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Turbine engine support structure with airflow ports

Abstract

An assembly is provided for a turbine engine. This engine assembly includes a combustor, an engine case, a support structure and a monolithic body. The combustor includes a combustor wall and a combustion chamber within the combustor. The combustor wall forms a peripheral boundary of the combustion chamber. The engine case forms a peripheral boundary of a plenum along the combustor. The support structure extends radially from the combustor wall to the engine case. The monolithic body includes the combustor wall, the engine case, the support structure and a plurality of ports arranged circumferentially about an axis. Each of the ports is fluidly coupled with the plenum and projects axially through the support structure. The ports include a first port. The first port includes a cross-sectional geometry that laterally tapers as the first port extends radially outward within the monolithic body.

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Background/Summary

(1) This application claims priority to and is a continuation of U.S. patent application Ser. No. 18/217,143 filed Jun. 30, 2023, which is hereby incorporated herein by reference in its entirety.

BACKGROUND OF THE DISCLOSURE

1. Technical Field

(1) This disclosure relates generally to a gas turbine engine and, more particularly, to a stationary structure for the gas turbine engine.

2. Background Information

(2) A gas turbine engine includes a stationary engine structure for housing and/or supporting internal rotating components of the gas turbine engine. Various stationary engine structures are known in the art. While these known stationary engine structures have various benefits, there is still room in the art for improvement.

SUMMARY OF THE DISCLOSURE

(3) According to an aspect of the present disclosure, an assembly is provided for a turbine engine. This engine assembly includes a combustor, an engine case, a support structure and a monolithic body. The combustor includes a combustor wall and a combustion chamber within the combustor. The combustor wall forms a peripheral boundary of the combustion chamber. The engine case forms a peripheral boundary of a plenum along the combustor. The support structure extends radially from the combustor wall to the engine case. The monolithic body includes the combustor wall, the engine case, the support structure and a plurality of ports arranged circumferentially about an axis. Each of the ports is fluidly coupled with the plenum and projects axially through the support structure. The ports include a first port. The first port includes a cross-sectional geometry that laterally tapers as the first port extends radially outward within the monolithic body.

(4) According to another aspect of the present disclosure, another assembly is provided for a turbine engine. This engine assembly includes a combustor, an engine case, a support structure and a monolithic body. The combustor includes a combustor wall and a combustion chamber within the combustor. The combustor wall includes an interior surface that forms a peripheral boundary of the combustion chamber. The engine case forms a peripheral boundary of a plenum along the combustor. The support structure extends radially from the combustor wall to the engine case. The monolithic body includes the combustor wall, the engine case, the support structure and a plurality of ports arranged circumferentially about an axis. Each of the ports is fluidly coupled with the plenum and projects axially through the support structure. The ports include a first port. An outlet from the first port includes a notch in the interior surface.

(5) According to still another aspect of the present disclosure, another assembly is provided for a turbine engine. This engine assembly includes a combustor, an engine case, a support structure and a monolithic body. The combustor includes a combustor wall and a combustion chamber within the combustor. The combustor wall includes an interior surface that forms a peripheral boundary of the combustion chamber. The engine case forms a peripheral boundary of a plenum along the combustor. The support structure extends radially from the combustor wall to the engine case. The monolithic body includes the combustor wall, the engine case, the support structure, a plurality of ports and a plurality of struts. The ports are arranged circumferentially about an axis. Each of the ports are fluidly coupled with the plenum and project axially through the support structure. The ports include a first port. The struts are arranged circumferentially about the axis and circumferentially interspersed with the ports. The struts include a first strut forming a lateral side of the first port. The first strut laterally tapers as the first strut extends axially towards an inlet into the first port from the plenum.

(6) A radial outer portion of the cross-sectional geometry may laterally taper as the first port extends radially outward within the monolithic body. The radial inner portion of the cross-sectional geometry may laterally taper as the first port extends radially inwards within the monolithic body.

(7) The first port may include the cross-sectional geometry at an outlet from the first port.

(8) The combustor wall and the support structure may extend axially to an end surface. The outlet may be disposed in the end surface. The cross-sectional geometry may have a hexagonal shape.

(9) The first port may laterally taper as the first port projects axially into the support structure from the outlet.

