

NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Materials Laboratory Division
Washington, D.C. 20594



May 3, 2022

MATERIALS LABORATORY FACTUAL REPORT

Report No. 22-031

A. ACCIDENT INFORMATION

Place : Cambridge, Ohio
Date : May 27, 2020
Vehicle : Beech 35-A33, N123JB
NTSB No. : CEN20LA197
Investigator : Andrew Todd Fox, ASI – CEN

B. COMPONENTS EXAMINED

Components from a Continental Motors IO-470-N13B engine; ESN: 1036858.
Number 3 cylinder assembly (P/N: 657910, S/N: AC18JB769).
Intake elbow tubes from numbers 1, 3, and 5 cylinders.
Number 3 cylinder piston, intake flange gasket, and injector fuel line.
Numbers 3 and 4 fuel injectors.
Numbers 3 and 5 inter-cylinder baffle.
Six fuel lines.
Fuel controller and attachment bracket.

C. DETAILS OF THE EXAMINATION

Components from a Continental Motors IO-470-N13B engine, as listed above and shown in figures 1a – 1i, were submitted to the NTSB Materials Laboratory for examination. The number 3 cylinder head exhibited staining from a blue dye (consistent with 100LL aviation gasoline) on several cooling fins located on the forward-facing side of the intake port, as shown in figure 2a. Blue staining was also observed on a number 3 – 5 inter-cylinder baffle, as shown in figure 1g. The number 3 intake elbow (see figure 2b) and cylinder intake port flange face (see figure 2c) were examined for any apparent indication of staining, but none were found. The intake flange gasket compression faces (see one side shown in figure 1d) were flattened around the inner diameter hole and there were no apparent kinks or tears.

The fuel injectors (figure 1f) had no apparent cracks or obstructions. As received, an oily substance had wicked into the aerator filter screen on one of the injectors but there were no apparent particulate blockages. The injector port (figure 3a) and intake port on the number 3 cylinder were examined for cracks in the surrounding material but none were found. The inside of the cylinder (figure 3b) was comparatively clean, and the exhaust valve exhibited a red tint from high-temperature exposure.

The insulated fuel lines and number 3 fuel injector line were plugged at one end, connected to regulated shop air, and pressurized to between 15 psi and 25 psi. All fuel lines held pressure. Soapy water was applied to end fittings and gaps in insulation to check for formation of foam or bubbles, but no such indications were observed. The fuel injector line was also examined visually with the aid of a stereo microscope for cracks or other notable indications but none were found. The fractured fittings on all submitted components were examined visually with the stereo microscope and all were consistent with overstress separations.

Donald Kramer, Ph.D.
Sr. Materials Engineer



Figure 1: Images of accident parts as received: a) number 3 cylinder assembly; b) numbers 1, 3, and 5 intake elbow tubes;

