NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, D.C. 20594

December 5, 2008

Computed Tomography Specialist's Factual Report

DCA-08-MA-076

A. ACCIDENT

Operator:	ABX Air
Location:	San Francisco International Airport, California
Date:	June 28,2008
Time:	Approximately 1015 pm local time
Airplane:	Boeing 767-281SF, N799AX

B. SYSTEMS GROUP

Computed Tomography Specialist: Scott Warren
National Transportation Safety Board
Washington, D.C.

C. SUMMARY

On June 28, 2008, about 2215 Pacific daylight time (PDT),[1] an ABX Air Boeing 767-200, registration N799AX, operating as flight 1611 from San Francisco International Airport (SFO), San Francisco, California, experienced a ground fire before engine startup. The fire was located in the supernumerary area,[2] so the two pilots had to egress the airplane through the cockpit windows. No injuries were reported, and the airplane was substantially damaged. The cargo flight was operating under the provisions of 14 *Code of Federal Regulations* (CFR) Part 121. At the time of the fire, the airplane was parked near the DHL loading facility and all of the cargo had been loaded.

Radiographic studies were done on October 16-31, 2008 in Chicago, Illinois to examine and document the internal configuration of six oxygen system hose ends on three hoses that had been removed from exemplar aircraft. The hose ends were documented using a combination of computed tomography (CT) scans and digital radiography. The hose ends were imaged using a total of 6 digital radiographs and 3038 CT slices.

D. DETAILS OF THE INVESTIGATION

1.0 General

The six hose ends were subjected to x-ray computed tomography (CT) and digital radiography scanning to document the internal condition of the hoses. The scanning was conducted from October 16-31, 2008. The scans were performed by Varian Medical Systems, Inc (formerly Bio-Imaging Research, Inc. (BIR)) under the direction of the NTSB. Varian used an ACTIS 600/450 CT system with an x-ray source strength of 222 kV and 2 mA, and the system recorded the x-ray attenuation information on a 1024 channel aSi flat panel detector system. For the CT scans, each component was imaged by using approximately 281-301 slices with a resulting image file size of slightly over 2 megabytes (Mb) for each slice. The slices were each 0.05 mm thick with a cross sectional pixel dimension within each slice of approximately 0.02 mm x 0.02 mm.

For the digital radiograph (DR) images, the hose end was subjected to a process similar to a conventional x-ray. The image was gathered using the same detector used for the CT scans, but the hose end remained stationary, and the images contain elements superimposed on each other.

Each data set was evaluated using the VGStudioMax software package to create a three-dimensional reconstructed image of the component. As part of the evaluation, some hose end sections were assigned different colors to aid with

[1] All times in this report are PDT based on a 24-hour clock unless otherwise noted.

[2] The supernumerary area is the portion of the airplane that is located directly aft of the cockpit and forward of the main deck cargo compartment. This area is where the lavatory, galley, and three non-flight crew seats are located.

visualization, and some sections of the hose end were digitally removed to allow closer observation of interior parts.

During this evaluation, the hose ends were randomly assigned designations lettered A-F. A representative hose end is shown in figure 1 prior to removal from the aircraft. The red dashed area represents the portion of the hose end documented in the CT images. The DR images cover a longer section of the hose end.

Figure 1
Representative Hose End

Each hose end was examined for any signs of missing or damaged parts, contamination in the flow passageway, or any other anomalies. Specific results (including example images) for each hose end are presented in subsequent sections of this report. The colors used in each image are used for clarity only. The various components in the hose end are depicted by the following different colors:

Red: Corrosion resistant steel (CRES) support spring wire.
Orange: Polyvinyl chloride (pvc) tube with aramid fiber outer cover. The colors are graduated between red and yellow to show the low density and high density areas respectively.
Green: Aluminum compression sleeve.
Lavender: Inner fitting (303 CRES).
Blue: Areas that have density values consistent with air.

The nomenclature associated with each hose was as follows:

Hose ends A and B:
Hydraflow
S/N: 24984
P/N: 38001-70
Boeing P/N: 60B50059-70
4/98

Hose ends C and D:
Hydraflow
S/N: 56047
P/N: 38001-70
Boeing P/N: 60B50059-70
10/82

Hose ends E and F:
Hydraflow
S/N: 52635
P/N: 38001-70
Boeing P/N: 60B50059-70
2/81

2.0 Hose End A

The image data set for hose end A was composed of 281 CT slices and one DR image. The DR is presented in figure 2; a representative three dimensional images are presented in figures 3 and 4.