(10) An interior surface of combustor wall may form the peripheral boundary of the combustion chamber. An outlet from the first port may include a notch in the interior surface.

(11) The notch may laterally taper as the notch projects axially into the interior surface.

(12) The notch may have a triangular shape in the interior surface.
(13) The monolithic body may also include a plurality of struts arranged circumferentially about the axis. Each of the struts may be between a respective circumferentially neighboring pair of the ports. Each of the struts may extend radially from the combustor wall to the engine case.
(14) The struts may include a first strut forming a lateral side of the first port. The first strut may laterally taper as the first strut extends axially towards an inlet into the first port from the plenum.
(15) A first portion of the first strut may laterally taper as the first strut extends axially towards an inlet into the first port from the plenum. A second portion of the first strut may laterally taper as the first strut extends axially towards an outlet from the first port. The second portion of the first strut may be axially between the first portion of the first strut and the outlet from the first port.
(16) A longitudinal centerline of the first port may be parallel with the axis.
(17) A longitudinal centerline of the first port may be angularly offset from the axis.
(18) The combustor may be radially outboard of and circumscribe the engine case and the support structure.
(19) The engine assembly may also include a vane array structure and a cavity. The vane array structure may include a first platform, a second platform and a plurality of vanes extending radially between and connected to the first platform and the second platform. The cavity may be formed by and located radially between the combustor wall and the first platform. Each of the ports may also be fluidly coupled with the combustion chamber through the cavity.
(20) The vane array structure may be radially outboard of and may axially overlap the support structure and the ports.
(21) The monolithic body may also include the first platform.
(22) The engine assembly may also include a compressor section, a turbine section and a flowpath extending through the compressor section, the plenum, the combustion chamber and the turbine section from an inlet into the flowpath to an exhaust from the flowpath.
(23) The present disclosure may include any one or more of the individual features disclosed above and/or below alone or in any combination thereof.
(24) The foregoing features and the operation of the invention will become more apparent in light of the following description and the accompanying drawings.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) FIG. **1** is a schematic side sectional illustration of a gas turbine engine.
(2) FIG. **2** is a schematic side sectional illustration of a portion of the gas turbine engine at its combustor.
(3) FIG. **3** is a perspective cutaway illustration of a portion of the gas turbine engine at a support structure between the combustor and a turbine case.
(4) FIG. **4** is another perspective cutaway illustration of another portion of the gas turbine engine at the support structure.
(5) FIG. **5** is a perspective illustration of another portion of the gas turbine engine at the support structure.
(6) FIG. **6** is a schematic sectional illustration through a portion of the support structure.
(7) FIG. **7** is a schematic sectional illustration through a portion of the support structure with canted port centerlines.
DETAILED DESCRIPTION
(8) FIG. **1** is a side sectional illustration of a turbine engine **20**. The turbine engine **20** of FIG. **1** is configured as a single spool, radial-flow turbojet gas turbine engine. This turbine engine **20** is configured for propelling an aircraft such as, but not limited to, an airplane, a drone (e.g., an