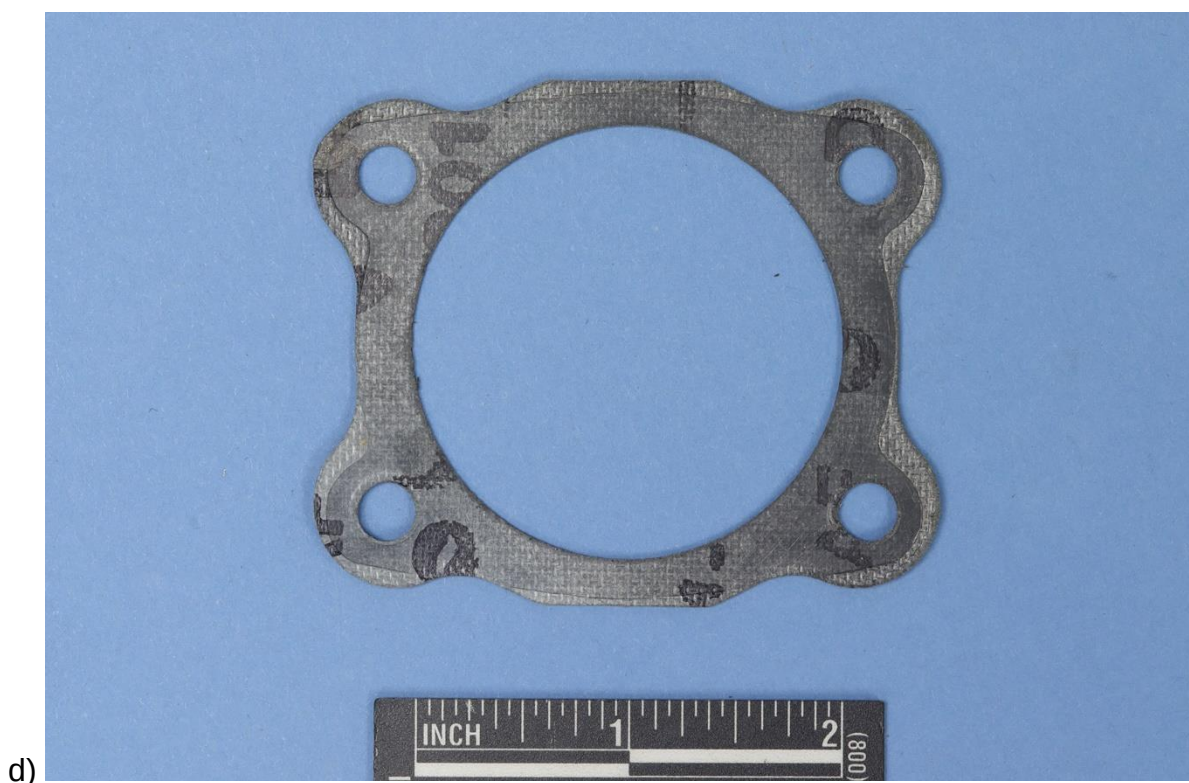
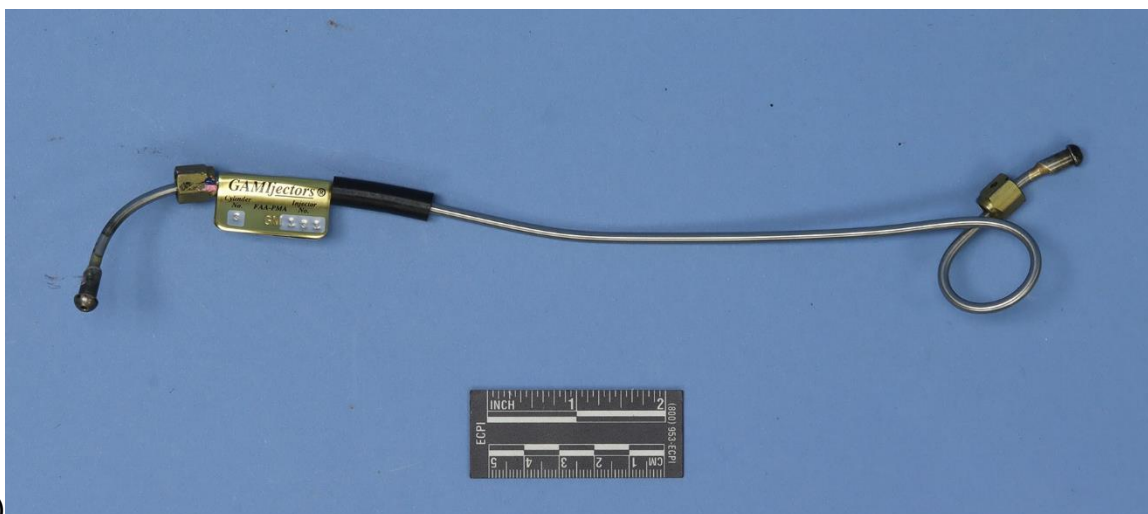


Figure 1 (cont.): c) number 3 piston; d) number 3 cylinder intake flange gasket;



e)



f)

Figure 1 (cont.): e) number 3 cylinder injector fuel line; f) numbers 3 and 4 fuel injectors;

