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ENGINE STAND

Abstract

A flat-packable engine stand for an engine includes a pair of base beams, a forward support, and a rear support. The forward support and the rear support include a pair of forward support members and a pair of rear support members, respectively, that are configured to engage opposing sides of the engine. At least one of the forward support and the rear support further includes a pair of telescoping legs, a pair of hydraulic rams coupled to and configured to telescopically actuate a respective telescoping leg, and a hydraulic pipe fluidly communicating the pair of hydraulic rams. The hydraulic pipe is configured to allow a flow of a hydraulic fluid between the pair of hydraulic rams.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This specification is based upon and claims the benefit of priority from United Kingdom patent application number GB 2402009.1 filed on Feb. 14, 2023, the entire contents of which is incorporated herein by reference.

BACKGROUND

Technical Field

[0002] The present disclosure relates to a flat-packable engine stand for an engine, e.g., an aircraft engine.

Description of the Related Art

[0003] Engines (e.g., gas turbine engines) are bulky machines that need to be installed onto an aircraft/vehicle to power the aircraft/vehicle and occasionally removed for maintenance and repair purposes. Some engines are assembled from modules, and maintenance and repair operations typically involve disassembling and reassembling those modules. During engine build and transportation activities, engines are typically supported on an engine stand that supports the engine from dedicated ground handling points.

[0004] Engine stands generally feature a balancing system to ensure that the engine is stable, or more specifically statically determinate. Without the balancing system, the engine may undergo torsional loading when supported on the engine stand. In such cases, it may be difficult to determine a load-share between the ground handling points during engine handling scenarios due to tolerances in both the engine stand and the ground handling points, thereby risking overloading of the engine and the engine stand that may cause potentially expensive damage to the engine and create a significant health and safety concern given the weight of the engine.

[0005] Current balancing systems of the engine stand typically include a balance beam having three separate structural sections that are pinned together, allow the balance beam to automatically adjust to the engine. However, an ability of the balance beam to withstand lateral loads is very limited, thereby requiring a more complex and expensive structure to prevent the subsequent movements. Additionally, the current balancing systems require space under the engine at the ground handling points. This may limit an opportunity to reduce an overall height of the engine during transportation, particularly by air freight, thereby increasing a cost of transportation of the engine.

SUMMARY

[0006] According to a first aspect, there is provided a flat-packable engine stand for an engine. The flat-packable engine stand includes a pair of base beams spaced apart from each other. Each base beam includes a first end and a second end that is opposite to the first end. The flat-packable engine stand further includes a forward support that straddles the pair of base beams between their respective first ends and their respective second ends. The forward support includes a pair of forward support members that are configured to engage opposing sides of the engine. The flat-packable engine stand further includes a rear support that straddles the pair of base beams adjacent their respective second ends. The rear support includes a pair of rear support members that are configured to engage the opposing sides of the engine rear of the forward support. At least one of the forward support and the rear support further includes a pair of telescoping legs. Each telescoping leg is operatively coupled to and configured to actuate a respective forward support member from the pair of forward support members or a respective rear support member from the pair of rear support members. At least one of the forward support and the rear support further includes a pair of hydraulic rams. Each hydraulic ram is operatively coupled to and configured to telescopically actuate a respective telescoping leg from the pair of telescoping legs. At least one of the forward support and the rear support further includes a hydraulic pipe fluidly communicating

the pair of hydraulic rams to each other. The hydraulic pipe is configured to allow a flow of a hydraulic fluid between the pair of hydraulic rams.
[0007] The engine stand is flat-packable, i.e. it may be disassembled allowing convenient, space-efficient, and cost-efficient storage and/or transportation.
[0008] The forward support members of the forward support and the rear support members of the rear support are configured to engage the opposing sides (or ground handling points) of the engine. Each telescoping leg is configured to actuate the respective forward support member or the respective rear support member. Each hydraulic ram is configured to telescopically actuate the respective telescoping leg from the pair of telescoping legs. Further, the hydraulic pipe fluidly communicates the pair of hydraulic rams to each other, allowing the flow of the hydraulic fluid between the pair of hydraulic rams. This may enable the pair of telescoping legs to balance the opposing sides of the engine through exchange of the hydraulic fluid, thereby allowing the flat-packable engine stand and the engine to be statically determinate. In other words, if the ground handling points of the engine are not in a same vertical position, the flat-packable engine stand may account for this by exchanging the hydraulic fluid between the pair of hydraulic rams. Specifically, each telescoping leg may allow movement of the respective forward support member or the respective rear support member to balance the opposing sides of the engine. The opposing sides of the engine may automatically balance based on exchange of the hydraulic fluid between the pair of hydraulic rams.
[0009] Additionally, the flat-packable engine stand of the present disclosure utilizes the pair of telescoping legs which ensures that the respective hydraulic ram is exposed to vertical loads only. Thus, the pair of telescoping legs may be capable of withstanding lateral loads when compared to balance beams of current designs, thereby allowing a greater load-share between the forward support and the rear support of the engine stand. This may in turn reduce the complexity of the flat-packable engine stand, and therefore, the cost of the flat-packable engine stand. Furthermore, the hydraulic pipe may not require to be positioned directly beneath the engine, thereby allowing the engine to be lowered close to the pair of base beams. This may optimise an overall package size of the engine and the engine stand for transportation purposes, thereby increasing opportunities to reduce transportation costs.
[0010] In some embodiments, each telescoping leg is directly coupled to and configured to telescopically acuate the respective forward support member or the respective rear support member. This may allow each telescoping leg to directly actuate the respective forward support member or the respective rear support member to balance the opposing sides of the engine.
[0011] In some embodiments, at least one of the forward support and the rear support further includes a transverse beam extending between and coupled to the pair of base beams. At least one of the forward support and the rear support further includes a pair of vertical beams extending from opposing ends of the transverse beam towards the pair of forward support members or the pair of rear support members. Each vertical beam at least partially and slidably receives therein a respective telescoping leg from the pair of telescoping legs.
[0012] The transverse beam may ensure stability of the pair of base beams and may support the pair of vertical beams. Thus, the transverse beam may enhance a robustness of the flat-packable engine stand during transportation of the engine and/or maintenance. The pair of vertical beams may allow the respective telescoping leg to move along a vertical direction only, thereby restricting lateral loads on the respective telescoping leg and stabilizing the respective telescoping leg. Thus, the pair of vertical beams may allow the forward support and the rear support to maintain their position with respect to the pair of base beams when supporting the engine.
[0013] In some embodiments, each hydraulic ram is received within a respective vertical beam from the pair of vertical beams. This may ensure that the pair of hydraulic rams is exposed to vertical loads only.
[0014] In some embodiments, the hydraulic pipe is at least partially received within the transverse

beam. This may allow the hydraulic pipe to be positioned on the flat-packable engine stand while protecting the hydraulic pipe.

