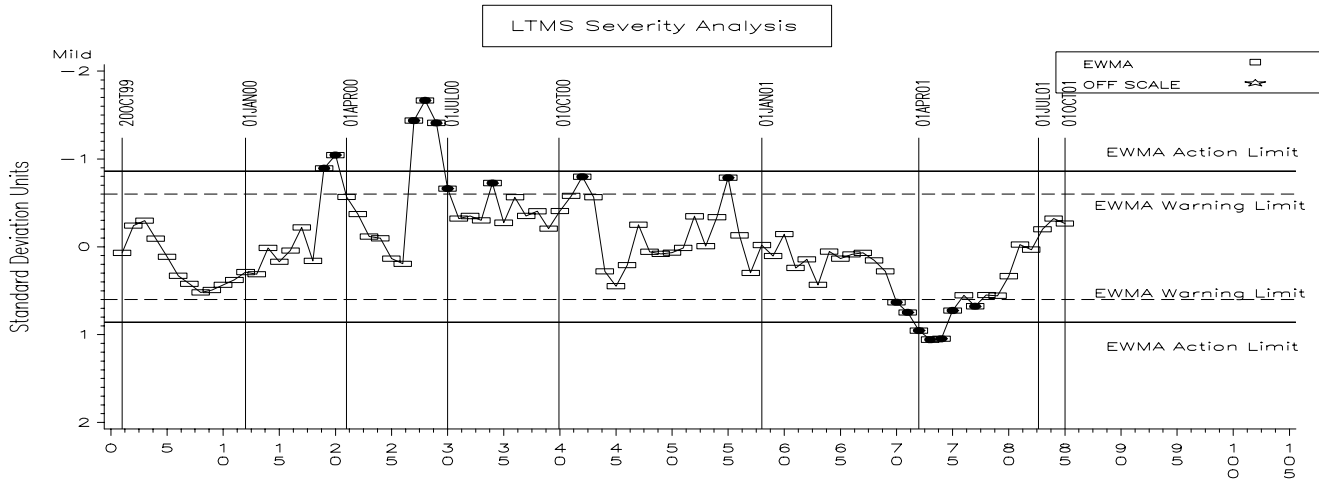
List of Figures

- Figure 1 graphically presents the Industry control charts for ACW and also the CUSUM delta/s plot (by count in completion date order) of average camshaft wear for operationally valid tests.
- Figure 2 graphically presents a historic perspective for ACW mean delta/s by report period.
- Figure 3 graphically presents a historic perspective for ACW pooled standard deviations by report period.
- Figure 4 is the Sequence IVA Timeline, created to track changes in test hardware and operations.