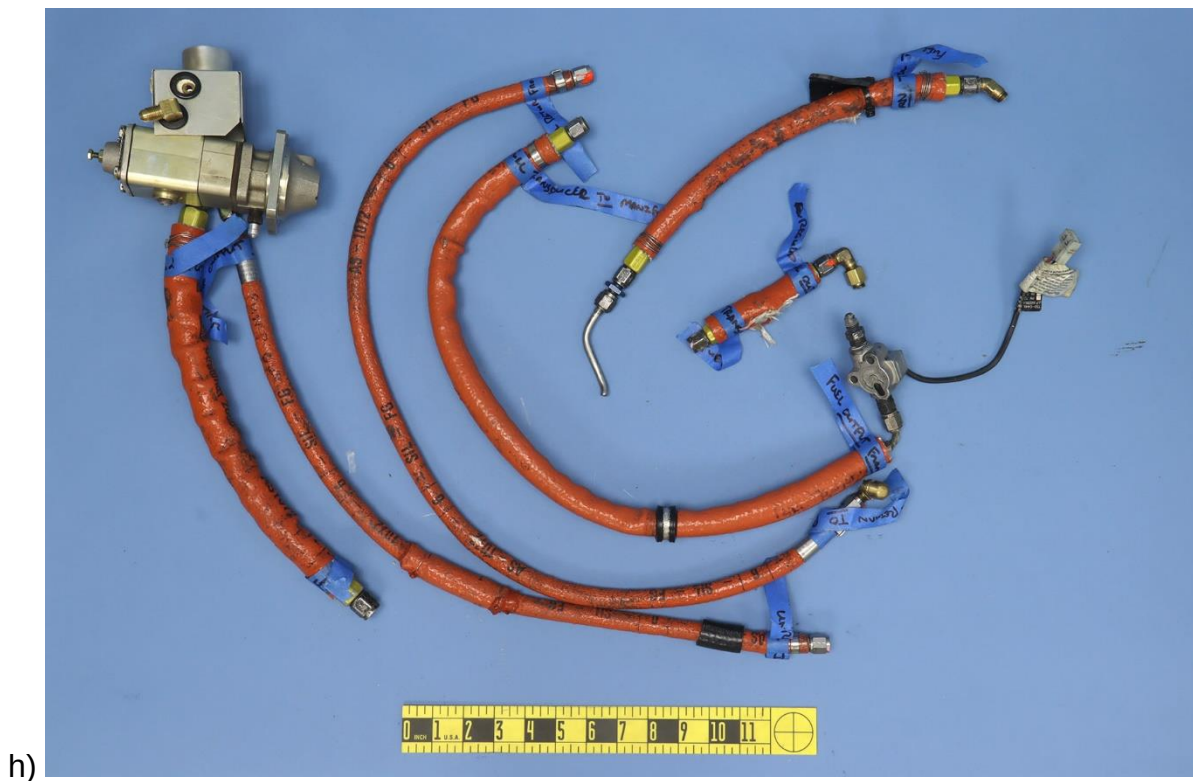
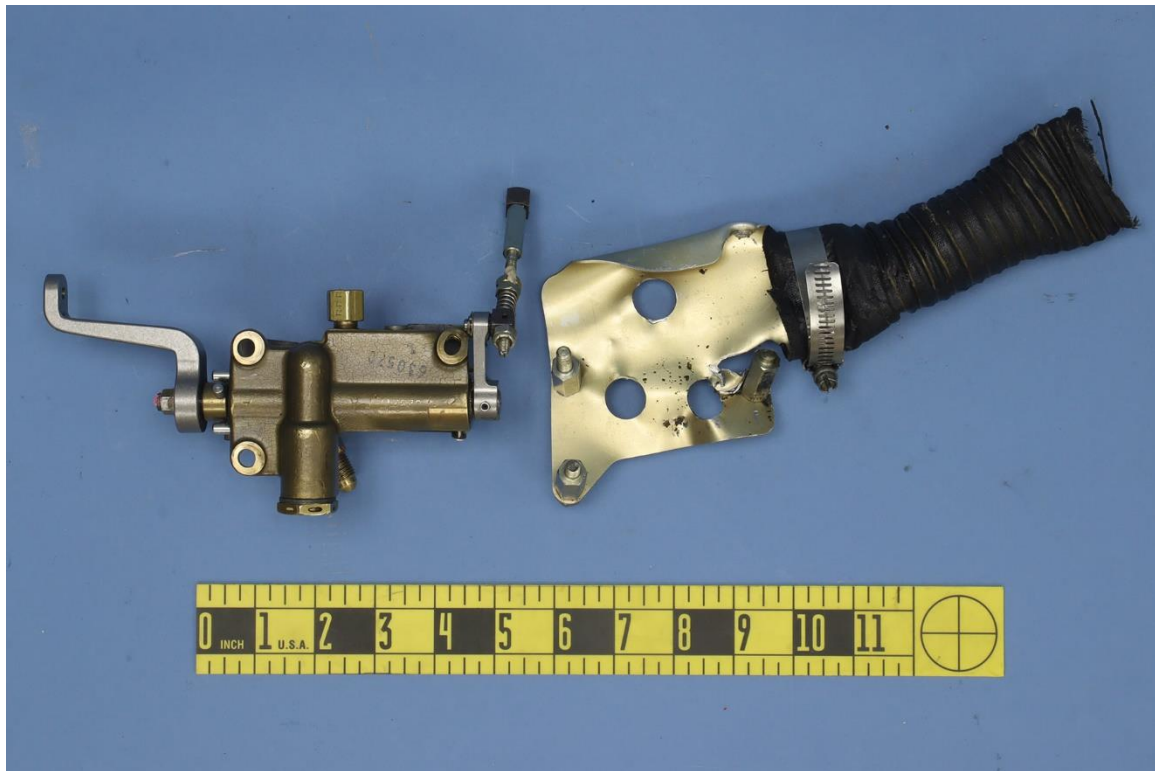