[0015] In some embodiments, at least one of the forward support and the rear support further includes a pair of vertical beams. Each vertical beam includes a first end and a second end that is opposite to the first end. The first end of each vertical beam is directly coupled to the respective forward support member or the rear support member. At least one of the forward support and the rear support further includes a first linkage pivotally coupled to the second end of one vertical beam from the pair of vertical beams. At least one of the forward support and the rear support further includes a second linkage pivotally coupled to the second end of the other vertical beam from the pair of vertical beams. One telescoping leg from the pair of telescoping legs is pivotally coupled to and configured to telescopically actuate the first linkage. The other telescoping leg from the pair of telescoping legs is pivotally coupled to and configured to telescopically actuate the second linkage.

[0016] The one telescoping leg from the pair of telescoping legs is indirectly coupled to the respective forward support member or the rear support member via the first linkage and the respective vertical beam, thereby allowing the one telescoping leg to actuate the forward support member or the rear support member. Further, the other telescoping leg from the pair of telescoping legs is indirectly coupled to the respective forward support member or the rear support member via the second linkage and the respective vertical beam, thereby allowing the other telescoping leg to actuate the forward support member or the rear support member.

[0017] In some embodiments, one hydraulic ram from the pair of hydraulic rams is pivotally coupled to the first linkage. The one hydraulic ram is operatively coupled to the one telescoping leg. The other hydraulic ram from the pair of hydraulic rams is pivotally coupled to the second linkage. The other hydraulic ram is operatively coupled to the other telescoping leg. Thus, the first linkage may provide support to the one hydraulic ram from the pair of hydraulic rams and the second linkage may provide support to the other hydraulic ram from the pair of hydraulic rams.

[0018] In some embodiments, the first linkage includes a first link pivotally coupled to the second end of the one vertical beam and the one telescoping leg at a first pivot point. Advantageously, the first pivot point may allow the second end of the one vertical beam to rotate relative to the one telescoping leg.

[0019] In some embodiments, the first linkage further includes a second link pivotally coupled to the first link at a second pivot point spaced apart from the first pivot point. The second link is pivotally coupled to the one hydraulic ram at a third pivot point spaced apart from each of the first pivot point and the second pivot point. Advantageously, the second pivot point may allow the first link to rotate relative to the second link and the third pivot point may allow the one hydraulic ram to rotate relative to the second link.

[0020] In some embodiments, the second linkage includes a first link including a first arm and a second arm inclined to the first arm. The first arm is pivotally coupled to the second end of the other vertical beam at a first pivot point. The second arm is pivotally coupled to the other telescoping leg at a second pivot point spaced apart from the first pivot point. Advantageously, the first pivot point may allow the first arm to rotate relative to the second end of the other vertical beam and the second pivot point may allow the other telescoping leg to rotate relative to the second arm.

[0021] In some embodiments, the second linkage further includes a second link pivotally coupled to the first link at a third pivot point spaced apart from each of the first pivot point and the second pivot point. The second link is pivotally coupled to the other hydraulic ram at a fourth pivot point spaced apart from each of the first pivot point, the second pivot point, and the third pivot point. Advantageously, the third pivot point may allow the second link to rotate relative to the first link and the fourth pivot point may allow the other hydraulic ram to rotate relative to the second link.

[0022] In some embodiments, at least one of the forward support and the rear support further

includes a hydraulic pump fluidly coupled to the hydraulic pipe. Advantageously, the hydraulic pump may provide pressurized hydraulic fluid to each of the pair of hydraulic rams, thereby allowing the respective telescoping leg to be raised or lowered. Therefore, a vertical height of the engine on the flat-packable engine stand may be raised or lowered based on application requirements. This may enable reduction in the overall package size of the engine and the engine stand for transportation purposes. Additionally, this may also enable raising or lowering of the engine during build up or maintenance. Additionally, this may allow raising or lowering of the engine where an engine axis requires levelling, e.g., on an uneven floor. Additionally, this may enable a rear end of the engine to be lowered to clear components on a pylon of an aircraft during installation/removal of the engine from a wing of the aircraft.
[0023] In some embodiments, the engine is a gas turbine engine including an engine core that houses at least one compressor and at least one turbine. The engine core includes an upstream end and a downstream end. The pair of forward support members are configured to engage the engine core adjacent to the upstream end of the engine core. The pair of rear support members are configured to engage the engine core adjacent to the downstream end of the engine core. Thus, the pair of forward support members and the pair of rear support members may support the engine core for transportation and/or maintenance purposes.
[0024] In some embodiments, the engine is a gas turbine engine including a fan case housing a fan and an engine core that houses at least one compressor and at least one turbine. The pair of forward support members are configured to engage the fan case. The pair of rear support members are configured to engage the engine core. Thus, the pair of forward support members and the pair of rear support members may support the fan case and the engine core, respectively, for transportation and/or maintenance purposes.
[0025] The skilled person will appreciate that except where mutually exclusive, a feature or parameter described in relation to any one of the above aspects may be applied to any other aspect. Furthermore, except where mutually exclusive, any feature or parameter described herein may be applied to any aspect and/or combined with any other feature or parameter described herein.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0026] Embodiments will now be described by way of example only, with reference to the Figures, in which:
[0027] FIG. **1** is a schematic sectional side view of a gas turbine engine;
[0028] FIG. **2** is a schematic perspective view of a flat-packable engine stand, according to an embodiment of the present disclosure, for supporting a gas turbine engine;
[0029] FIG. **3** is a schematic side view of a flat-packable engine stand, e.g., the stand shown in FIG. **2**, supporting a gas turbine engine, e.g., the gas turbine engine of FIG. **1**;
[0030] FIG. **4** is a schematic side view of a flat-packable engine stand supporting an engine, according to another embodiment of the present disclosure;
[0031] FIG. **5** is a schematic rear view of a flat-packable engine stand, e.g. that of FIGS. **2** and **3** or FIG. **4**, supporting an engine;
[0032] FIG. **6** is a schematic rear view of a flat-packable engine stand supporting an engine, according to another embodiment of the present disclosure;
[0033] FIG. **7** is a schematic rear view of the flat-packable engine stand supporting an engine, according to yet another embodiment of the present disclosure;
[0034] FIG. **8** is a schematic side view of a flat-packable engine stand supporting an engine, according to another embodiment of the present disclosure;
[0035] FIG. **9** is a schematic side view of a flat-packable engine stand supporting an engine,

according to another embodiment of the present disclosure;
[0036] FIG. **10** is a schematic side view of the flat-packable engine stand of FIG. **9** where a base frame is disengaged from a mid frame;
[0037] FIG. **11** is a schematic rear view of a flat-packable engine stand supporting an engine, according to another embodiment of the present disclosure; and
[0038] FIG. **12** is a schematic rear view of the engine stand of FIG. **11** where the base frame is disengaged from the mid frame.