unmanned aerial vehicle (UAV)), a spacecraft or any other manned or unmanned aerial vehicle or system. The present disclosure, however, is not limited to such an exemplary turbojet turbine engine configuration nor to an aircraft propulsion system application. For example, the turbine engine **20** may alternatively be configured as an auxiliary power unit (APU) for the aircraft, or an industrial gas turbine engine.
(9) The turbine engine **20** of FIG. **1** extends axially along an axial centerline **22** from a forward, upstream airflow inlet **24** into the turbine engine **20** to an aft, downstream combustion products exhaust **26** from the turbine engine **20**. This axial centerline **22** may also be a centerline axis and/or a rotational axis for various components within the turbine engine **20**.
(10) The turbine engine **20** includes a core flowpath **28**, an inlet section **30**, a compressor section **31**, a (e.g., reverse flow) combustor section **32**, a turbine section **33** and an exhaust section **34**. At least (or only) the compressor section **31**, the combustor section **32** and the turbine section **33** may form a core **36** of the turbine engine **20**. The turbine engine **20** also includes a stationary structure **38** housing and/or forming one or more or all of the engine sections **30**-**34**.
(11) The core flowpath **28** extends within the turbine engine **20** and its engine core **36** from an airflow inlet **40** to the core flowpath **28** to a combustion products exhaust **42** from the core flowpath **28**. More particularly, the core flowpath **28** of FIG. **1** extends sequentially through the inlet section **30**, the compressor section **31**, the combustor section **32** and the turbine section **33** to the exhaust section **34**. The core inlet **40** of FIG. **1** forms the engine inlet **24** into the turbine engine **20**. The core exhaust **42** of FIG. **1** forms the engine exhaust **26** from the turbine engine **20**.
(12) The compressor section **31** includes a bladed compressor rotor **44**. The turbine section **33** includes a bladed turbine rotor **46**. Each of these engine rotors **44**, **46** includes a rotor base (e.g., a hub or a disk) and a plurality of rotor blades arranged circumferentially around and connected to the rotor base. The rotor blades, for example, may be formed integral with or mechanically fastened, welded, brazed and/or otherwise attached to the respective rotor base.
(13) The compressor rotor **44** may be configured as a radial flow compressor rotor (e.g., an axial inflow-radial outflow compressor rotor), and the compressor section **31** may be configured as a radial flow compressor section. The turbine rotor **46** may be configured as a radial flow turbine rotor (e.g., a radial inflow-axial outflow turbine rotor), and the turbine section **33** may be configured as a radial flow turbine section. The compressor rotor **44** is connected to the turbine rotor **46** through an engine shaft **48**. This engine shaft **48** is rotatably supported by the stationary structure **38** through a plurality of bearings **50**; e.g., rolling element bearings, journal bearings, etc.
(14) The combustor section **32** includes an annular combustor **52** with an annular combustion chamber **54**. The combustor **52** of FIG. **1** is configured as a reverse flow combustor. Inlet ports **56**/flow tubes into the combustion chamber **54**, for example, may be arranged at (e.g., on, adjacent or proximate) and/or towards an aft bulkhead wall **58** of the combustor **52**. An outlet from the combustor **52** may be arranged axially aft of an inlet to the turbine section **33**. The combustor **52** may also be arranged radially outboard of and/or axially overlap at least a (e.g., aft) portion of the turbine section **33**. With this arrangement, the core flowpath **28** of FIG. **1** reverses direction (e.g., from a forward-to-aft direction to an aft-to-forward direction) a first time as the core flowpath **28** extends from a diffuser plenum **60** surrounding the combustor **52** into the combustion chamber **54**. The core flowpath **28** of FIG. **1** then reverses direction (e.g., from the aft-to-forward direction to the forward-to-aft direction) a second time as the core flowpath **28** extends from the combustion chamber **54** into the turbine section **33**.
(15) During operation, air enters the turbine engine **20** through the inlet section **30** and its core inlet **40**. The inlet section **30** directs the air from the core inlet **40** into the core flowpath **28** and the compressor section **31**. The air entering the core flowpath **28** may be referred to as “core air”. This core air is compressed by the compressor rotor **44**. The compressed core air is directed through a diffuser and its diffuser plenum **60** into the combustion chamber **54**. Fuel is injected and mixed with the compressed core air to provide a fuel-air mixture. This fuel-air mixture is ignited within

the combustion chamber **54**, and combustion products thereof flow through the turbine section **33** and cause the turbine rotor **46** to rotate. The rotation of the turbine rotor **46** drives rotation of the compressor rotor **44** and, thus, compression of the air received from the core inlet **40**. The exhaust section **34** directs the combustion products out of the turbine engine **20** to provide forward engine thrust.

(16) Referring to FIG. **2**, the stationary structure **38** includes the combustor **52** and one or more engine cases **62** and **64** forming the diffuser plenum **60** along the combustor **52**. The stationary structure **38** of FIG. **2** also includes a vane array structure **66**, which may be configured as an outlet nozzle from the combustor section **32** and its combustor **52** and/or an inlet nozzle into the turbine section **33**.