Figure 1 (cont.): g) numbers 3 – 5 intercylinder baffle exhibiting a fuel stain; h) six fuel lines and fuel pump; and



i)

Figure 1 (cont.): i) fuel injection control assembly and mounting bracket.

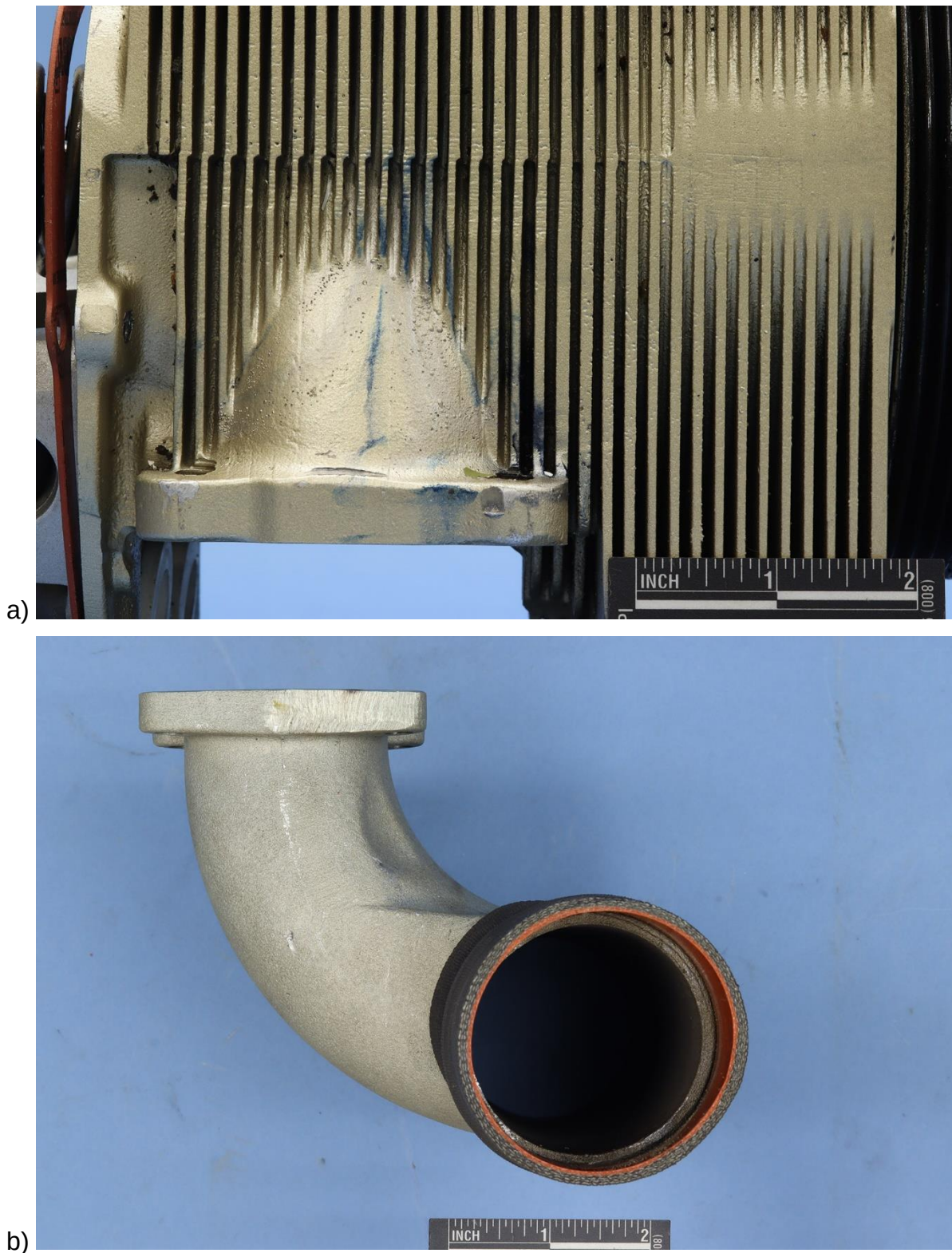