DETAILED DESCRIPTION

[0039] Aspects and embodiments of the present disclosure will now be discussed with reference to the accompanying figures. Further aspects and embodiments will be apparent to those skilled in the art.
[0040] FIG. **1** shows a schematic sectional side view of a gas turbine engine **10** having a principal rotational axis X-X′. The gas turbine engine **10** includes, in axial flow series, an air intake **11**, a compressive fan **12** (which may also be referred to as a low pressure compressor), an intermediate pressure compressor **13**, a high pressure compressor **14**, combustion equipment **15**, a high pressure turbine **16**, an intermediate pressure turbine **17**, a low pressure turbine **18**, and a core exhaust nozzle **19**. A nacelle **21** generally surrounds the gas turbine engine **10** and defines the air intake **11**, a bypass duct **22**, and a bypass exhaust nozzle **23**.
[0041] The intermediate and high pressure compressors **13**, **14**, the combustion equipment **15**, the high, intermediate, and low pressure turbines **16**, **17**, **18**, and the core exhaust nozzle **19** may constitute an engine core **25** of the gas turbine engine **10**. In some embodiments, the engine core **25** further includes an engine casing **26** that at least partially encloses the one or more aforementioned components. A fan case **27** is disposed around the engine core **25**. Specifically, the fan case **27** surrounds the compressive fan **12**. In some embodiments, the fan case **27** is coupled to the engine core **25** and/or the nacelle **21** by various coupling mechanisms, such as fasteners (e.g., bolts), welding, brazing, and so forth.
[0042] The gas turbine engine **10** works in a conventional manner so that the air entering the air intake **11** is accelerated by the compressive fan **12** to produce two air flows: a first air flow A into the intermediate pressure compressor **13**, and a second air flow B which passes through the bypass duct **22** to provide a propulsive thrust. The intermediate pressure compressor **13** compresses the first air flow A directed into it before delivering that air to the high pressure compressor **14** where further compression takes place.
[0043] The compressed air exhausted from the high pressure compressor **14** is directed into the combustion equipment **15** where it is mixed with fuel and the mixture is combusted. The resulting hot combustion products then expand through, and thereby drive the high, intermediate, and low pressure turbines **16**, **17**, **18** before being exhausted through the core exhaust nozzle **19** to provide additional propulsive thrust. The high, intermediate, and low pressure turbines **16**, **17**, **18** respectively drive the high and intermediate pressure compressors **14**, **13**, and the compressive fan **12** by suitable interconnecting shafts.
[0044] The gas turbine engine **10** as illustrated in FIG. **1** is exemplary in nature. Other gas turbine engines to which the present disclosure may be applied may have alternative configurations. By way of example, such engines may have an alternative number of interconnecting shafts and/or an alternative number of compressors and/or turbines. In some embodiments, the gas turbine engine **10** may be used in an aircraft. In some embodiments, the gas turbine engine **10** is an ultra-high bypass ratio engine (UHBPR). In addition, the present disclosure is equally applicable to other aero gas turbine engines, marine gas turbine engines, and land-based gas turbine engines.
[0045] In some embodiments, the gas turbine engine **10** includes detachable modules that constitute certain components of the gas turbine engine **10**. In other words, the gas turbine engine **10** includes multiple modules and these modules are then assembled to form the gas turbine engine **10**. For example, the engine core **25** and the fan case **27** are assembled separately and then

connected to each other. Typically, the gas turbine engine **10** may include other modules, such as an intake module. The fan case **27** is generally coaxially disposed around the engine core **25**. Specifically, the engine core **25** and the fan case **27** may be coaxially disposed about the principal rotational axis X-X′. Correct alignment between the engine core **25** and the fan case **27** may be required before the engine core **25** and the fan case **27** are moved proximal to each other and connected.

[0046] FIG. **2** is a schematic perspective view of a flat-packable engine stand **100** for an engine (e.g., the gas turbine engine **10** shown in FIG. **1**), according to an embodiment of the present disclosure. The flat-packable engine stand **100** is shown in an erected configuration in FIG. **2**. In some embodiments, the engine stand **100** may support the engine during engine build and transportation activities. For example, the engine stand **100** may be suitable for use in maintaining and/or transportation of the engine, which includes detachable modules, e.g., the engine core **25**, the fan case **27**, etc., shown in FIG. **1**.

[0047] The flat-packable engine stand **100** includes a pair of base beams **102**A, **102**B spaced apart from each other. Each base beam **102**A, **102**B includes a first end **104**A, **104**B and a second end **106**A, **106**B that is opposite to the first end **104**A, **104**B. Specifically, the base beam **102**A includes the first end **104**A and the second end **106**A that is opposite to the first end **104**A, and the base beam **102**B includes the first end **104**B and the second end **106**B that is opposite to the first end **104**B. The pair of base beams **102**A, **102**B may ensure that the engine supported on the engine stand **100** remains stable, or more specifically statically determinate, during transportation and/or maintenance.

[0048] In some embodiments, the pair of base beams **102**A, **102**B are substantially parallel. However, in other embodiments, the pair of base beams **102**A, **102**B may not be parallel. For example, the pair of base beams **102**A, **102**B may diverge, e.g., with a distance between the first ends **104**A, **104**B being greater than a distance between the second ends **106**A, **106**B to accommodate any dimension of the engine to be maintained and/or transported. In some embodiments, the flat-packable engine stand **100** may be configured such that an orientation of the pair of base beams **102**A, **102**B may be adjusted to accommodate dimensions of a variety of engines. In some embodiments, one or more additional base beams may be provided to enhance a robustness of the engine stand **100**. In some embodiments, the engine stand **100** may be provided with a set of wheel assemblies (not shown). The set of wheel assemblies may enable ease of movement of the engine stand **100** for various purposes. The set of wheel assemblies may include multiple wheels located at suitable positions on the engine stand **100**.

[0049] In some embodiments, each of the pair of base beams **102**A, **102**B may be made of any suitably rigid and strong material, typically a metal or an alloy. Further, each of the pair of base beams **102**A, **102**B may take any form based on application requirements. For example, each of the pair of base beams **102**A, **102**B may have a suitable cross-sectional shape, e.g., rectangle, square, polygonal, I-section, C-section, etc.

[0050] The flat-packable engine stand **100** further includes a forward support **110** that straddles the pair of base beams **102**A, **102**B between their respective first ends **104**A, **104**B and their respective second ends **106**A, **106**B. In some embodiments, the forward support **110** may be coupled to the pair of base beams **102**A, **102**B via any suitable coupling mechanism, e.g., detachable clamps, etc. The forward support **110** may assume a variety of forms based on application requirements to fulfil the purpose of supporting the engine. The forward support **110** includes a pair of forward support members **112**A, **112**B. Each of the pair of forward support members **112**A, **112**B may include suitable coupling mechanisms (e.g., a trunnion) for engaging the engine that may be specific to a type of the engine.