(17) The combustor **52** of FIG. **2** includes an outer combustor wall **68**, an inner combustor wall **70** and the bulkhead wall **58**. The combustor **52** and each of its combustor walls **58**, **68**, **70** extends circumferentially about (e.g., completely around) the axial centerline **22**. The combustor **52** and each of its combustor walls **68**, **70** may thereby have a full-hoop (e.g., tubular) geometry, and the bulkhead wall **58** may have a full-hoop (e.g., annular, frustoconical, etc.) geometry.

(18) The outer combustor wall **68** is arranged axially between the bulkhead wall **58** and the vane array structure **66**. The outer combustor wall **68** of FIG. **2**, for example, projects axially along the axial centerline **22** (e.g., in the forward direction) out from the bulkhead wall **58** to an outer platform **72** of the vane array structure **66**. The outer combustor wall **68** of FIG. **2** is connected to (e.g., formed integral with) the bulkhead wall **58** at a radial out end of the bulkhead wall **58**, and the outer platform **72** at an aft end of the outer platform **72**.

(19) The inner combustor wall **70** is arranged axially between the bulkhead wall **58** and the vane array structure **66**. The inner combustor wall **70** of FIG. **2**, for example, projects axially along the axial centerline **22** (e.g., in the forward direction) out from the bulkhead wall **58** towards an inner platform **74** of the vane array structure **66**. The inner combustor wall **70** of FIG. **2** is connected to (e.g., formed integral with) the bulkhead wall **58** at a radial inner end of the bulkhead wall **58**.

(20) The bulkhead wall **58** is arranged radially between the outer combustor wall **68** and the inner combustor wall **70**. The bulkhead wall **58** of FIG. **2**, for example, projects radially (e.g., outward away from the axial centerline **22**) out from the inner combustor wall **70** to the outer combustor wall **68**. The bulkhead wall **58** of FIG. **2** is connected to the outer combustor wall **68** at an aft end of the outer combustor wall **68**, and to the inner combustor wall **70** at an aft end of the inner combustor wall **70**.

(21) The combustor walls **58**, **68** and **70** collectively form the combustion chamber **54** of FIG. **2** within the combustor **52**. An interior surface **76** (e.g., a tubular radial inner surface) of the outer combustor wall **68** forms an outer peripheral boundary of the combustion chamber **54**. An interior surface **78** (e.g., a tubular radial outer surface) of the inner combustor wall **70** forms an inner peripheral boundary of the combustion chamber **54**. An interior surface **80** (e.g., an annular forward surface) of the bulkhead wall **58** forms a side peripheral boundary of the combustion chamber **54**. The combustion chamber **54** thereby extends radially within the combustor **52** between the inner combustor wall **70** and its interior surface **78** and the outer combustor wall **68** and its interior surface **76**. The combustion chamber **54** projects axially into the combustor **52** from the outlet of the combustion chamber **54** (e.g., at the vane array structure **66**) to the bulkhead wall **58** and its interior surface **80**.

(22) The diffuser case **62** is spaced radially outboard from the combustor **52** and the vane array structure **66**. The diffuser case **62** extends axially along the axial centerline **22**, and axially overlaps the combustor **52** and its outer combustor wall **68**. The diffuser case **62** may also axially overlap the vane array structure **66** and its outer platform **72**. The diffuser case **62** of FIG. **2**, for example, includes a diffuser sidewall **82** and a diffuser endwall **84**. The diffuser sidewall **82** projects axially (e.g., in the forward direction) out from the diffuser endwall **84**, axially along the outer combustor wall **68** and the outer platform **72**, to a diffuser nozzle **86**; e.g., another vane array structure. This

diffuser sidewall **82** of FIG. **2** is connected to (e.g., formed integral with) the diffuser endwall **84** at a radial outer end of the diffuser endwall **84**, and to an outer platform **88** of the diffuser nozzle **86** at an aft end of the outer platform **88**. The diffuser endwall **84** projects radially (e.g., outward away from the axial centerline **22**) out from the turbine case **64**, along the bulkhead wall **58**, to the diffuser sidewall **82**. This diffuser endwall **84** of FIG. **2** is connected to (e.g., formed integral with) the diffuser sidewall **82** at an aft end of the diffuser sidewall **82**, and to the turbine case **64**. The diffuser case **62** and its diffuser walls **82** and **84** extend circumferentially about (e.g., completely around) the axial centerline **22**. The diffuser case **62** and its diffuser walls **82** and **84** may thereby circumscribe the combustor **52** and/or the turbine case **64**.

