What is claimed is:

1. A system comprising:

an electromagnetic inspection device including:

an electromagnetic radiation source to generate pulsed electromagnetic radiation that penetrates through a coating of a component of an engine; and

a detector to receive reflected electromagnetic radiation that is reflected from the component; and

a controller in operative communication with the electromagnetic inspection device, the controller being configured to:

cause the electromagnetic radiation source to direct at least some pulsed electromagnetic radiation through the coating;

receive an electromagnetic radiation waveform that is representative of the reflected electromagnetic radiation that is reflected from the coating;

determine a change in a dielectric property of the coating based on the electromagnetic radiation waveform;

receive calibration data that includes a relationship between the change in the dielectric property and a level of foreign material infiltration into the coating;

determine the level of foreign material infiltration into the coating based at least in part upon the relationship;

determine a remaining life of the coating based at least in part upon a relationship between foreign material infiltration of the coating and remaining life of the coating; and

update a model of the engine based on the remaining life of the coating.

2. The system of claim 1, wherein the electromagnetic radiation source is to generate pulsed electromagnetic radiation in a terahertz frequency range.

3. The system of claim 1, wherein the level of foreign material infiltration is representative of a depth of foreign material infiltration into the coating.

4. The system of claim 1, wherein the controller is further configured to compare the electromagnetic radiation waveform to baseline data indicative of electromagnetic radiation reflected from the coating in a prior state.

5. The system of claim 4, wherein the controller is further configured to determine a change between the electromagnetic radiation waveform relative to the baseline data.

6. The system of claim 4, wherein the controller is configured to determine the remaining life of the coating based at least in part upon the comparison.

7. The system of claim 1, wherein the electromagnetic radiation waveform includes a first electromagnetic radiation waveform and a second electromagnetic radiation waveform, and wherein the controller is to determine the dielectric property of the coating based on at least one of: a time shift between a first peak of the first electromagnetic radiation waveform and a first peak of the second electromagnetic radiation waveform; a change in amplitude or electric field between the first peak of the first electromagnetic radiation waveform and the first peak of the second electromagnetic radiation waveform; an additional peak present in the second electromagnetic radiation waveform; or a transit time between the first peak of the first electromagnetic radiation waveform and a second peak of the first electromagnetic radiation waveform.

8. The system of claim 7, wherein the first electromagnetic radiation waveform is from a first scan of the component at a first time and the second electromagnetic radiation waveform is from a second scan of the component at a second time.

9. The system of claim 1, wherein the dielectric property is a refractive index.

10. The system of claim 1, wherein the controller is further configured to determine an action for the engine or the coating based on the remaining life.

11. The system of claim 1, wherein the controller is configured to compare the remaining life of the coating to a threshold value, wherein the controller determines an action for the engine upon determining that the remaining life of the coating falls below the threshold value.

12. A method comprising:

at an electromagnetic radiation source, directing at least some pulsed electromagnetic radiation through a coating of a component of an engine;

at a detector, receiving reflected electromagnetic radiation that is reflected from at least one of the coating or the component;

determining a change in a dielectric property of the coating based on the reflected electromagnetic radiation;

receiving calibration data that includes a relationship between the change in the dielectric property and a level of foreign material infiltration into the coating;

determining the level of foreign material infiltration into the coating based at least in part upon the relationship;

determining a remaining life of the coating based at least in part upon a relationship between foreign material infiltration of the coating and remaining life of the coating; and

adjusting operation or maintenance of the engine based on the remaining life.

13. The method of claim 12, wherein the electromagnetic radiation source generates pulsed electromagnetic radiation in a terahertz frequency range.

14. The method of claim 12, wherein the level of foreign material infiltration is representative of a depth of foreign material infiltration into the coating.

15. The method of claim 12, further comprising:

comparing data indicative of the reflected electromagnetic radiation to baseline data indicative of electromagnetic radiation reflected from the coating in a prior state, wherein the remaining life is based at least in part upon the comparison.

16. The method of claim 12, further comprising:

determining an action for the engine or the component based on the remaining life.

17. The method of claim 16, wherein the dielectric property is a refractive index.

18. The method of claim 17, further comprising:

receiving a reflected electromagnetic waveform that is representative of the reflected electromagnetic radiation, the reflected electromagnetic waveform including a first electromagnetic radiation waveform and a second electromagnetic radiation waveform, wherein determining the dielectric property of the coating is based on at least one of a time shift between a first peak of the first electromagnetic radiation waveform and a first peak of the second electromagnetic radiation waveform; a change in amplitude or electric field between the first peak of the first electromagnetic radiation waveform and the first peak of the second electromagnetic radiation waveform; an additional peak present in the second electromagnetic radiation waveform; or a transit time between the first peak of the first electromagnetic radiation waveform and a second peak of the first electromagnetic radiation waveform; and

comparing the first electromagnetic radiation waveform to the second electromagnetic radiation waveform, wherein the first electromagnetic radiation waveform is from a first scan of the component at a first time and the second electromagnetic radiation waveform is from a second scan of the component at a second time.

19. A non-transitory computer readable storage medium comprising instructions that, when executed, cause a processor of a controller to:

cause an electromagnetic radiation source to direct at least some pulsed electromagnetic radiation through a coating of a component of an engine;

receive electromagnetic radiation waveform reflected from at least one of the coating or the component;

determine a change in a dielectric property of the coating based on the electromagnetic radiation waveform;

receive calibration data that includes a relationship between the change in the dielectric property and a level of foreign material infiltration into the coating;

determine the level of foreign material infiltration into the coating based at least in part upon the relationship;

determine a remaining life of the coating based at least in part upon a relationship between foreign material infiltration of the coating and remaining life of the coating; and

update a model of the engine based on the remaining life.

20. The non-transitory computer readable storage medium of claim 19, wherein the level of foreign material infiltration is representative of a depth of foreign material infiltration into the coating, and wherein the controller is further configured to:

determine an action for at least one of the engine or the component based on the remaining life.