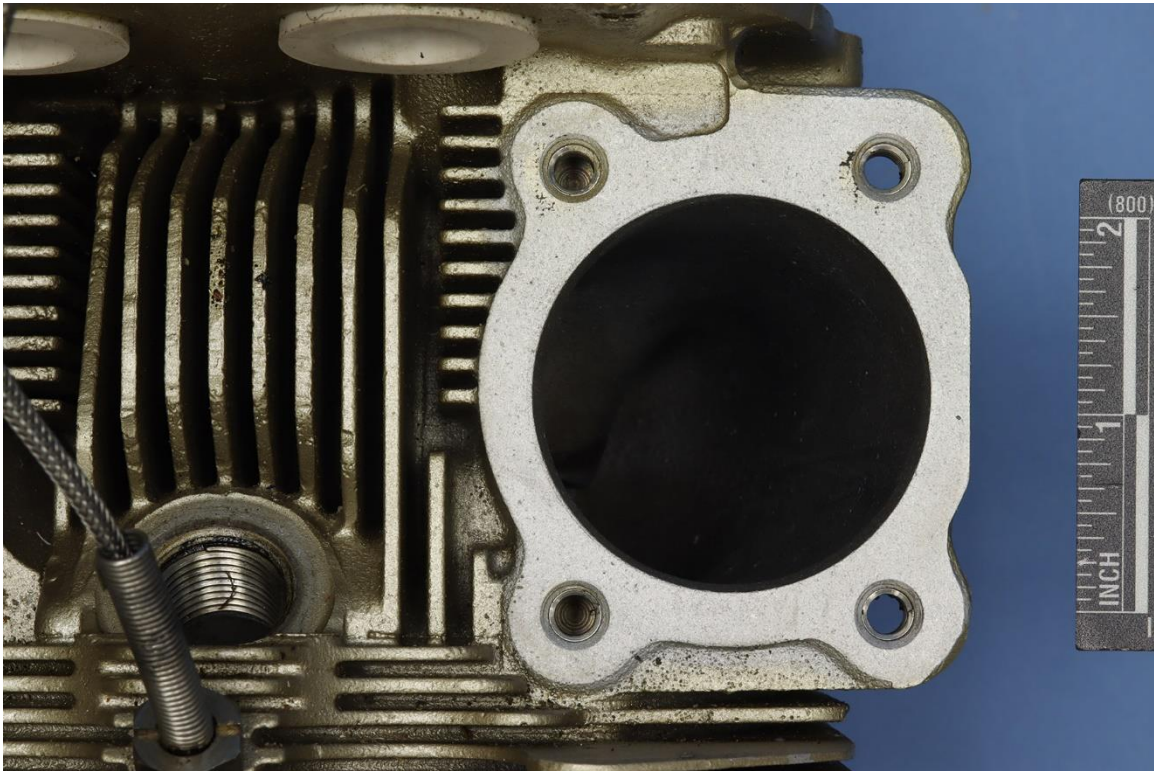


Figure 2: a) Image of the number 3 cylinder head at the air intake showing fuel dye staining and b) corresponding intake elbow.



c)

Figure 2 (cont.): c) Image of number 3 cylinder head intake port flange end face.

