CLAIMS

What is claimed is:

1. A fuel-air premixer for a combustor of a turbine engine comprising:

a central passage along an axis, said central passage operable to communicate an unswirled airflow;

an outer annular passage around said axis, said outer annular passage including a multiple of first swirl vanes operable to communicate a first swirled airflow in a first direction; and

an inner annular passage around said axis between said central passage and said outer annular passage, said inner annular passage including a multiple of second swirl vanes operable to communicate a second swirled airflow in a second direction different than said first direction.

2. The fuel-air premixer as recited in claim 1, wherein said multiple of first swirl vanes and said multiple of second swirl vanes define respective chord directions C1 and C2 that are transverse to said axis and to each other.

3. The fuel-air premixer as recited in claim 1, further comprising a swirler body extending around said outer annular passage, said inner annular passage, and said central passage.

4. The fuel-air premixer as recited in claim 3, wherein said multiple of first swirl vanes extend between said swirler body and a splitter plate, said multiple of second swirl vanes extend between said splitter plate and a central nozzle body that defines said central passage.

5. The fuel-air premixer as recited in claim 4, wherein said swirler body radially contracts downstream of said central nozzle body.

6. The fuel-air premixer as recited in claim 5, wherein said central nozzle body includes a multiple of fuel passages disposed radially outboard and parallel to said central passage.

7. The fuel-air premixer as recited in claim 6, wherein said multiple of fuel passages include respective fuel orifices that each extend in a radial direction.

8. The fuel-air premixer as recited in claim 7, wherein said fuel orifices are located downstream of said splitter plate.

9. The fuel-air premixer as recited in claim 7, wherein said fuel orifices are located downstream of said splitter plate at an axial distance greater than approximately five (5) diameters of said fuel orifices.

10. The fuel-air premixer as recited in claim 4, wherein said swirler body radially contracts downstream of said central nozzle body.

11. The fuel-air premixer as recited in claim 4, wherein said swirler body is axially spaced from said central nozzle body.

12. A gas turbine engine comprising:

a compressor section;

a combustor in fluid communication with said compressor section; and

a turbine section in fluid communication with said combustor,

said combustor including fuel-air premixer having a central passage along an axis, said central passage operable to communicate an unswirled airflow, an outer annular passage around said axis, said outer annular passage including a multiple of first swirl vanes operable to communicate a first swirled airflow in a first direction, and an inner annular passage around said axis between said central passage and said outer annular passage, said inner annular passage including a multiple of second swirl vanes operable to communicate a second swirled airflow in a second direction different than said first direction.

13. A method of communicating fuel and air to a combustor of a turbine engine comprising:

communicating an unswirled airflow along an axis;

communicating a first swirled airflow in a first direction around the unswirled airflow;

communicating a second swirled airflow in a second direction different than the first direction forming a turbulent region; and

injecting fuel into the turbulent region.

14. The method as recited in claim 13, further comprising radially injecting the fuel outward relative to the axis into the turbulent region at a location approximately equivalent to a one-quarter auto-ignition time relative to an end of a swirler body.

15. The method as recited in claim 13, further comprising choking the unswirled airflow, the first swirled airflow and the second swirled airflow downstream of the turbulent region.

16. The method as recited in claim 13, further comprising providing essentially zero net swirl at an end of a swirler body that receives the unswirled airflow, the first swirled airflow and the second swirled airflow.

CLAIMS

1. A fuel-air premixer for a combustor of a turbine engine comprising:

a central passage along an axis, said central passage operable to communicate an unswirled airflow;

an outer annular passage around said axis, said outer annular passage including a multiple of first swirl vanes operable to communicate a first swirled airflow in a first direction; an inner annular passage around said axis between said central passage and said outer annular passage, said inner annular passage including a multiple of second swirl vanes operable to communicate a second swirled airflow in a second direction different than said first direction; and

a swirler body extending around said outer annular passage, said inner annular passage, and said central passage, wherein:

said multiple of first swirl vanes extend between said swirler body and a splitter plate, said multiple of second swirl vanes extend between said splitter plate and a central nozzle body that defines said central passage, and

said central nozzle body includes fuel orifices at a location L that is greater than approximately five (5) diameters of said fuel orifices from said splitter plate and that corresponds to a one-quarter (¼) auto-ignition time relative to an end of said swirler body.

2. The fuel-air premixer as recited in claim 1, wherein said multiple of first swirl vanes and said multiple of second swirl vanes define respective chord directions C1 and C2 that are transverse to said axis and to each other.

3. The fuel-air premixer as recited in claim 1, wherein said swirler body radially contracts downstream of said central nozzle body.

4. The fuel-air premixer as recited in claim 3, wherein said central nozzle body includes a multiple of fuel passages disposed radially outboard and parallel to said central passage.

5. The fuel-air premixer as recited in claim 4, wherein said fuel orifices extend in a radial direction from said multiple of fuel passages.

6. The fuel-air premixer as recited in claim 1, wherein said swirler body is spaced in the axial direction from said central nozzle body.

7. A gas turbine engine comprising:

a compressor section;

a combustor in fluid communication with said compressor section; and

a turbine section in fluid communication with said combustor,

said combustor including a fuel-air premixer having a central passage along an axis, said central passage operable to communicate an unswirled airflow, an outer annular passage around said axis, said outer annular passage including a multiple of first swirl vanes operable to communicate a first swirled airflow in a first direction, and an inner annular passage around said axis between said central passage and said outer annular passage, said inner annular passage including a multiple of second swirl vanes operable to communicate a second swirled airflow in a second direction different than said first direction, and a swirler body extending around said outer annular passage, said inner annular passage, and said central passage, wherein:

said multiple of first swirl vanes extend between said swirler body and a splitter plate, said multiple of second swirl vanes extend between said splitter plate and a central nozzle body that defines said central passage, and

said central nozzle body includes fuel orifices at a location L that is greater than approximately five (5) diameters of said fuel orifices from said splitter plate and that corresponds to a one-quarter (¼) auto-ignition time relative to an end of said swirler body.

8. A method of communicating fuel and air to a combustor of a turbine engine comprising:

communicating an unswirled airflow along an axis;

communicating a first swirled airflow in a first direction around the unswirled airflow;

communicating a second swirled airflow in a second direction different than the first direction forming a turbulent region; and

radially injecting the fuel outward relative to the axis into the turbulent region at a location approximately equivalent to a one-quarter auto-ignition time relative to an end of a swirler body.

9. The method as recited in claim 8, further comprising choking the unswirled airflow, the first swirled airflow and the second swirled airflow downstream of the turbulent region.

10. The method as recited in claim 8, further comprising providing essentially zero net swirl at an end of a swirler body that receives the unswirled airflow, the first swirled airflow and the second swirled airflow.