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IX 4

CLASSIFICATION
STANDARD FORM 14 REV. MARCH 13, 1957
GSA REGULATION 24X-203.04
14-203

TELEGRAPHIC MESSAGE

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July 1, 1965

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 University of Alabama, in Huntsville
saturn history
 7/1/65

W. G. WENDERS, DIRECTOR, APOLLO PROGRAM
 WASHINGTON, D. C., CODE NR
 ALL FROM KING, WASH WASHINGTON, D. C., CODE WAF
 W. J. BOGODA, WPA ENGINE PROJECT OFFICE, WPA, INC.
 6622 SANYAL AVENUE, CANOGA PARK, CALIFORNIA
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 WPA ENGINE TEST SITE, BOX 6035
 WPA ENGINE TEST BASE, CALIFORNIA
 PLEASE MAGARNE. IN EARLY REFER TO I-B-2-40
 APOLLO PROGRAM FLASH REPORT, S-1C STAGE F-1 ENGINE

COPIES TO:

Dr. von Braun,
 SAC, Huntsville
 I-4-100

Dr. D. R. ...
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Mr. ...
 I-4-100

Mr. Weidner,
 R-DIR

Mr. Cline,
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Mr. Heinburg,
 R-TEST-DIR

Mr. Grau,
 R-QUAL-DIR

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SATURN HISTORY DOCUMENT
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BEGINNING OF TEXT

THIS IS AN APOLLO FLASH REPORT AND IS FOR THE PERSONAL ATTENTION OF THE APOLLO PROGRAM DIRECTOR.

PART I
PROBLEM.

SEPARATIONS IN THE BRAZE USED BETWEEN THE RINGS AND THE LANDS OF THE F-1 ENGINE THRUST CHAMBER INJECTOR.

BACKGROUND.

SINGLE ENGINE TESTING OF F-1 PRODUCTION ENGINE 2009 AT MARSHALL REVEALED BRASS EROSION. CLOSE INSPECTION OF THIS INJECTOR REVEALED AREAS WHERE A BRAZE PROBLEM EXISTED. ONE WAS FOUND ON THE INJECTOR FACE WHERE INSUFFICIENT BRAZE WAS

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*From
Leland F.
Belew*

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REGULATED BY FUEL COLLECTION UNDER THE BAFFLE AND SUBSEQUENT BURNING. THE SECOND WAS A SEPARATION BETWEEN THE BRAZE AND A LOX RING-TO-LAND JOINT. BASED ON THESE FINDINGS, A DETAILED VISUAL IN PLACE INSPECTION WAS MADE ON THE ENGINES WHICH ARE INSTALLED IN S-IC-T. THIS INSPECTION REVEALED THAT FOUR OF FIVE OF THE F-1 ENGINES PRESENTLY BEING TESTED IN THE S-IC-T HAD INJECTOR BRAZE-TO-RING SEPARATIONS SIMILAR TO THOSE FOUND IN ENGINE 2009. COORDINATION WITH ROCKETDYNE REVEALED THAT SOME INSTANCES OF SEPARATIONS HAD BEEN ENCOUNTERED IN THE R&D PROGRAM BUT NOT TO THE EXTENT NOR THE FREQUENCY ENCOUNTERED IN THE ENGINES AT MSFC. THE INJECTORS INVOLVED ARE OF THE QUALIFICATION I (FRT CONFIGURATION) AND USED NICKEL PLATING ON BOTH THE COPPER RINGS AND THE 347 STAINLESS STEEL LANDS AS A MEDIA TO IMPROVE THE BRAZE BOND. USE OF GOLD AS AN ALTERNATE PLATING MATERIAL ON THE RINGS TO IMPROVE THE STRENGTH OF THE BRAZE BOND IS IN R&D TESTING AND HAS BEEN APPROVED FOR INCORPORATION IN ENGINES FOR THE SA-503. HOWEVER, BECAUSE OF THE LEAD TIME INVOLVED, NONE OF THESE IMPROVED INJECTORS ARE IMMEDIATELY AVAILABLE FOR INCORPORATION IN THE S-IC-T. CONSEQUENTLY, INJECTORS IN S-IC-T WILL BE REPLACED WITH NEW INJECTORS FABRICATED BY THE SAME PROCESS AS THE INJECTORS WHICH SEPARATED. INSPECTION OF THE ENGINES FOR 501 AND 502, ALL OF WHICH ALSO USE THE

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NICKEL PLATING ON THE COPPER RINGS, IS NOT YET COMPLETE.

IMPACT.

IN REGARD TO THE SCHEDULE FOR S-IC-T, A 150-SECOND TEST WAS ORIGINALLY SCHEDULED FOR JULY 15. THIS TEST, HOWEVER, WILL BE DELAYED UNTIL JULY 22, IN ORDER TO ALLOW INJECTOR CHANGEOUT. HOWEVER, THE DELAY IS NOT A COMPLETE LOSS BECAUSE IT WILL PERMIT INSTALLATION OF THE BOEING PRESSURIZATION SYSTEM PRIOR TO THE TEST. THE JULY 22 TEST IS NOW SCHEDULED FOR 40 SECONDS WITH A 150-SECOND TEST TO FOLLOW ON JULY 27, BOTH WITH THE PRESSURIZATION SYSTEM IF PRESENT PLANS MATERIALIZE. THE RISK OF USING INJECTORS WHICH USE NICKEL PLATING IN VEHICLES 501 AND 502 HAS NOT YET BEEN ASSESSED. NEITHER HAS THE IMPACT OF THE ALTERNATE APPROACH OF EXCHANGING THE PRESENT INJECTORS FOR THE IMPROVED INJECTORS BEEN ASSESSED, BUT IF REQUIRED COULD RESULT IN S-IC-1 AND S-IC-2 SCHEDULE DIFFICULTY.

PART II

IMMEDIATE ACTION.

EXCHANGE THE INJECTORS ON S-IC-T WHICH HAVE SEPARATED DRAZE JOINTS FOR NEW SPARE INJECTORS SO THE STAGE TESTING CAN CONTINUE WITHOUT UNDUE RISK. REVIEW AVAILABLE DATA AND ASSESS THE NEED AND POTENTIAL IMPACT OF CHANGING THE INJECTORS IN ENGINES ALLOCATED TO

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SA-501 AND 502. THIS REVIEW AND ASSESSMENT IS EXPECTED TO BE COMPLETE BY JULY 8, 1965.

CORRECTIVE ACTION.

ADOPTION OF THE INTERIOR CONFIGURATION WHICH USES GOLD PLATING ON THE RINGS RATHER THAN THE PRESENT NICKEL PLATED RINGS. EXPEDITE PROCUREMENT OF SPARE INJECTORS WITH GOLD PLATED RINGS FOR POSSIBLE USE ON VEHICLES 501 AND 502. IN THE EVENT A DECISION IS MADE TO EXCHANGE THE PRESENT INJECTORS FOR THE IMPROVED MODEL PRIOR TO FLIGHT.

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SIGNED BY LELAND F. BELEW, ENGINE PROGRAM MANAGER.

GROUP 4
Downgraded at 3 year intervals;
declassified after 10 years

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NAME AND TITLE OF ORIGINATOR (Type) Richard L. Brown, Chief, R&D Branch	ORIGINATOR'S TEL. NO. 877-8396
I certify that this message is official business, is not personal, and is in the interest of the Government. Leland F. Belew Engine Program Manager	

DATE AND TIME PREPARED
2:20 P.M. July 1, 1965

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