Figure 2
Hose End A – Digital Radiograph

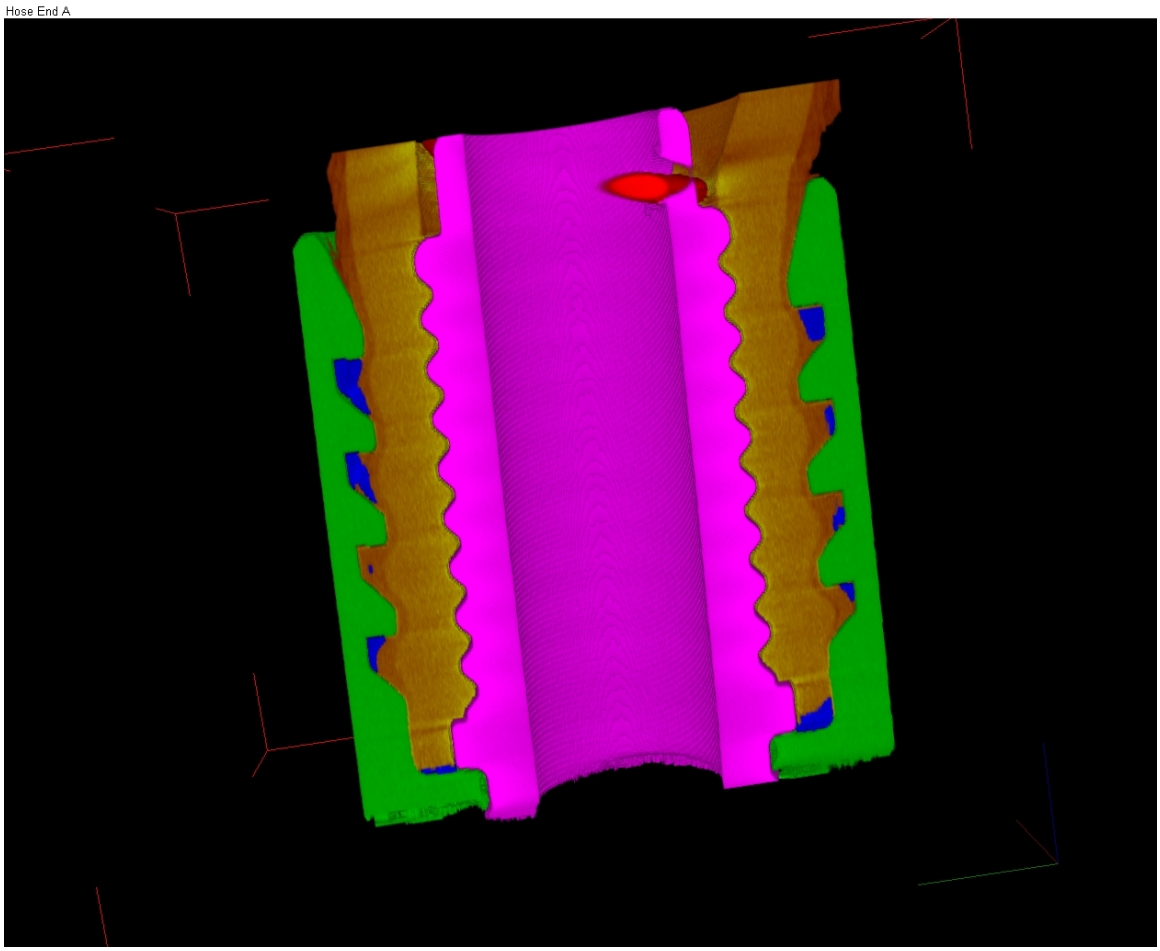

Figure 3
Hose End A – Cross Section

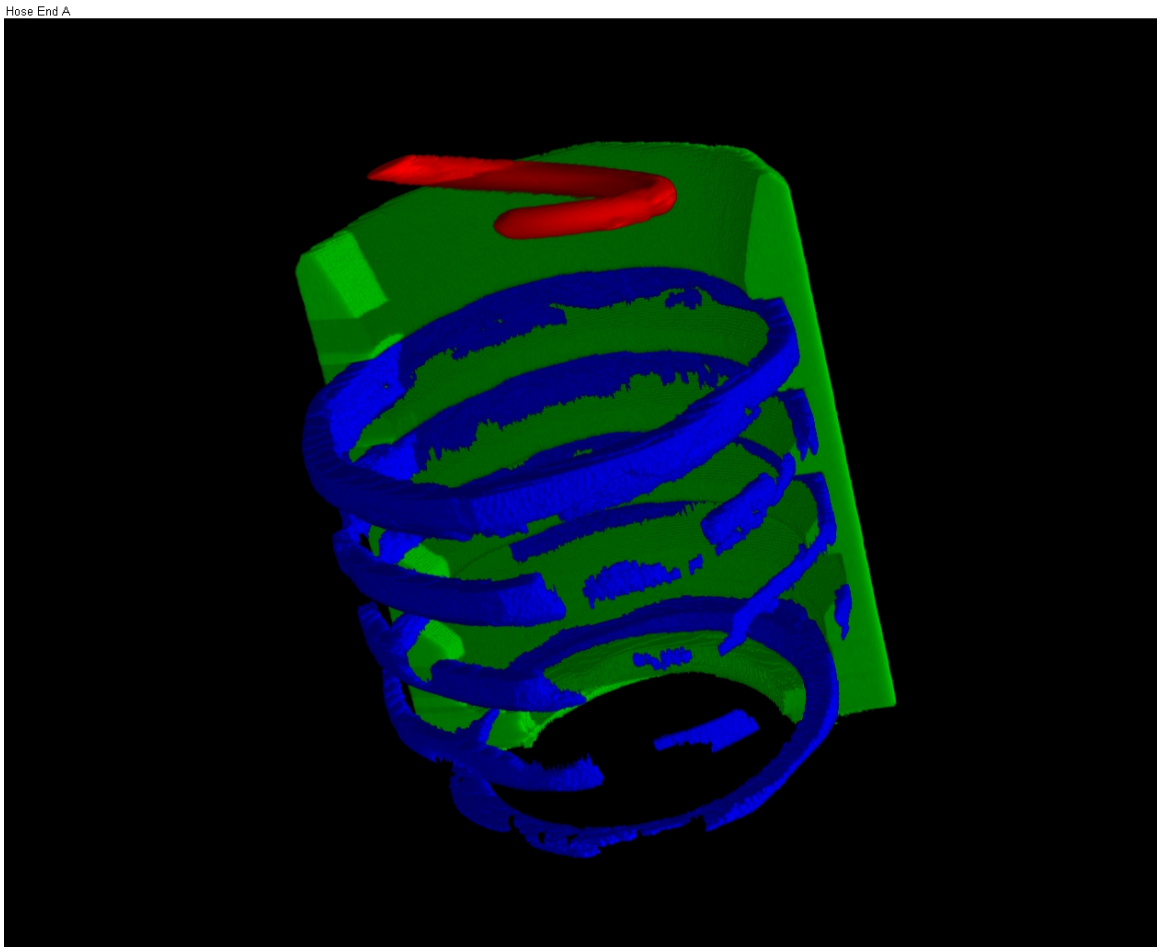

Figure 4
Hose End A – Cross Section with Inner Layers Digitally Removed

3.0 Hose End B

The image data set for hose end B was composed of 281 CT slices and one DR image. The DR is presented in figure 5; a representative three dimensional image is presented in figure 6.