(23) The diffuser nozzle **86** is configured to condition the core air leaving the compressor section **31** and entering the diffuser plenum **60**. The diffuser nozzle **86** of FIG. **2**, for example, includes one or more diffuser guide vanes **90** configured to impart swirl to the core air. These diffuser guide vanes **90** are arranged circumferentially about the axial centerline **22** in an array; e.g., a circular array. Each of the diffuser guide vanes **90** extends radially across the core flowpath **28**. Each of the diffuser guide vanes **90** of FIG. **2**, for example, extends radially between and is connected to (e.g., formed integral with) the outer platform **88** and an inner platform **92** of the diffuser nozzle **86**. Here, the inner platform **92** may be partially (or completely) formed by the outer platform **72** of the vane array structure **66**. However, in other embodiments, the inner platform **92** and the outer platform **72** may be discrete; e.g., axially offset.

(24) The turbine case **64** is spaced radially outboard of the turbine rotor **46**. The turbine case **64** extends axially along the axial centerline **22**, and axially overlaps at least an aft portion of the turbine rotor **46**. The turbine case **64** extends circumferentially about (e.g., completely around) the axial centerline **22**, and circumscribes at least the aft portion of the turbine rotor **46**. The turbine case **64** thereby houses at least the aft portion of the turbine rotor **46**. The turbine case **64** also forms a peripheral boundary of the core flowpath **28** across at least the aft portion of the turbine rotor **46**. The turbine case **64** of FIG. **2** is also spaced radially inboard from the combustor **52** and the vane array structure **66**. For example, a downstream end portion **94** (e.g., a forward end portion) of the inner combustor wall **70** projects axially into a (e.g., annular) space radially between the turbine case **64** and the inner platform **74**. The turbine case **64** may be connected to (e.g., formed integral with) the inner platform **74**. With this arrangement, a flowpath wall collectively formed by the turbine case **64** and the inner platform **74** may thereby wrap around the downstream end portion **94** of the inner combustor wall **70**.

(25) The engine cases **62** and **64** collectively form the diffuser plenum **60** of FIG. **2** around the combustor **52**. A (e.g., tubular) radial inner surface **96** of the diffuser sidewall **82** forms an outer peripheral boundary of the diffuser plenum **60** radially outboard of the combustor **52** and its outer combustor wall **68**. A (e.g., tubular) radial outer surface **98** of the diffuser sidewall **82** forms an inner peripheral boundary of the diffuser plenum **60** radially inboard of the combustor **52** and its inner combustor wall **70**. An (e.g., annular) axial side surface **100** of the diffuser endwall **84** forms a side peripheral boundary of the diffuser plenum **60** axially to a side of the combustor **52** and its bulkhead wall **58**. With this arrangement, a radial outer portion of the diffuser plenum **60** extends radially between and is formed by the diffuser case **62** and the outer combustor wall **68**. A radial inner portion of the diffuser plenum **60** extends radially between and is formed by the turbine case **64** and the inner combustor wall **70**. An axial end portion of the diffuser plenum **60** extends axially between and is formed by the diffuser endwall **84** and the bulkhead wall **58**. The diffuser plenum **60** may thereby extend axially along each combustor wall **68**, **70** and radially along the bulkhead wall **58**.

(26) The vane array structure **66** is configured to condition the combustion products exiting the combustor **52** and its combustion chamber **54**. The vane array structure **66** of FIG. **2**, for example, includes one or more guide vanes **102** configured to impart swirl to the combustion products. These guide vanes **102** are arranged circumferentially about the axial centerline **22** in an array; e.g., a