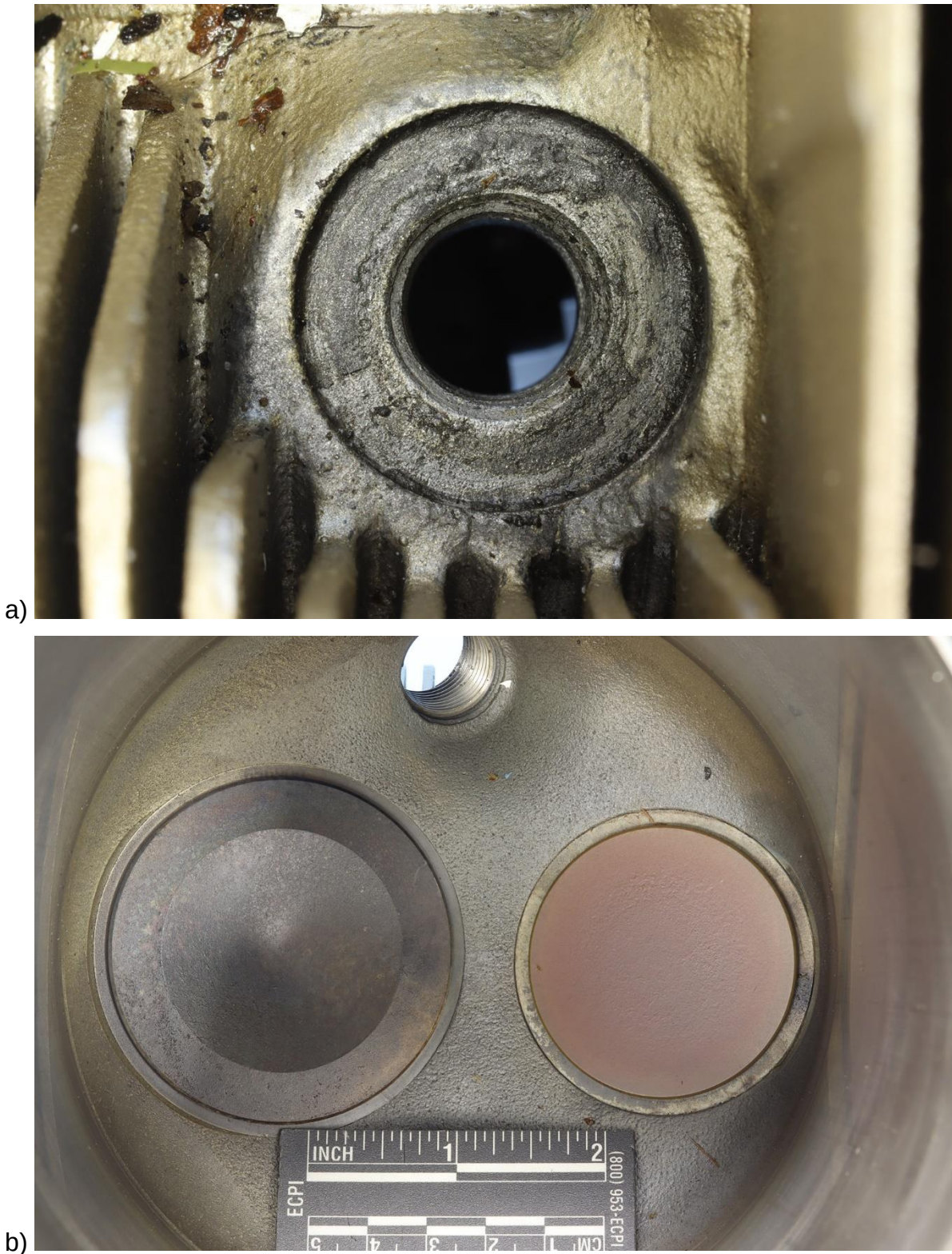


Figure 3: a) Image of number 3 cylinder fuel injector port. There were no apparent cracks or stains around the port; and b) inside view of the number 3 cylinder head. The exhaust valve exhibited a red tint.