Figure 5
Hose End B – Digital Radiograph

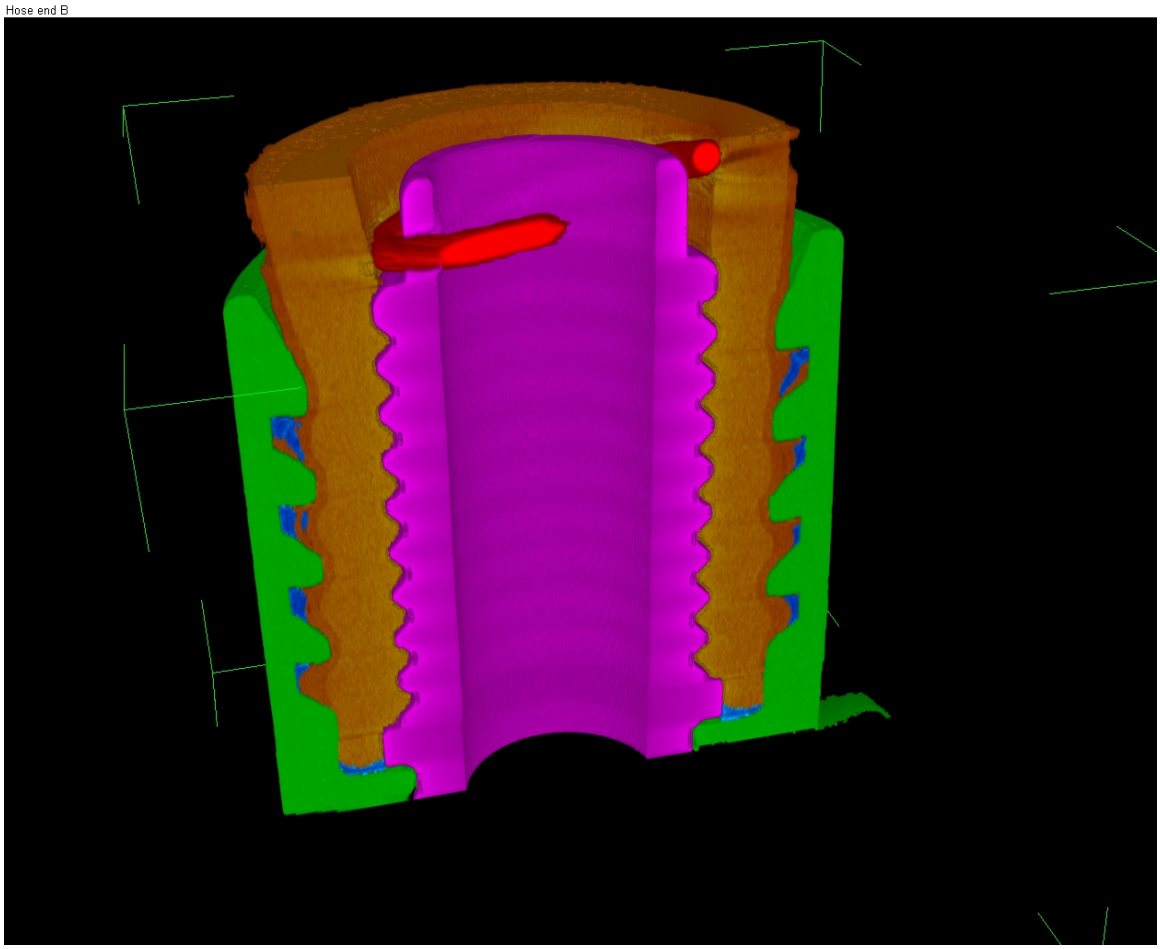

Figure 6
Hose End B – Cross Section

4.0 Hose End C

The image data set for hose end C was composed of 301 CT slices and one DR image. The DR is presented in figure 7; a representative three dimensional image is presented in figure 8.