circular array. Each of the guide vanes **102** extends radially across the core flowpath **28**. Each of the guide vanes **102** of FIG. **2**, for example, extends radially between and is connected to (e.g., formed integral with) the outer platform **72** and the inner platform **74**.
(27) The inner platform **74** is spaced radially outboard of the inner combustor wall **70** as well as the turbine case **64**. The inner platform **74** extends circumferentially about (e.g., completely around) the axial centerline **22**, and circumscribes the inner combustor wall **70** as well as the turbine case **64**. With this arrangement, a (e.g., annular) cavity **103** formed by and radially between the inner platform **74** and the inner combustor wall **70** may fluidly couple the inner portion of the diffuser plenum **60** to the combustion chamber **54**.
(28) At least a portion (or an entirety) of the stationary structure **38** may be formed as a monolithic body **104**. At least the stationary structure members **52**, **62**, **64**, **66** and **86** of FIG. **2**, for example, are included in the monolithic body **104**. Herein, the term "monolithic" may describe an apparatus which is formed as a single, unitary body. The stationary structure members **52**, **62**, **64**, **66** and **86**, for example, may be additively manufactured, cast, machined and/or otherwise formed together as an integral, unitary body. By contrast, a non-monolithic body may include multiple parts which are discretely formed from one another, where those parts are subsequently mechanically fastened and/or otherwise attached to one another.
(29) Referring to FIG. **3**, the monolithic body **104** also includes a support structure **106** for the combustor **52**. The support structure **106** of FIG. **3** is configured to support the inner combustor wall **70** and its downstream end portion **94**. The support structure **106** is also configured to locate the downstream end portion **94** of the inner combustor wall **70** relative to the turbine case **64** and the inner platform **74**; e.g., maintain radial spacing between the stationary structure members **64**, **70**, **74**. Moreover, the stationary structure **38** of FIG. **3** is configured to facilitate building the stationary structure **38** as the monolithic body **104** using additive manufacturing.
(30) The support structure **106** of FIG. **3** is arranged radially between and connected to (e.g., formed integral with) the inner combustor wall **70** and the turbine case **64**. This support structure **106**, for example, projects radially out from the turbine case **64** to the downstream end portion **94** of the inner combustor wall **70**. The support structure **106** extends axially along the support structure members **64** and **70** from an upstream, aft end surface **108** of the support structure **106** to a downstream, forward end surface **110** of the support structure **106** and the inner combustor wall **70**. Briefly, the aft end surface **108** extends radially between and is contiguous with the inner combustor wall **70** and the turbine case **64**. The forward end surface **110** extends radially between and is contiguous with the turbine case **64** and the interior surface **78** of the inner combustor wall **70**. The support structure **106** extends circumferentially about (e.g., completely around) the axial centerline **22** and along the stationary structure members **64** and **70**.
(31) Referring to FIG. **4**, the support structure **106** includes a plurality of ports **112** and a plurality of struts **114** circumferentially interposed with the ports **112**. The ports **112** of FIG. **4**, for example, are arranged circumferentially about the axial centerline **22** in an array; e.g., a circular array. Similarly, the struts **114** are arranged circumferentially about the axial centerline **22** in an array; e.g., a circular array. Each of the ports **112** may be arranged circumferentially between a respective circumferentially neighboring (e.g., adjacent) pair of the struts **114**. Similarly, each of the struts **114** may be arranged circumferentially between a respective circumferentially neighboring pair of the ports **112**.
(32) Each port **112** of FIG. **4** extends laterally (e.g., circumferentially or tangentially) within the monolithic body **104** and its support structure **106** between the respective circumferentially neighboring pair of the struts **114**. Each port **112** extends radially within the monolithic body **104** (e.g., through the support structure **106**) from a radial inner side **116** of the respective port **112** to a radial outer side **118** of the respective port **112**. The port inner side **116** of FIG. **4** is formed by the turbine case **64**. The port outer side **118** of FIG. **4** is formed by the inner combustor wall **70**. Referring to FIG. **3**, each port **112** projects axially along the axial centerline **22** through the

monolithic body **104** and its support structure **106** from the aft end surface **108** to the forward end surface **110**. More particularly, each port **112** extends longitudinally (e.g., axially) along a centerline **119** (see FIG. **6**) of the respective port **112** from an inlet **120** into the respective port **112** to an outlet **122** from the respective port **112**. The port inlet **120** of FIG. **3** is (e.g., wholly) formed in the aft end surface **108**, and the port inlet **120** is fluidly coupled with the inner portion of the diffuser plenum **60**. The port outlet **122** of FIG. **3** is (e.g., partially, or wholly) formed in the forward end surface **110**, and the port outlet **122** is fluidly coupled with the combustion chamber **54** through the cavity **103**.