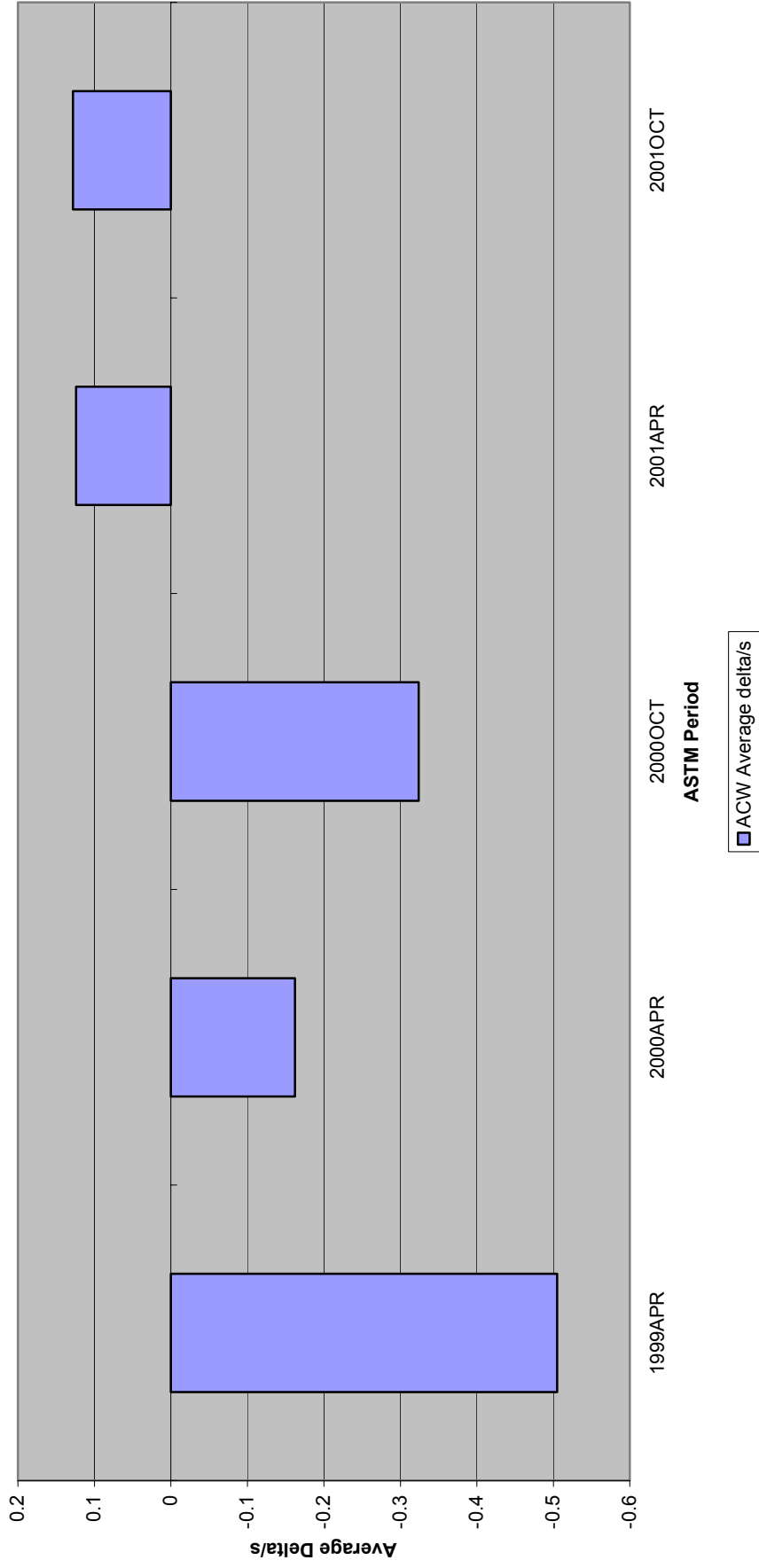
SEQUENCE IVA INDUSTRY OPERATIONALLY VALID DATA

AVERAGE CAM WEAR

FIGURE 1



**Figure 2 - Sequence IVA Reference Oil Data
Average Camshaft Wear**



**Figure 3 - Sequence IVA Reference Oil Data
Average Camshaft Wear**

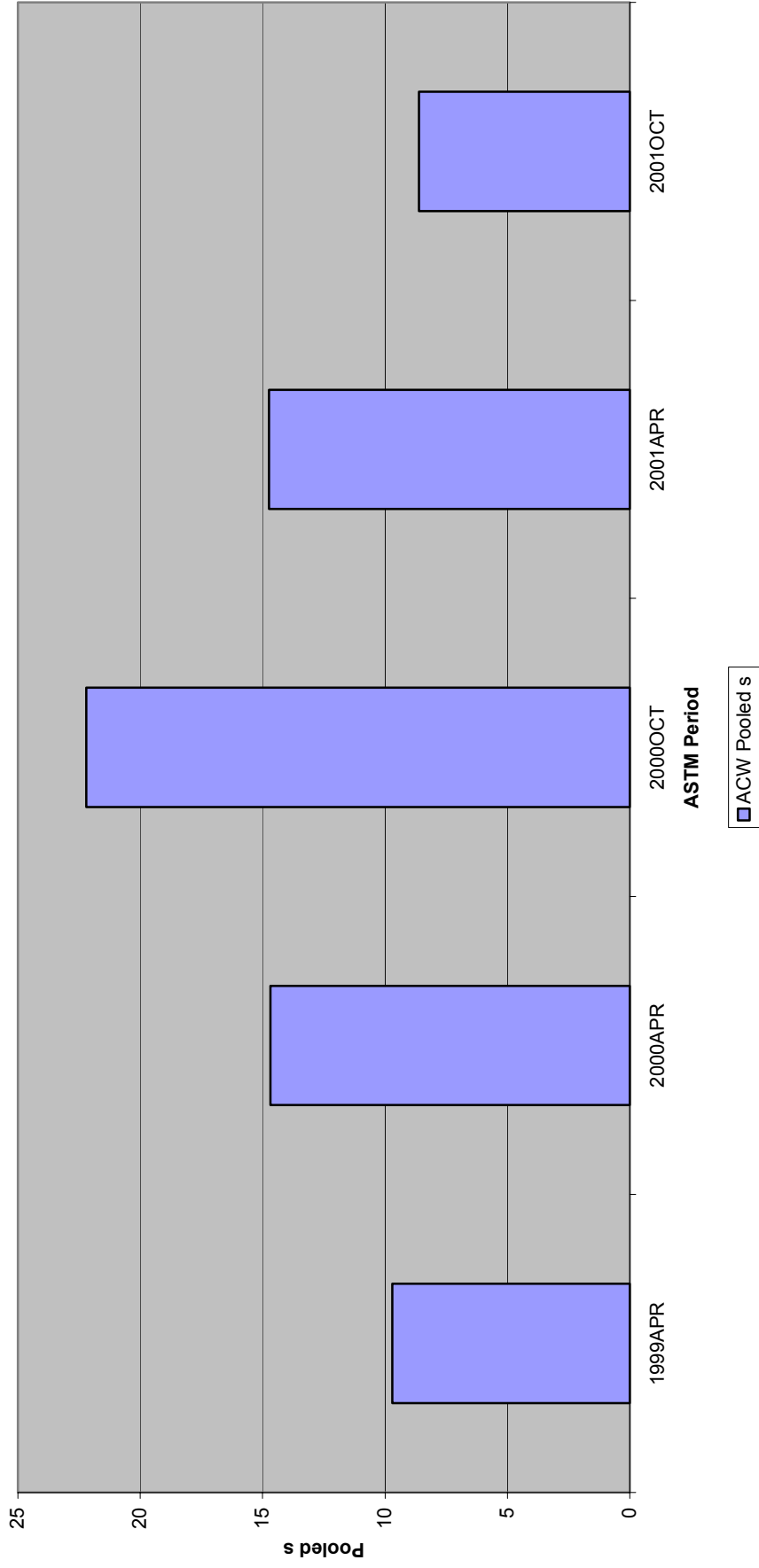


Figure 4 - Sequence IVA Timeline

Date	Topic	Information Letter
2/10/1999	SEQUENCE IVA TEST LTMS ESTABLISHED BY SURVEILLANCE PANEL	
11/17/1999	CALIBRATION STATUS RESUMED	
2/16/2000	DRAFT 4 OF TEST PROCEDURE ISSUED. INCORPORATED JACKETED ROCKER COVER, CONTROLLED FLOW OF FRESH AIR TO ROCKER COVER, AND OIL CYLINDER HEAD AS OIL TEMPERATURE CONTROL POINT.	00-1