Figure 7
Hose End C – Digital Radiograph

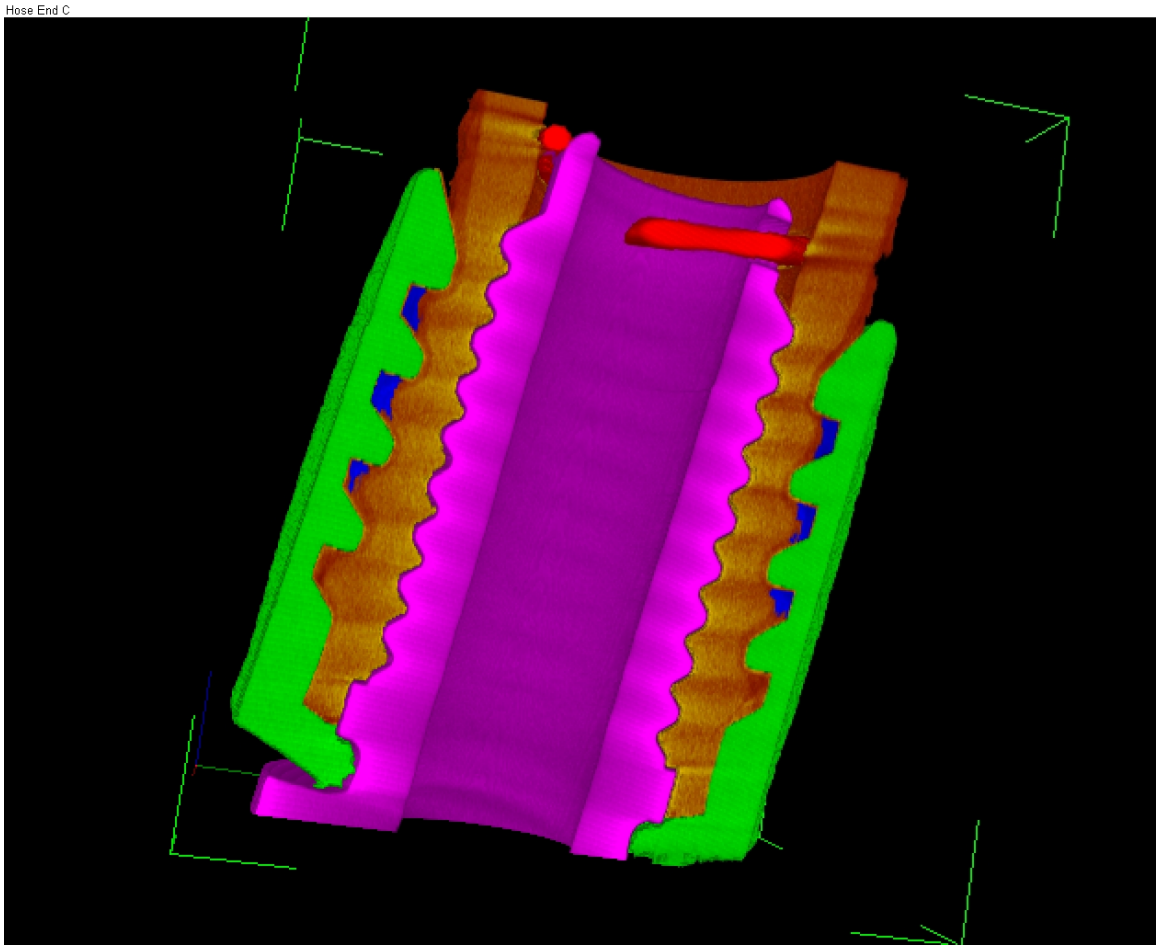

Figure 8
Hose End C – Cross Section

5.0 Hose End D

The image data set for hose end D was composed of 291 CT slices and one DR image. The DR is presented in figure 9; a representative three dimensional image is presented in figure 10.

