CLAIMS

What is claimed is:

1. A gas turbine engine, comprising:

a heat exchanger that exchanges heat with a bleed airflow to provide a conditioned airflow;

a mid-turbine frame in fluid communication with said heat exchanger;

a passageway that extends through at least a portion of said mid-turbine frame, wherein said conditioned airflow is communicated through said passageway; and

a first nozzle assembly in fluid communication with said passageway to receive said conditioned airflow to condition gas turbine engine hardware.

2. The gas turbine engine as recited in claim 1, wherein said first nozzle assembly is a tangential onboard injection (TOBI) nozzle.

3. The gas turbine engine as recited in claim 1, comprising a rotor assembly downstream from said first nozzle assembly, wherein said rotor assembly is conditioned by said conditioned airflow from said first nozzle assembly.

4. The gas turbine engine as recited in claim 1, comprising a rotor assembly upstream from said first nozzle assembly, wherein said rotor assembly is conditioned by said conditioned airflow from said first nozzle assembly.

5. The gas turbine engine as recited in claim 1, wherein said passageway includes tubing.

6. The gas turbine engine as recited in claim 1, wherein said bleed airflow is communicated from a compressor section of the gas turbine engine.

7. The gas turbine engine as recited in claim 1, wherein said heat exchanger exchanges heat between said bleed airflow and a fan airflow to render said conditioned airflow.

8. The gas turbine engine as recited in claim 1, comprising a bearing compartment positioned radially inwardly from said mid-turbine frame, wherein said bearing compartment is positioned between said passageway and said first nozzle assembly.

9. The gas turbine engine as recited in claim 1, wherein said first nozzle assembly communicates said conditioned airflow between a seal and a disk to condition said gas turbine engine hardware.

10. The gas turbine engine as recited in claim 1, wherein said passageway includes an opening, and said conditioned airflow is communicated through said opening to said first nozzle assembly.

11. The gas turbine engine as recited in claim 1, wherein said first nozzle assembly is connected to a radially inner casing of said mid-turbine frame to establish a cavity.

12. The gas turbine engine as recited in claim 1, comprising a second nozzle assembly, wherein said conditioned airflow is communicated to a high pressure turbine through one of said first nozzle assembly and said second nozzle assembly and to a low pressure turbine through the other of said first nozzle assembly and said second nozzle assembly.

13. A method of conditioning a portion of a gas turbine engine, comprising:

removing heat from a bleed airflow to render a conditioned airflow;

communicating the conditioned airflow through a passageway disposed at least partially through a mid-turbine frame of the gas turbine engine; and

feeding the conditioned airflow through a nozzle assembly to at least one of an upstream location and a downstream location of the gas turbine engine.

14. The method as recited in claim 13, comprising the step of cooling a rotor assembly of the gas turbine engine with the conditioned airflow.

15. The method as recited in claim 13, wherein the step of communicating the conditioned airflow includes:

communicating the conditioned airflow from a heat exchanger, through the passageway of the mid-turbine frame, and then through the nozzle assembly.

16. The method as recited in claim 13, wherein the step of feeding the conditioned airflow includes:

feeding the conditioned airflow through a cavity, then through the nozzle assembly, and then onboard of a rotor assembly of a lower pressure turbine of the gas turbine engine.

17. The method as recited in claim 13, wherein the step of feeding the conditioned airflow includes:

feeding the conditioned airflow through a bearing compartment, then through the nozzle assembly, and then onboard of a rotor assembly of a high pressure turbine of the gas turbine engine.

18. A gas turbine engine, comprising:

a high pressure turbine;

a low pressure turbine downstream from said high pressure turbine;

a mid-turbine frame positioned axially between said high pressure turbine and said low pressure turbine, wherein said mid-turbine frame includes at least one strut that extends radially between an outer casing and an inner casing;

a bearing compartment radially inward from said inner casing of said mid-turbine frame; and

a buffer cooling system including a heat exchanger, a passageway that extends between said outer casing and said bearing compartment, and a nozzle assembly in fluid communication with said passageway to receive a conditioned airflow rendered by said heat exchanger to condition hardware of at least one of said high pressure turbine and said low pressure turbine.