(33) Referring to FIG. **5**, the port outlet **122** may include (e.g., be formed by) an aperture **124** in the forward end surface **110**. Each port **112** of FIG. **5** and its aperture **124** has a cross-sectional geometry when viewed, for example, in a first reference plane perpendicular to the axial centerline **22** and/or the port centerline **119** (see FIG. **6**). This cross-sectional geometry may have a radial inner portion **126** and a radial outer portion **128**. The inner portion **126** of FIG. **5** laterally tapers as that inner portion **126** extends radially inward (e.g., towards the axial centerline **22**) from the outer portion **128** towards (e.g., to) the port inner side **116**/the turbine case **64**. The outer portion **128** of FIG. **5** laterally tapers as that outer portion **128** extends radially outward (e.g., away from the axial centerline **22**) from the inner portion **126** towards (e.g., to) the port outer side **118**/the inner combustor wall **70**. The cross-sectional geometry, for example, may have a double-tapered polygonal shape; e.g., a hexagonal shape. The present disclosure, however, is not limited to such an exemplary cross-sectional geometry.

(34) The port outlet **122** may also include (e.g., be formed by) a notch **130** in the interior surface **78** of the inner combustor wall **70**. The notch **130** of FIG. **5** projects axially along the axial centerline **22** into the interior surface **78** of the inner combustor wall **70** from the forward end surface **110** to a distal end **132** (e.g., a point) of the notch **130**. The notch **130** may have a tapered geometry. The notch **130** of FIG. **5**, for example, laterally tapers as the notch **130** extends axially into the interior surface **78** of the inner combustor wall **70** from the forward end surface **110** towards (e.g., to) the notch end **132**. The notch **130** of FIG. **5** has a single tapered polygonal shape; e.g., a triangular shape. The present disclosure, however, is not limited to such an exemplary geometry.

(35) Each strut **114** extends laterally between (and forms lateral sides of) the respective circumferentially neighboring pair of the ports **112**. Each strut **114** extends radially between and to the turbine case **64** and the inner combustor wall **70**. Referring to FIG. **3**, each strut **114** extends axially along the axial centerline **22** between and to the aft end surface **108** and the forward end surface **110**. The struts **114** of FIG. **3** collectively form the aft end surface **108**. The struts **114** of FIG. **3** along with the inner combustor wall **70** collectively form the forward end surface **110**.

(36) Referring to FIG. **6**, each strut **114** may be configured as an airfoil; e.g., a guide vane. Each strut **114** of FIG. **6**, for example, includes an upstream, aft portion **134** and a downstream, forward portion **136**. The aft portion **134** may laterally taper as that aft portion **134** projects axially out from the forward portion **136** towards (e.g., to) the aft end surface **108**/the respective laterally flanking port inlets **120**. The forward portion **136** may laterally taper as that forward portion **136** projects axially out form the aft portion **134** toward (e.g., to) the forward end surface **110**/the respective laterally flanking port outlets **122**. Each strut **114** of FIG. **6**, for example, has a double tapered sectional geometry. With such an arrangement, an upstream, aft portion **138** of each port **112** may laterally taper as that aft portion **138** projects axially into the support structure **106** from the respective port inlet **120**. Similarly, a downstream, forward portion **140** of each port **112** may laterally taper as that forward portion **140** projects axially into the support structure **106** from the respective port outlet **122**.

(37) In some embodiments, referring to FIG. **6**, the port centerline **119** may be parallel with the axial centerline **22** when viewed, for example, in a second reference plane tangent to a reference circle around the axial centerline **22**. In other embodiments, referring to FIG. **7**, the port centerline **119** may be angularly offset from the axial centerline **22** by an included angle **142**; e.g., a non-zero