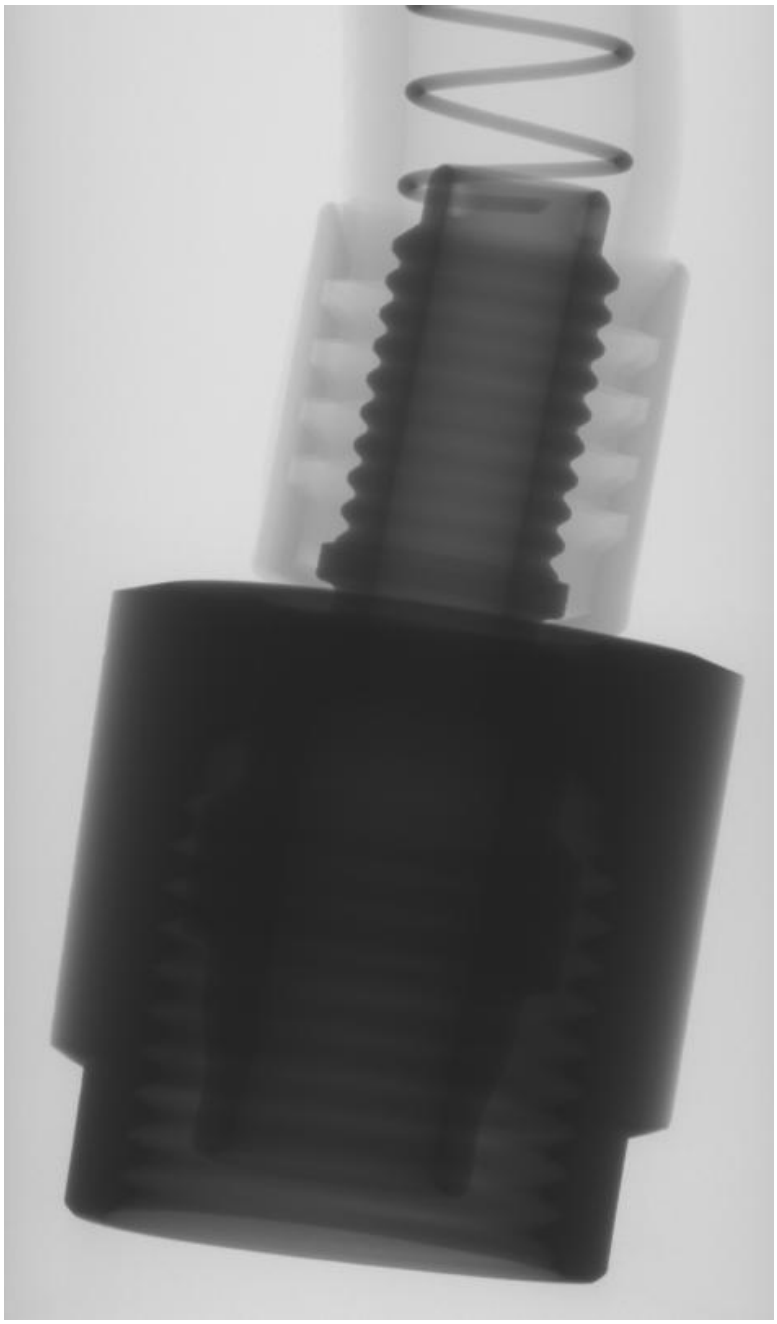

Figure 9
Hose End D – Digital Radiograph

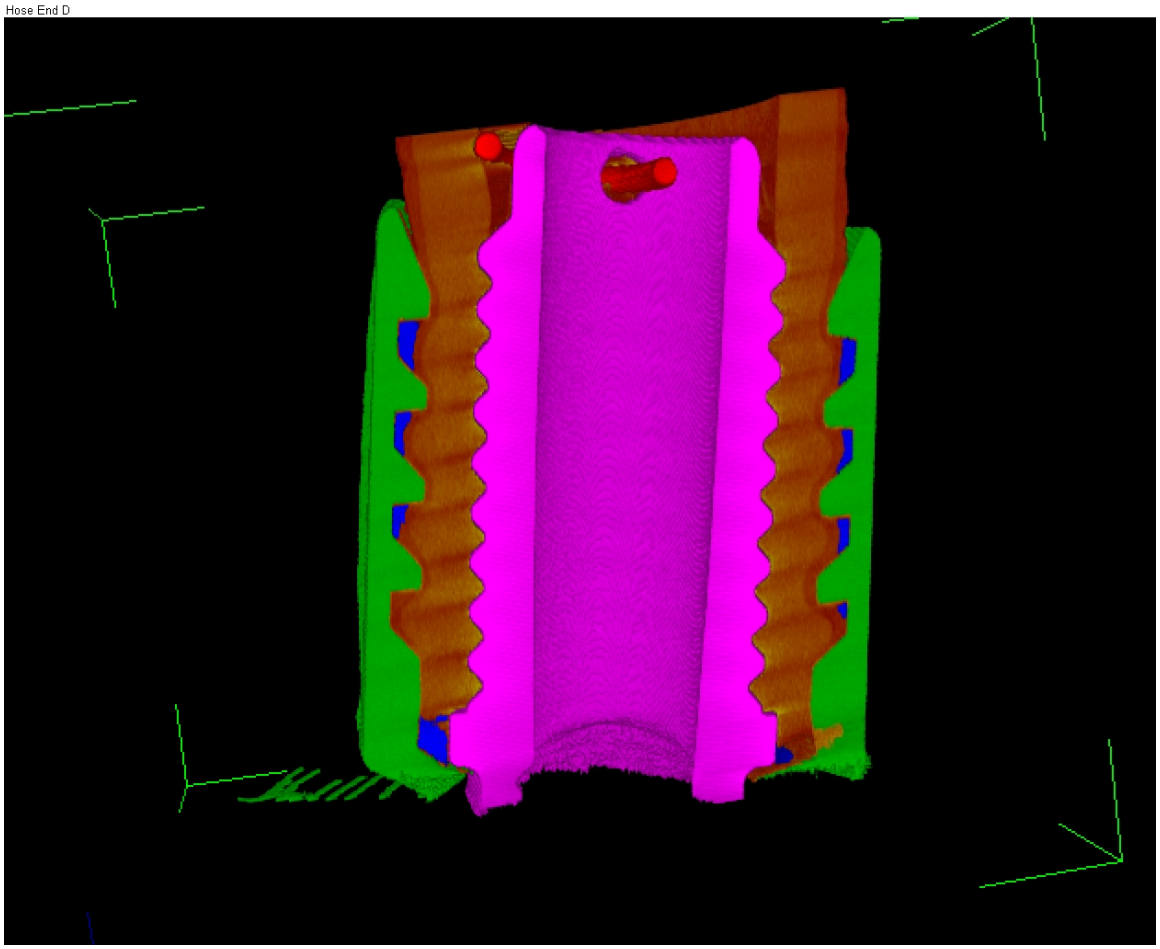

Figure 10
Hose End D – Cross Section

6.0 Hose End E

The image data set for hose end E was composed of 301 CT slices and one DR image. The DR is presented in figure 11; a representative three dimensional image is presented in figure 12.