8/1/2000	REVISED DATA DICTIONARY AND REPORT FORM SET (VERSION 20000126) GOES INTO EFFECT.	00-2
6/12/2000	REVISED DOUBLE-FLUSH COOLANT CONTROL REQUIREMENTS EFFECTIVE	00-3
6/12/2000	REVISED ENGINE STARTING PROCEDURE EFFECTIVE	00-3
6/12/2000	ELIMINATE THE REQUIREMENT FOR LINEAR RAMPING OF TRANSIENT PARAMETERS	00-3
6/12/2000	REVISED OIL SAMPLING PROCEDURE	00-3
6/12/2000	REVISED DOUBLE-FLUSH OIL DRAIN REQUIREMENT	00-3
6/12/2000	REVISED COMPRESSION TEST REQUIREMENTS	00-3
6/12/2000	NEW CAMSHAFT CLEANING REQUIREMENTS	00-3
1/24/2001	CAMSHAFT LOT RESTRICTIONS	00-4
7/22/2001	ROCKER COVER COOLANT FLOW MEASUREMENT & REPORTING	01-1
5/24/2001	REVISED CYLINDER HEAD AND TEST ENGINE REPLACEMENT REQUIREMENTS	01-2
5/25/2001	REVISED TEST NUMBERING REQUIREMENTS	01-2