acute angle. Moreover, while each port centerline **119** of FIGS. **6** and **7** is straight, it is contemplated some or all of the port centerline **119** may alternatively be non-straight; e.g., curved.
(38) The turbine engine **20** is described above as a single spool, radial-flow turbojet gas turbine engine for ease of description. The present disclosure, however, is not limited to such an exemplary turbine engine. The turbine engine **20**, for example, may alternatively be configured as an axial flow gas turbine engine. The turbine engine **20** may be configured as a direct drive gas turbine engine. The turbine engine **20** may alternatively include a geartrain that connects one or more rotors together such that the rotors rotate at different speeds. The turbine engine **20** may be configured with a single spool (e.g., see FIG. **1**), two spools, or with more than two spools. The turbine engine **20** may be configured as a turbofan engine, a turbojet engine, a propfan engine, a pusher fan engine or any other type of turbine engine. In addition, while the turbine engine **20** is described above with an exemplary reverse flow annular combustor, the turbine engine **20** may also or alternatively include any other type/configuration of annular, tubular (e.g., CAN), axial flow and/or reverse flow combustor. The present disclosure therefore is not limited to any particular types or configurations of turbine engines.
(39) While various embodiments of the present disclosure have been described, it will be apparent to those of ordinary skill in the art that many more embodiments and implementations are possible within the scope of the disclosure. For example, the present disclosure as described herein includes several aspects and embodiments that include particular features. Although these features may be described individually, it is within the scope of the present disclosure that some or all of these features may be combined with any one of the aspects and remain within the scope of the disclosure. Accordingly, the present disclosure is not to be restricted except in light of the attached claims and their equivalents.

Claims

1. An assembly for a turbine engine, comprising: a combustor including a combustor wall and a combustion chamber within the combustor, an interior surface of the combustor wall forming a peripheral boundary of the combustion chamber; an engine case forming a peripheral boundary of a plenum along the combustor; a support structure extending radially from the combustor wall to the engine case; and a monolithic body including the combustor wall, the engine case, the support structure, a first platform and a plurality of ports arranged circumferentially about an axis, each of the plurality of ports fluidly coupled with the plenum and projecting axially through the support structure, the plurality of ports comprising a first port, and the first port comprising a cross-sectional geometry, wherein a radially outer portion of the cross-sectional geometry laterally tapers as the first port extends radially outward within the monolithic body and a radially inner portion of the cross-sectional geometry laterally tapers as the first port extends radially inwards from the radially outer portion of the cross-sectional geometry within the monolithic body; a cavity formed by and located radially between the combustor wall and the first platform, each of the plurality of ports further fluidly coupled with the combustion chamber through the cavity; and an outlet from the first port includes a notch in the interior surface, the notch laterally tapers as the notch projects axially into the interior surface.
2. The assembly of claim 1, further comprising a vane array structure including the first platform, a second platform and a plurality of vanes extending radially between and connected to the first platform and the second platform.
3. The assembly of claim 2, wherein the vane array structure is radially outboard of and axially overlaps the support structure and the plurality of ports.
4. The assembly of claim 1, wherein the combustor wall and the support structure extend axially to an end surface; the outlet is disposed in the end surface; and the cross-sectional geometry has a hexagonal shape.

5. The assembly of claim 1, wherein the notch has a triangular shape in the interior surface.
6. The assembly of claim 1, wherein the monolithic body further includes a plurality of struts arranged circumferentially about the axis; each of the plurality of struts is between a respective circumferentially neighboring pair of the plurality of ports; and each of the plurality of struts extends radially from the combustor wall to the engine case.
7. The assembly of claim 6, wherein the plurality of struts comprise a first strut forming a lateral side of the first port; and the first strut laterally tapers as the first strut extends axially towards an inlet into the first port from the plenum.
8. The assembly of claim 7, wherein a first portion of the first strut laterally tapers as the first strut extends axially towards an inlet into the first port from the plenum; a second portion of the first strut laterally tapers as the first strut extends axially towards an outlet from the first port; and the second portion of the first strut is axially between the first portion of the first strut and the outlet from the first port.
9. The assembly of claim 1, wherein a longitudinal centerline of the first port is parallel with the axis.
10. The assembly of claim 1, wherein a longitudinal centerline of the first port is angularly offset from the axis.
11. The assembly of claim 1, wherein the combustor is radially outboard of and circumscribes the engine case and the support structure.
12. The assembly of claim 1, further comprising: a compressor section; a turbine section; and a flowpath extending through the compressor section, the plenum, the combustion chamber and the turbine section from an inlet into the flowpath to an exhaust from the flowpath.