[0051] The flat-packable engine stand **100** further includes a rear support **114** that straddles the pair of base beams **102**A, **102**B adjacent to their respective second ends **106**A, **106**B. In some embodiments, the rear support **114** may be substantially similar to the forward support **110**. In some embodiments, the rear support **114** may be coupled to the pair of base beams **102**A, **102**B via any suitable coupling mechanism, e.g., detachable clamps, etc. The rear support **114** may assume a variety of forms based on application requirements to fulfil the purpose of supporting the engine. The rear support **114** includes a pair of rear support members **116**A, **116**B. Each of the pair of rear support members **116**A, **116**B may include suitable coupling mechanisms (e.g., a trunnion) for engaging the engine that may be specific to a type of the engine.

[0052] In some embodiments, at least one of the forward support **110** and the rear support **114** further includes a transverse beam **130** extending between and coupled to the pair of base beams **102**A, **102**B. Advantageously, the transverse beam **130** may ensure stability of the pair of base beams **102**A, **102**B while supporting the engine. Thus, the transverse beam **130** may enhance the robustness of the engine stand **100** during transportation of the engine and/or maintenance.

[0053] In some embodiments, at least one of the forward support **110** and the rear support **114** further includes a pair of vertical beams **132**A, **132**B extending from opposing ends **134**A, **134**B of the transverse beam **130** towards the pair of forward support members **112**A, **112**B or the pair of rear support members **116**A, **116**B. Specifically, the vertical beam **132**A extends from the end **134**A of the transverse beam **130** towards the forward support member **112**A or the rear support member **116**A. Further, the vertical beam **132**B extends from the end **134**B of the transverse beam **130** towards the forward support member **112**B or the rear support member **116**B. The pair of vertical beams **132**A, **132**B may allow the forward support **110** and/or the rear support **114** to maintain their position with respect to the pair of base beams **102**A, **102**B when supporting the engine.

[0054] The engine stand **100** is flat-packable. In other words, the engine stand **100** may be disassembled, thereby enabling the engine stand **100** to be readily transported by rail, road, or even by air. For example, the engine stand **100** may be stored within a lower-hold of a passenger carrying aircraft. This may allow convenient, space-efficient, and cost-efficient storage and/or transportation of the engine stand **100**. The engine stand **100** may be built up with minimal infrastructure or tools once delivered to a required location.

[0055] FIG. **3** is a schematic side view of the engine stand **100** supporting an engine **50**, according to an embodiment of the present disclosure. In the illustrated embodiment, the engine **50** is the gas turbine engine **10** shown in FIG. **1**. The engine **50** is schematically shown in FIG. **3** for the purpose of illustration. Referring to FIGS. **1** and **3**, in some embodiments, the gas turbine engine **10** (or the engine **50**) includes the engine core **25** that houses at least one compressor (i.e., the intermediate pressure compressor **13** and the high pressure compressor **14**) and at least one turbine (i.e., high, intermediate, and low pressure turbines **16**, **17**, **18**). In some embodiments, the engine **50** includes various detachable modules, e.g., the engine core **25**, the fan case **27**, etc. Only the base beam **102**A, the forward support member **112**A, the rear support member **116**A, and the vertical beams **132**A are visible in FIG. **3**.

[0056] Referring to FIGS. **2** and **3**, the pair of forward support members **112**A, **112**B are configured to engage the engine **50**. In some embodiments, the engine core **25** includes an upstream end **30** and a downstream end **35**. The upstream end **30** of the engine core **25** is disposed adjacent to the fan case **27** and the downstream end **35** of the engine core **25** is disposed distal to the fan case **27**. In some embodiments, the pair of forward support members **112**A, **112**B are configured to engage the engine core **25** adjacent to the upstream end **30** of the engine core **25**.

[0057] In some embodiments, a position of the pair of forward support members **112**A, **112**B with respect to the pair of base beams **102**A, **102**B may vary based on application requirements. In the illustrated embodiment, the pair of forward support members **112**A, **112**B are positioned between the respective first ends **104**A, **104**B and the respective second ends **106**A, **106**B of the pair of base beams **102**A, **102**B. Specifically, the pair of forward support members **112**A, **112**B are positioned at a respective mid portion of the pair of base beams **102**A, **102**B. For example, the pair of forward support members **112**A, **112**B may be positioned such that the pair of forward support members **112**A, **112**B may engage the engine **50** at a mid-portion of the engine **50** for maintenance and/or removal of the compressive fan **12** (shown in FIG. **1**).

[0058] In some embodiments, the pair of rear support members **116**A, **116**B are configured to engage the engine **50** rear of the forward support **110**. Specifically, the pair of rear support members **116**A, **116**B are configured to engage the engine core **25** adjacent to the downstream end **35** of the engine core **25**. Therefore, the pair of forward support members **112**A, **112**B of the forward support **110** and the pair of rear support members **116**A, **116**B of the rear support **114** may support the engine **50** for maintenance and/or transportation purposes. This may enable various modules the engine **50** to be disassembled, transported, and assembled as required.

[0059] FIG. **4** is a schematic side view of a flat-packable engine stand **150** supporting the engine **50**, according to another embodiment of the present disclosure. The engine stand **150** may be substantially similar and functionally equivalent to the engine stand **100** (shown in FIG. **3**), and same components in this embodiment are referred to by same reference numerals and differences between the embodiments are discussed. Specifically, in the illustrated embodiment of FIG. **4**, the forward support **110** of the engine stand **150** is disposed proximal to the respective first ends **104**A, **104**B of the pair of base beams **102**A, **102**B. Only the base beam **102**A, the forward support member **112**A, the rear support member **116**A, and the vertical beams **132**A are visible in FIG. **4**.

[0060] In the illustrated embodiment, the engine **50** is the gas turbine engine **10** shown in FIG. **1**. The engine **50** is schematically shown in FIG. **4** for the purpose of illustration. Referring to FIGS. **1** and **3**, in some embodiments, the gas turbine engine **10** (or the engine **50**) includes the fan case **27** housing the compressive fan **12** and the engine core **25** that houses at least one compressor (i.e., the intermediate pressure compressor **13** and the high pressure compressor **14**) and at least one turbine (i.e., high, intermediate, and low pressure turbines **16**, **17**, **18**). In some embodiments, the gas turbine engine **10** may include various detachable modules.

[0061] Referring to FIGS. **2** and **4**, in some embodiments, the pair of forward support members **112**A, **112**B are configured to engage the fan case **27**. Thus, the forward support **110** may support the engine **50** via the fan case **27**. Further, the pair of rear support members **116**A, **116**B are configured to engage the engine core **25**. Therefore, the pair of forward support members **112**A, **112**B of the forward support **110** and the pair of rear support members **116**A, **116**B of the rear support **114** may support the engine **50** for maintenance and/or transportation purposes. This may enable various modules the engine **50** to be disassembled, transported, and assembled as required.

[0062] FIG. **5** is a schematic rear view of the flat-packable engine stand **100**, **150** supporting the engine **50**, according to an embodiment of the present disclosure. Although the rear support **114** is visible in FIG. **5**, however, the following description is equally applicable to the forward support **110** since the forward support **110** is substantially similar to the rear support **114**. The teachings in the following description are described with reference to both the forward support **110** and the rear support **114**. The engine **50** is schematically shown in FIG. **5** for the purpose of illustration.