CLAIMS

What is claimed is:

1. A gas turbine engine, comprising:

a heat exchanger that exchanges heat with a bleed airflow to provide a conditioned airflow;

a mid-turbine frame in fluid communication with said heat exchanger;

a passageway that extends through at least a portion of said mid-turbine frame, wherein said conditioned airflow is communicated through said passageway; a first nozzle assembly in fluid communication with said passageway to receive said conditioned airflow to condition gas turbine engine hardware;

a bearing compartment positioned radially inwardly from said mid-turbine frame, wherein said bearing compartment is positioned between said passageway and said first nozzle assembly; and

said conditioned airflow is communicated through said bearing compartment prior to reaching said first nozzle assembly.

2. The gas turbine engine as recited in claim 1, wherein said first nozzle assembly is a tangential onboard injection (TOBI) nozzle.

3. The gas turbine engine as recited in claim 1, comprising a rotor assembly downstream from said first nozzle assembly, wherein said rotor assembly is conditioned by said conditioned airflow from said first nozzle assembly.

4. The gas turbine engine as recited in claim 1, comprising a rotor assembly upstream from said first nozzle assembly, wherein said rotor assembly is conditioned by said conditioned airflow from said first nozzle assembly.

5. The gas turbine engine as recited in claim 1, wherein said passageway includes tubing.

6. The gas turbine engine as recited in claim 1, wherein said bleed airflow is communicated from a compressor section of the gas turbine engine.

7. The gas turbine engine as recited in claim 1, wherein said heat exchanger exchanges heat between said bleed airflow and a fan airflow to render said conditioned airflow.

8. The gas turbine engine as recited in claim 1, wherein said first nozzle assembly communicates said conditioned airflow between a seal and a disk to condition said gas turbine engine hardware.

9. The gas turbine engine as recited in claim 1, wherein said passageway includes an opening, and said conditioned airflow is communicated through said opening to said first nozzle assembly.

10. The gas turbine engine as recited in claim 1, wherein said first nozzle assembly is connected to a radially inner casing of said mid-turbine frame to establish a cavity.

11. The gas turbine engine as recited in claim 1, comprising a second nozzle assembly, wherein said conditioned airflow is communicated to a high pressure turbine through one of said first nozzle assembly and said second nozzle assembly and to a low pressure turbine through the other of said first nozzle assembly and said second nozzle assembly.

12. A method of conditioning a portion of a gas turbine engine, comprising:

removing heat from a bleed airflow to render a conditioned airflow;

communicating the conditioned airflow through a passageway disposed at least partially through a mid-turbine frame of the gas turbine engine; and

feeding the conditioned airflow through a nozzle assembly to at least one of an upstream location and a downstream location of the gas turbine engine, wherein the step of feeding includes first feeding the conditioned airflow through a bearing compartment, then through the nozzle assembly, and then onboard of a rotor assembly of a high pressure turbine of the gas turbine engine.

13. The method as recited in claim 12, comprising the step of cooling a rotor assembly of the gas turbine engine with the conditioned airflow.

14. The method as recited in claim 12, wherein the step of communicating the conditioned airflow includes:

communicating the conditioned airflow from a heat exchanger, through the passageway of the mid-turbine frame, and then through the nozzle assembly.

15. The method as recited in claim 12, wherein the step of feeding the conditioned airflow includes:

feeding the conditioned airflow through a cavity, then through the nozzle assembly, and then onboard of a rotor assembly of a lower pressure turbine of the gas turbine engine.

16. A gas turbine engine, comprising:

a high pressure turbine;

a low pressure turbine downstream from said high pressure turbine;

a mid-turbine frame positioned axially between said high pressure turbine and said low pressure turbine, wherein said mid-turbine frame includes at least one strut that extends radially between an outer casing and an inner casing;

a bearing compartment radially inward from said inner casing of said mid-turbine frame; and

a buffer cooling system including a heat exchanger, a passageway that extends between said outer casing and said bearing compartment, and a nozzle assembly in fluid communication with said passageway to receive a conditioned airflow rendered by said heat exchanger to condition hardware of at least one of said high pressure turbine and said low pressure turbine, and said conditioned airflow is communicated through said bearing compartment prior to reaching said nozzle assembly.