Figure 11
Hose End E – Digital Radiograph

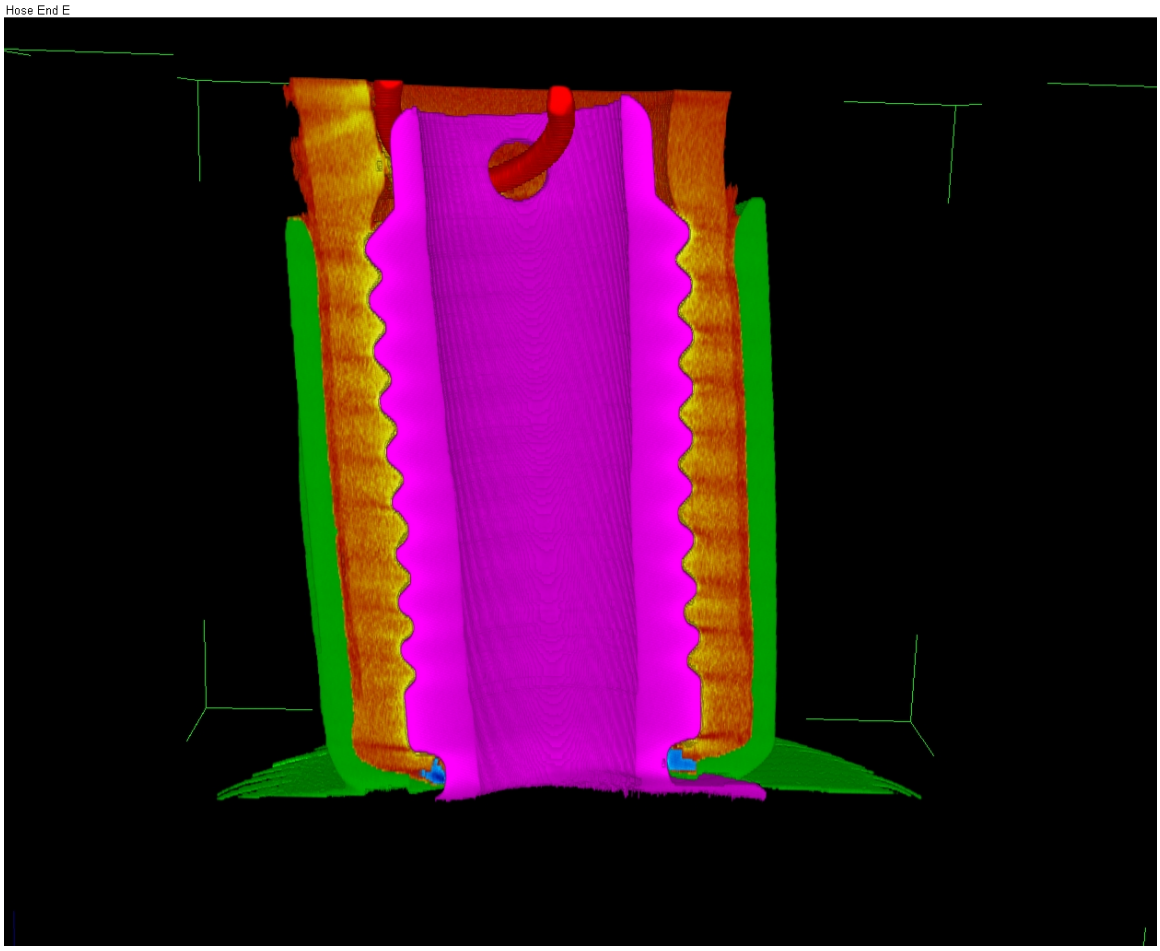

Figure 12
Hose End E – Cross Section

7.0 Hose End F

The image data set for hose end F was composed of 301 CT slices and one DR image. The DR is presented in figure 13; a representative three dimensional image is presented in figure 14.

On hose end F, there was a cracked area noted on the lower section of the innermost layer of the hose end. This cracked area is shown in figure 15. An additional color (blue areas denote areas of relatively low density) were added to the three dimensional image to highlight these areas.