[0063] As shown in FIG. **5**, the pair of forward support members **112**A, **112**B are configured to engage opposing sides **40** of the engine **50**. Similarly, the pair of rear support members **116**A, **116**B are configured to engage the opposing sides **40** of the engine **50**. The pair of forward support members **112**A, **112**B and the pair of rear support members **116**A, **116**B may securely engage the opposing sides **40** of the engine **50**.

[0064] At least one of the forward support **110** and the rear support **114** further includes a pair of telescoping legs **120**A, **120**B. Each telescoping leg **120**A, **120**B is operatively coupled to and configured to actuate a respective forward support member **112**A, **112**B from the pair of forward support members **112**A, **112**B or a respective rear support member **116**A, **116**B from the pair of rear support members **116**A, **116**B. Specifically, the telescoping leg **120**A is operatively coupled to and configured to actuate the forward support member **112**A or the rear support member **116**A. Similarly, the telescoping leg **120**B is operatively coupled to and configured to actuate the forward support member **112**B or the rear support member **116**B.

[0065] In some embodiments, each vertical beam **132**A, **132**B at least partially and slidably receives therein a respective telescoping leg **120**A, **120**B from the pair of telescoping legs **120**A, **120**B. Specifically, the vertical beam **132**A at least partially and slidably receives therein the telescoping leg **120**A and the vertical beam **132**B at least partially and slidably receives therein the telescoping leg **120**B.

[0066] At least one of the forward support **110** and the rear support **114** further includes a pair of hydraulic rams **122**A, **122**B. Each hydraulic ram **122**A, **122**B is operatively coupled to and configured to telescopically actuate a respective telescoping leg **120**A, **120**B from the pair of telescoping legs **120**A, **120**B. Specifically, the hydraulic ram **122**A is operatively coupled to and configured to telescopically actuate the telescoping leg **120**A. Similarly, the hydraulic ram **122**B is operatively coupled to and configured to telescopically actuate the telescoping leg **120**B. In some embodiments, each hydraulic ram **122**A, **122**B is received within a respective vertical beam **132**A, **132**B from the pair of vertical beams **132**A, **132**B. Specifically, the hydraulic ram **122**A is received within the vertical beam **132**A and the hydraulic ram **122**B is received within the vertical beam **132**B.

[0067] At least one of the forward support **110** and the rear support **114** further includes a hydraulic pipe **124** fluidly communicating the pair of hydraulic rams **122**A, **122**B to each other. The hydraulic pipe **124** is configured to allow a flow of a hydraulic fluid **126** between the pair of hydraulic rams **122**A, **122**B. In other words, the hydraulic pipe **124** may allow exchange of the hydraulic fluid **126** between the pair of hydraulic rams **122**A, **122**B. This may enable the pair of telescoping legs **120**A, **120**B to balance the opposing sides **40** of the engine **50** through exchange of the hydraulic fluid **126**, thereby allowing the engine stand **100**, **150** and the engine **50** to be statically determinate.

[0068] In other words, if the opposing sides **40** of the engine **50** are not in a same vertical position, the engine stand **100**, **150** may account for this by exchanging the hydraulic fluid **126** between the pair of hydraulic rams **122**A, **122**B. Specifically, the telescoping leg **120**A may allow movement of the respective forward support member **112**A or the respective rear support member **116**A along a vertical direction S**1**, and the telescoping leg **120**B may allow movement of the respective forward support member **112**B or the respective rear support member **116**B along a vertical direction S**2** to balance the opposing sides **40** of the engine **50**. The opposing sides **40** of the engine **50** may automatically balance based on exchange of the hydraulic fluid **126** between the pair of hydraulic rams **122**A, **122**B since the pair of forward support members **112**A, **112**B or the pair of rear support members **116**A, **116**B may be actuated individually.

[0069] In the illustrated embodiment of FIG. **5**, each telescoping leg **120**A, **120**B is directly coupled to and configured to telescopically acuate the respective forward support member **112**A, **112**B or the respective rear support member **116**A, **116**B. This may allow each telescoping leg **120**A, **120**B to directly actuate the respective forward support member **112**A, **112**B or the respective rear support member **116**A, **116**B to balance the opposing sides **40** of the engine **50**. Further, the pair of vertical beams **132**A, **132**B may allow the respective telescoping leg **120**A, **120**B to move along a vertical direction only, thereby restricting lateral loads on the respective telescoping leg **120**A, **120**B and stabilizing the respective telescoping leg **120**A, **120**B. Thus, the pair of telescoping legs **120**A, **120**B may be capable of withstanding lateral loads, thereby allowing a greater load-share between the forward support **110** and the rear support **114** of the engine stand **100**, **150**. This may in turn reduce a complexity of the engine stand **100**, **150**, and therefore, a cost of the engine stand **100**, **150**.

[0070] In some embodiments, the hydraulic pipe **124** is at least partially received within the transverse beam **130**. This may allow the hydraulic pipe **124** to be positioned on the flat-packable engine stand **100**, **150** while protecting the hydraulic pipe **124**. Further, the hydraulic pipe **124** may not require to be positioned directly beneath the engine **50**, thereby allowing the engine **50** to be lowered close to the pair of base beams **102**A, **102**B. This may optimise an overall package size of the engine **50** and the engine stand **100**, **150** for transportation purposes, thereby increasing

opportunities to reduce transportation costs.
[0071] FIG. **6** is a schematic rear view of a flat-packable engine stand **200**, according to another embodiment of the present disclosure. The engine stand **200** may be substantially similar and functionally equivalent to the engine stands **100**, **150** (shown in FIG. **5**), and same components in this embodiment are referred to by same reference numerals and differences between the embodiments are discussed.
[0072] Specifically, in the illustrated embodiment of FIG. **6**, at least one of the forward support **110** and the rear support **114** further includes a hydraulic pump **128** fluidly coupled to the hydraulic pipe **124**. In some embodiments, the hydraulic pump **128** may be a manually operated pump. In some embodiments, the hydraulic pump **128** may be a powered pump, such as an electric pump. The hydraulic pump **128** is schematically shown in FIG. **6** for the purpose of illustration. In some embodiments, the hydraulic pump **128** may be an integral part of a hydraulic system of the engine stand **100**, **150**.
[0073] In some embodiments, the hydraulic pump **128** may provide pressurized hydraulic fluid **126** to each of the pair of hydraulic rams **122**A, **122**B, thereby allowing the respective telescoping leg **120**A, **120**B to be raised or lowered along a vertical direction S**3** with respect to the pair of base beams **102**A, **102**B. Therefore, a vertical height of the engine **50** on the engine stand **200** may be raised or lowered based on application requirements. This may enable reduction in the overall package size of the engine **50** and the engine stand **200** for transportation purposes. Additionally, this may also enable raising or lowering of the engine **50** during build up or maintenance. Additionally, this may allow raising or lowering of the engine **50** where an engine axis (e.g., the principal rotational axis X-X′ shown in FIG. **1**) requires levelling, e.g., on an uneven floor. Additionally, this may enable a rear end of the engine **50** (e.g., the downstream end **35** shown in FIG. **3**) to be lowered to clear components on a pylon of an aircraft during installation/removal of the engine **50** from a wing of the aircraft.
[0074] FIG. **7** is a schematic rear view of a flat-packable engine stand **300** supporting the engine **50**, according to yet another embodiment of the present disclosure. The engine stand **300** may be functionally equivalent to the engine stands **100**, **150**, **200** (shown in FIGS. **3-6**), and same components in this embodiment are referred to by similar reference numerals and differences between the embodiments are discussed. Although the rear support **114** is visible in FIG. **7**, however, the following description is equally applicable to the forward support **110** since the forward support **110** is substantially similar to the rear support **114**. The teachings in the following description are described with reference to both the forward support **110** and the rear support **114**. The engine **50** is schematically shown in FIG. **7** for the purpose of illustration.
[0075] In some embodiments, at least one of the forward support **110** and the rear support **114** further includes a pair of vertical beams **308**A, **308**B. Each vertical beam **308**A, **308**B includes a first end **304**A and a second end **306**B that is opposite to the first end **304**A. The first end **304**A, **304**B of each vertical beam **308**A, **308**B is directly coupled to the respective forward support member **112**A, **112**B or the rear support member **116**A, **116**B. Specifically, the first end **304**A of the vertical beam **308**A is directly coupled to the respective forward support member **112**A or the rear support member **116**A. Similarly, the first end **304**B of the vertical beam **308**B is directly coupled to the respective forward support member **112**B or the rear support member **116**B.
[0076] At least one of the forward support **110** and the rear support **114** further includes a first linkage **310** pivotally coupled to the second end **306**A of one vertical beam **308**A from the pair of vertical beams **308**A, **308**B. In some embodiments, the first linkage **310** is coupled to one base beam **102**A from the pair of base beams **102**A, **102**B. One telescoping leg **120**A from the pair of telescoping legs **120**A, **120**B is pivotally coupled to and configured to telescopically actuate the first linkage **310**.
[0077] In some embodiments, the one telescoping leg **120**A is indirectly coupled to the respective forward support member **112**A or the rear support member **116**A via the first linkage **310** and the

respective vertical beam **308**A, thereby allowing the one telescoping leg **120**A to actuate the forward support member **112**A or the rear support member **116**A. In some embodiments, one hydraulic ram **122**A from the pair of hydraulic rams **122**A, **122**B is pivotally coupled to the first linkage **310**. Thus, the first linkage **310** may provide support to the one hydraulic ram **122**A. The one hydraulic ram **122**A is operatively coupled to the one telescoping leg **120**A.

[0078] In some embodiments, the first linkage **310** includes a first link **312** pivotally coupled to the second end **306**A of the one vertical beam **308**A and the one telescoping leg **120**A at a first pivot point **314**. Advantageously, the first pivot point **314** may allow the second end **306**A of the one vertical beam **308**A to rotate relative to the one telescoping leg **120**A. In some embodiments, the first linkage **310** further includes a second link **318** pivotally coupled to the first link **312** at a second pivot point **316** spaced apart from the first pivot point **314**. In some embodiments, the second link **318** of the first linkage **310** is coupled to the one base beam **102**A.

[0079] The second link **318** is pivotally coupled to the one hydraulic ram **122**A at a third pivot point **320** spaced apart from each of the first pivot point **314** and the second pivot point **316**. Advantageously, the second pivot point **316** may allow the first link **312** to rotate relative to the second link **318** and the third pivot point **320** may allow the one hydraulic ram **122**A to rotate relative to the second link **318**.

[0080] At least one of the forward support **110** and the rear support **114** further includes a second linkage **330** pivotally coupled to the second end **306**B of the other vertical beam **308**B from the pair of vertical beams **308**A, **308**B. In some embodiments, the second linkage **330** is coupled to the other base beam **102**B from the pair of base beams **102**A, **102**B. The other telescoping leg **120**B from the pair of telescoping legs **120**A, **120**B is pivotally coupled to and configured to telescopically actuate the second linkage **330**.

[0081] In some embodiments, the other telescoping leg **120**B is indirectly coupled to the respective forward support member **112**B or the rear support member **116**B via the second linkage **330** and the respective vertical beam **308**B, thereby allowing the other telescoping leg **120**B to actuate the forward support member **112**B or the rear support member **116**B. The other hydraulic ram **122**B from the pair of hydraulic rams **122**A, **122**B is pivotally coupled to the second linkage **330**. Thus, the second linkage **330** may provide support to the other hydraulic ram **122**B. The other hydraulic ram **122**B is operatively coupled to the other telescoping leg **120**B.

[0082] In some embodiments, the second linkage **330** includes a first link **332** including a first arm **334** and a second arm **336** inclined to the first arm **334**. The first arm **334** is pivotally coupled to the second end **306**B of the other vertical beam **308**B at a first pivot point **338**. The second arm **336** is pivotally coupled to the other telescoping leg **120**B at a second pivot point **340** spaced apart from the first pivot point **338**. Advantageously, the first pivot point **338** may allow the first arm **334** to rotate relative to the second end **306**B of the other vertical beam **308**B and the second pivot point **340** may allow the other telescoping leg **120**B to rotate relative to the second arm **336**.

[0083] In some embodiments, the second linkage **330** further includes a second link **344** pivotally coupled to the first link **332** at a third pivot point **342** spaced apart from each of the first pivot point **338** and the second pivot point **340**. In some embodiments, the second link **344** of the second linkage **330** is coupled to the other base beam **102**B. The second link **344** is pivotally coupled to the other hydraulic ram **122**B at a fourth pivot point **346** spaced apart from each of the first pivot point **338**, the second pivot point **340**, and the third pivot point **342**. Advantageously, the third pivot point **342** may allow the second link **344** to rotate relative to the first link **332** and the fourth pivot point **346** may allow the other hydraulic ram **122**B to rotate relative to the second link **344**.

[0084] FIG. **8** is a schematic side view of a flat-packable engine stand **400** supporting the engine **50**, according to another embodiment of the present disclosure. The engine stand **400** may be functionally equivalent to the engine stands **100**, **150**, **200**, **300** (shown in FIGS. **3-7**), and same components in this embodiment are referred to by similar reference numerals and differences between the embodiments are discussed. The engine **50** is schematically shown in FIG. **8** for the purpose of illustration. In the illustrated embodiment, the engine **50** is the gas turbine engine **10** shown in FIG. **1**. The engine **50** includes various detachable modules, e.g., the engine core **25**, the fan case **27**, etc. Only the forward support member **112**A, the rear support member **116**A, and the vertical beams **132**A are visible in FIG. **8**.