Figure 13
Hose End F – Digital Radiograph

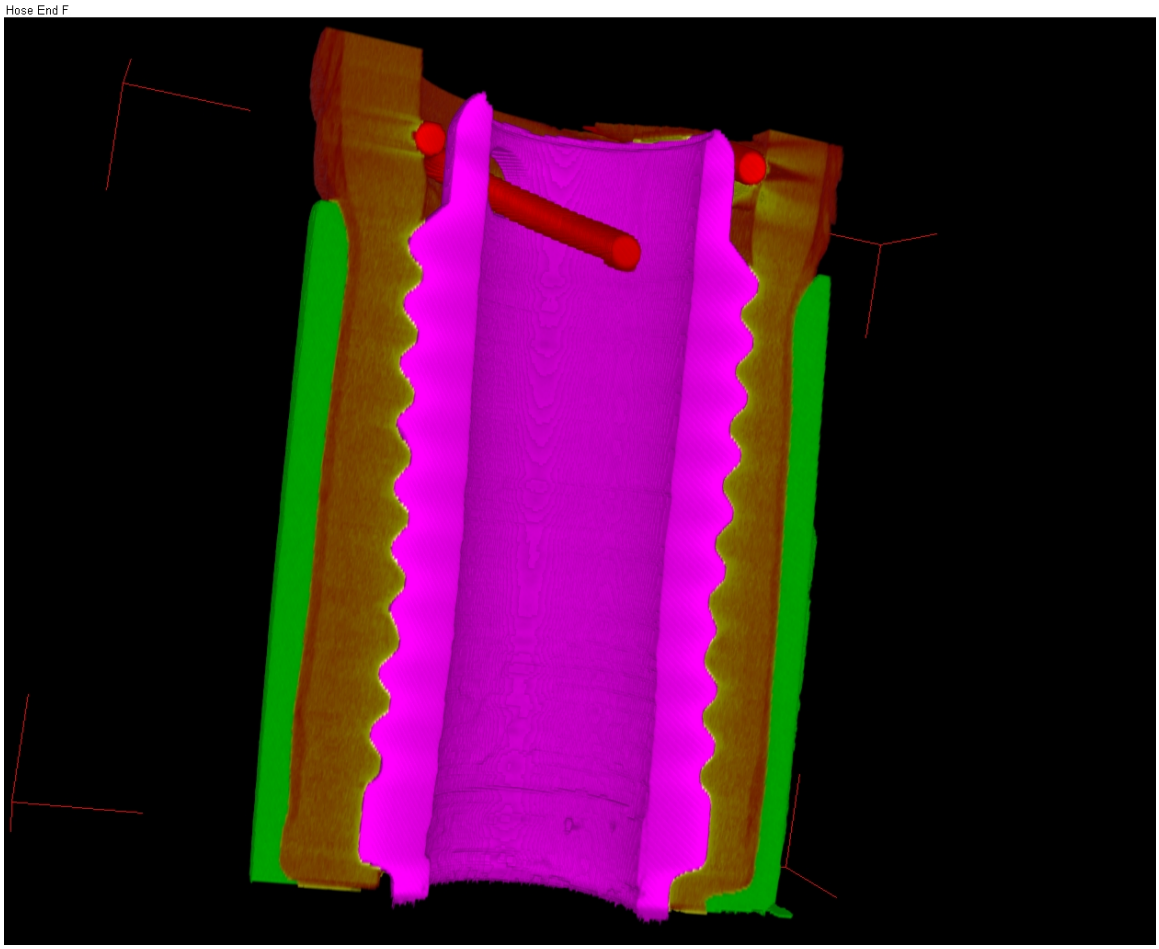

Figure 14
Hose End F – Cross Section

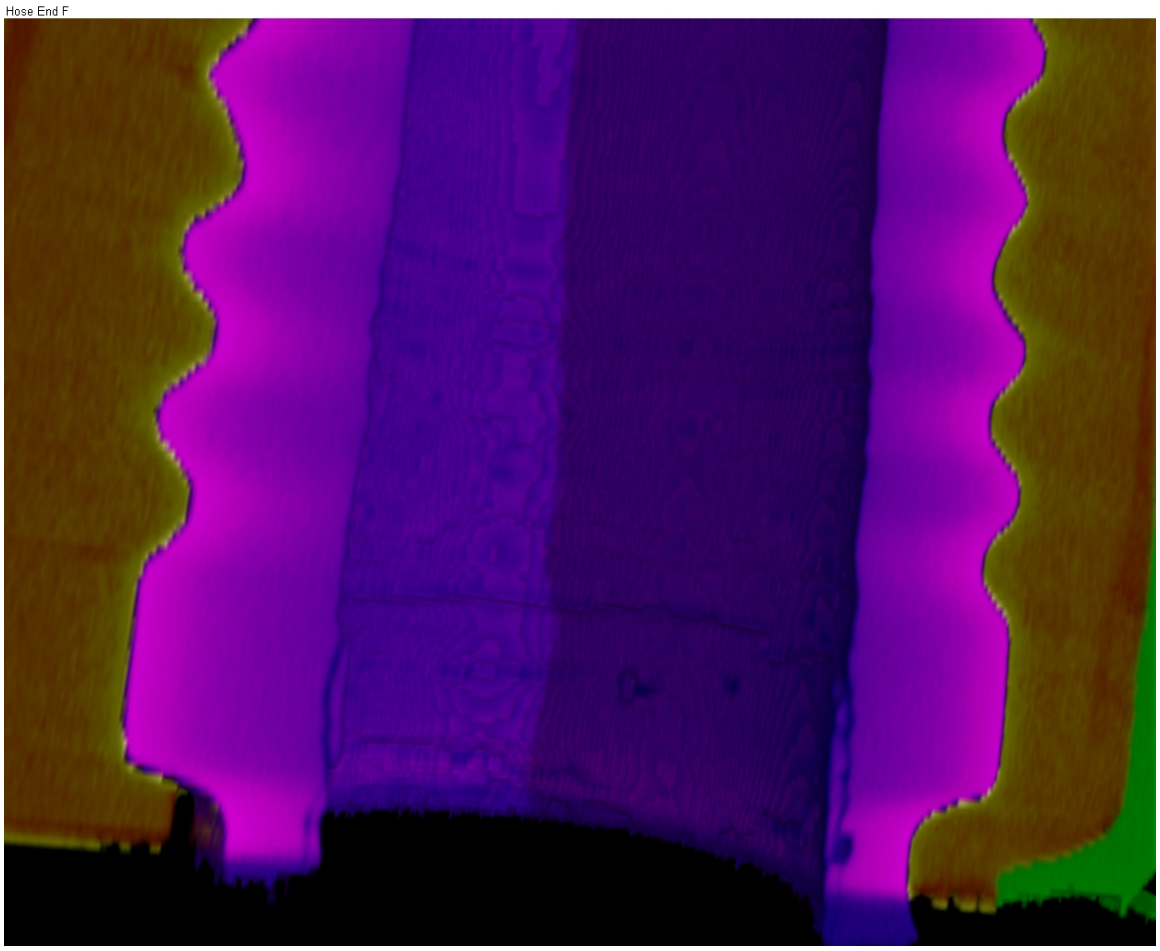

Figure 15
Hose End F – Cross Section With An Additional Color Digitally Added To Highlight Suspected Cracked Areas

Scott Warren
Lead Aerospace Engineer
(Computed Tomography Specialist)