[0085] In some embodiments, the flat-packable engine stand **400** further includes a mid frame **452** including the pair of base beams **102**A, **102**B (shown in FIG. **2**). The engine **50** is supported on the mid frame **452**. The mid frame **452** includes a first end **454** and a second end **456** opposite to the first end **454**. The first end **454** of the mid frame **452** is disposed adjacent to the respective first ends **104**A, **104**B (shown in FIG. **2**) of the pair of base beams **102**A, **102**B. Similarly, the second end **454** of the mid frame **452** is disposed adjacent to the respective second ends **106**A, **106**B (shown in FIG. **2**) of the pair of base beams **102**A, **102**B.

[0086] In some embodiments, the flat-packable engine stand **400** further includes a base frame **460** disposed adjacent to and removably coupled to the mid frame **452**. Thus, the mid frame **452** rests on the base frame **460** while the engine **50** is supported by the mid frame **452**. The base frame **460** incudes a first end **462** and a second end **464** opposite to the first end **462**. The first end **462** of the base frame **460** is disposed adjacent to the first end **454** of the mid frame **452** and the second end **464** of the base frame **460** is disposed adjacent to the second end **456** of the mid frame **452**.

[0087] In some embodiments, the base frame **460** may include arrangements (not shown) such as castors, tie-down rings, etc. to assist the engine stand **400** for engine movement and transportation. The mid frame **452** may disengage with the base frame **460** when required allowing the engine **50** and the mid frame **452** to be separated from the base frame **460**.

[0088] FIG. **9** is a schematic side view of a flat-packable engine stand **500** supporting the engine **50**, according to another embodiment of the present disclosure. The engine stand **500** may be functionally equivalent to the engine stands **100**, **150**, **200**, **300**, **400** (shown in FIGS. **3-8**), and same components in this embodiment are referred to by similar reference numerals and differences between the embodiments are discussed. The engine **50** is schematically shown in FIG. **9** for the purpose of illustration. In the illustrated embodiment, the engine **50** is the gas turbine engine **10** shown in FIG. **1**. The engine **50** includes various detachable modules, e.g., the engine core **25**, the fan case **27**, etc. Only the forward support member **112**A, the rear support member **116**A, and the vertical beams **132**A are visible in FIG. **9**.

[0089] In the illustrated embodiment, the flat-packable engine stand **500** further includes a mid frame **552** including the pair of base beams **102**A, **102**B (shown in FIG. **2**). In some embodiments, the engine stand **500** further includes a base frame **560** configured to engage with the mid frame **552**. Specifically, FIG. **9** illustrates the engine stand **500** where the base frame **560** is engaged with the mid frame **552**. In the illustrated embodiment, the base frame **560** includes a plurality of locator members **566** that are configured to engage the base frame **560** with the mid frame **552**.

[0090] FIG. **10** is a schematic side view of the engine stand **500** supporting the engine **50** where the base frame **560** is disengaged from the mid frame **552**. Referring to FIGS. **9** and **10**, in some embodiments, the base frame **560** includes a plurality of locator members **566** and the mid frame **552** includes a plurality of locator recesses **558** (shown in FIG. **10**) formed in the mid frame **552**. Each locator member **566** from the plurality of locator members **566** is configured to be received within a corresponding locator recess **558** from the plurality of locator recesses **558**, thereby engaging the base frame **560** with the mid frame **552**. The plurality of locator members **566** and the plurality of locator recesses **558** may function to position the base frame **560** relative to the mid frame **552**.

[0091] In the illustrated embodiment of FIGS. **9** and **10**, each locator member **566** is conical shaped. However, it should be noted that the plurality of locator members **566** may have any suitable shape, including, but not limited to, frustoconical shape, cylindrical shape, irregular shape, etc. Further, the plurality of locator members **566** may be made of any suitably rigid and strong material, typically a metal or an alloy.

[0092] FIG. **11** is a schematic rear view of a flat-packable engine stand **600** supporting the engine **50**, according to another embodiment of the present disclosure. Although the rear support **114** is visible in FIG. **11**, however, the following description is equally applicable to the forward support **110**. The engine **50** is schematically shown in FIG. **11** for the purpose of illustration. The engine stand **600** may be functionally equivalent to the engine stands **100**, **150**, **200**, **300**, **400**, **500** (shown in FIGS. **3-10**), and same components in this embodiment are referred to by similar reference numerals and differences between the embodiments are discussed.

[0093] In the illustrated embodiment, the flat-packable engine stand **600** further includes a mid frame **652** including the pair of base beams **102**A, **102**B. In some embodiments, the engine stand **600** further includes a base frame **660** configured to engage with the mid frame **652**. Specifically, FIG. **11** illustrates the engine stand **400** where the base frame **660** is engaged with the mid frame **652**.

[0094] FIG. **12** is a schematic rear view of the flat-packable engine stand **600** supporting the engine **50** where the base frame **660** is disengaged from the mid frame **652**. Referring to FIGS. **11** and **12**, in some embodiments, the base frame **660** includes a plurality of locator members **666** and the mid frame **652** includes a plurality of locator recesses **658** (shown in FIG. **12**) formed in the mid frame **652**. Each locator member **666** from the plurality of locator members **666** is configured to be received by a corresponding locator recess **658** from the plurality of locator recesses **658**, thereby engaging the base frame **660** with the mid frame **652**. The plurality of locator members **666** and the plurality of locator recesses **658** may function to position the base frame **660** relative to the mid frame **652**.

[0095] In the illustrated embodiment of FIGS. **11** and **12**, each locator member **666** is conical shaped. However, it should be noted that the plurality of locator members **666** may have any suitable shape, including, but not limited to, frustoconical shape, cylindrical shape, irregular shape, etc. Further, the plurality of locator members **666** may be made of any suitably rigid and strong material, typically a metal or an alloy.

[0096] Referring to FIGS. **1-12**, the flat-packable engine stand **100**, **150**, **200**, **300**, **400**, **500**, **600** of the present disclosure includes the forward support members **112**A, **112**B and the rear support members **116**A, **116**B that are configured to engage the opposing sides **40** of the engine **50**. Each telescoping leg **120**A, **120**B is configured to actuate the respective forward support member **112**A, **112**B or the respective rear support member **116**A, **116**B. Further, each hydraulic ram **122**A, **122**B is configured to telescopically actuate the respective telescoping leg **120**A, **120**B from the pair of telescoping legs **120**A, **120**B. The hydraulic pipe **124** fluidly communicates the pair of hydraulic rams **122**A, **122**B to each other, allowing a flow of the hydraulic fluid **126** between the pair of hydraulic rams **122**A, **122**B. This may enable the pair of telescoping legs **120**A, **120**B to balance the opposing sides **40** of the engine **50** through exchange of the hydraulic fluid **126**, thereby allowing the engine stand **100**, **150**, **200**, **300**, **400**, **500**, **600** and the engine **50** to be statically determinate. In other words, if the opposing sides **40** of the engine **50** are not in a same vertical position, the engine stand **100**, **150**, **200**, **300**, **400**, **500**, **600** may account for this by exchanging the hydraulic fluid **126** between the pair of hydraulic rams **122**A, **122**B. Specifically, each telescoping leg **120**A, **120**B may allow movement of the respective forward support member **112**A, **112**B or the respective rear support member **116**A, **116**B to balance the opposing sides **40** of the engine **50**. The opposing sides **40** of the engine **50** may automatically balance based on exchange of the hydraulic fluid **126** between the pair of hydraulic rams **122**A, **122**B.

[0097] Additionally, the flat-packable engine stand **100**, **150**, **200**, **300**, **400**, **500**, **600** of the present disclosure utilizes the pair of telescoping legs **120**A, **120**B which ensures that the respective hydraulic ram **122**A, **122**B is exposed to vertical loads only. Thus, the pair of telescoping legs **120**A, **120**B may be capable of withstanding lateral loads when compared to balance beams of current designs, thereby allowing a greater load-share between the forward support **110** and the rear support **114** of the engine stand **100**, **150**, **200**, **300**, **400**, **500**, **600**. This may in turn reduce a

complexity of the engine stand **100**, **150**, **200**, **300**, **400**, **500**, **600**, and therefore, a cost of the engine stand **100**, **150**, **200**, **300**, **400**, **500**, **600**. Furthermore, the hydraulic pipe **124** may not require to be positioned directly beneath the engine **50**, thereby allowing the engine **50** to be lowered close to the pair of base beams **102**A, **102**B. This may optimise an overall package size of the engine **50** and the engine stand **100**, **150**, **200**, **300**, **400**, **500**, **600** for transportation purposes, thereby increasing opportunities to reduce transportation costs.
[0098] It will be understood that the invention is not limited to the embodiments above-described and various modifications and improvements can be made without departing from the concepts described herein. Except where mutually exclusive, any of the features may be employed separately or in combination with any other features and the disclosure extends to and includes all combinations and sub-combinations of one or more features described herein.

Claims

1. A flat-packable engine stand for an engine, the flat-packable engine stand comprising: a pair of base beams spaced apart from each other, each base beam having a first end and a second end that is opposite to the first end; a forward support that straddles the pair of base beams between their respective first ends and their respective second ends, the forward support comprising a pair of forward support members that are configured to engage opposing sides of the engine; and a rear support that straddles the pair of base beams adjacent their respective second ends, the rear support comprising a pair of rear support members that are configured to engage the opposing sides of the engine rear of the forward support; wherein at least one of the forward support and the rear support further comprises: a pair of telescoping legs, wherein each telescoping leg is operatively coupled to and configured to actuate a respective forward support member from the pair of forward support members or a respective rear support member from the pair of rear support members; a pair of hydraulic rams, wherein each hydraulic ram is operatively coupled to and configured to telescopically actuate a respective telescoping leg from the pair of telescoping legs; and a hydraulic pipe fluidly communicating the pair of hydraulic rams to each other, wherein the hydraulic pipe is configured to allow a flow of a hydraulic fluid between the pair of hydraulic rams.
2. The flat-packable engine stand of claim 1, wherein each telescoping leg is directly coupled to and configured to telescopically actuate the respective forward support member or the respective rear support member.
3. The flat-packable engine stand of claim 2, wherein at least one of the forward support and the rear support further comprises: a transverse beam extending between and coupled to the pair of base beams; and a pair of vertical beams extending from opposing ends of the transverse beam towards the pair of forward support members or the pair of rear support members, wherein each vertical beam at least partially and slidably receives therein a respective telescoping leg from the pair of telescoping legs.
4. The flat-packable engine stand of claim 3, wherein each hydraulic ram is received within a respective vertical beam from the pair of vertical beams.
5. The flat-packable engine stand of claim 3, wherein the hydraulic pipe is at least partially received within the transverse beam.
6. The flat-packable engine stand of claim 1, wherein at least one of the forward support and the rear support further comprises: a pair of vertical beams, each vertical beam comprising a first end and a second end that is opposite to the first end, wherein the first end of each vertical beam is directly coupled to the respective forward support member or the rear support member; a first linkage pivotally coupled to the second end of one vertical beam from the pair of vertical beams; and a second linkage pivotally coupled to the second end of the other vertical beam from the pair of vertical beams; wherein: one telescoping leg from the pair of telescoping legs is pivotally coupled to and configured to telescopically actuate the first linkage; and the other telescoping leg from the

pair of telescoping legs is pivotally coupled to and configured to telescopically actuate the second linkage.

7. The flat-packable engine stand of claim 6, wherein: one hydraulic ram from the pair of hydraulic rams is pivotally coupled to the first linkage, the one hydraulic ram being operatively coupled to the one telescoping leg; and the other hydraulic ram from the pair of hydraulic rams is pivotally coupled to the second linkage, the other hydraulic ram being operatively coupled to the other telescoping leg.

8. The flat-packable engine stand of claim 6, wherein the first linkage comprises a first link pivotally coupled to the second end of the one vertical beam and the one telescoping leg at a first pivot point.

9. The flat-packable engine stand of claim 8, wherein the first linkage further comprises a second link pivotally coupled to the first link at a second pivot point spaced apart from the first pivot point, and wherein the second link is pivotally coupled to the one hydraulic ram at a third pivot point spaced apart from each of the first pivot point and the second pivot point.

10. The flat-packable engine stand of claim 6, wherein the second linkage comprises a first link comprising a first arm and a second arm inclined to the first arm, wherein the first arm is pivotally coupled to the second end of the other vertical beam at a first pivot point, and wherein the second arm is pivotally coupled to the other telescoping leg at a second pivot point spaced apart from the first pivot point.

11. The flat-packable engine stand of claim 10, wherein the second linkage further comprises a second link pivotally coupled to the first link at a third pivot point spaced apart from each of the first pivot point and the second pivot point, and wherein the second link is pivotally coupled to the other hydraulic ram at a fourth pivot point spaced apart from each of the first pivot point, the second pivot point, and the third pivot point.

12. The flat-packable engine stand of claim 1, wherein at least one of the forward support and the rear support further comprises a hydraulic pump fluidly coupled to the hydraulic pipe.

13. The flat-packable engine stand of claim 1, further comprises a mid frame comprising the pair of base beams, and a base frame configured to engage with the mid frame.

14. The flat-packable engine stand of claim 1, wherein the engine is a gas turbine engine comprising an engine core that houses at least one compressor and at least one turbine, the engine core having an upstream end and a downstream end, wherein the pair of forward support members are configured to engage the engine core adjacent to the upstream end of the engine core, and wherein the pair of rear support members are configured to engage the engine core adjacent to the downstream end of the engine core.

15. The flat-packable engine stand of claim 1, wherein the engine is a gas turbine engine comprising a fan case housing a fan and an engine core that houses at least one compressor and at least one turbine, wherein the pair of forward support members are configured to engage the fan case, and wherein the pair of rear support members are configured to engage the engine core.