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Seat mounted inboard flight controllers for aircraft pilot seats

Abstract

Seat mounted inboard flight controllers for aircraft pilot seats cause the flight controllers to move with the pilot and copilot seats as the seats are adjusted forward and aft. The flight controllers are tied to the seats and move with the seats via the extenders and flight controller mounting brackets. The two flight controllers are coupled together using a linear bearing. One half of the linear bearing is attached to the inboard side of the flight controller. The other half of the linear bearing attaches to the inboard side of the copilot cyclic flight controller. The flight controllers attach to a mounting bracket that extends down to the extenders that attach to the seats. A complete load path is formed between the pilot and copilot seats that support the flight controllers without mounting anything to the cockpit center column.

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References Cited

U.S. PATENT DOCUMENTS

Patent No.	Issued Date	Patentee Name	U.S. Cl.	CPC
3580636	12/1970	Setto	N/A	N/A
4574651	12/1985	Nordstrom	244/234	G05G 1/01
4763860	12/1987	Vauvelle et al.	N/A	N/A
5137234	12/1991	Sakurai	244/237	B64C 13/0421
5156363	12/1991	Cizewski et al.	N/A	N/A
5769363	12/1997	Griswold	74/553	G05G 9/047
6347770	12/2001	Oyzerskiy et al.	N/A	N/A
8028960	12/2010	Wassenhove et al.	N/A	N/A
8052097	12/2010	Rollet	N/A	N/A
8812177	12/2013	Yates et al.	N/A	N/A
8991770	12/2014	Bandera	N/A	N/A
9056675	12/2014	Yates et al.	N/A	N/A
9452839	12/2015	Chatrenet et al.	N/A	N/A
9764830	12/2016	Yates et al.	N/A	N/A
9908614	12/2017	Cherepinsky et al.	N/A	N/A
10059439	12/2017	Gillett et al.	N/A	N/A
10464662	12/2018	Mercer et al.	N/A	N/A
10689096	12/2019	Lavallee	N/A	B64C 13/06
10829202	12/2019	Haugeberg	N/A	N/A
11117653	12/2020	Covington et al.	N/A	N/A
11167837	12/2020	Taylor	N/A	N/A
11459109	12/2021	Hoover et al.	N/A	N/A
11472535	12/2021	Worsham et al.	N/A	N/A
11498685	12/2021	Hoover et al.	N/A	N/A
11524786	12/2021	Hoover	N/A	N/A
11535373	12/2021	Johnson	N/A	N/A
11577839	12/2022	Hoover	N/A	N/A
2011/0101176	12/2010	Núñez et al.	N/A	N/A
2014/0138492	12/2013	Staagen	N/A	N/A
2019/0359318	12/2018	Guering et al.	N/A	N/A
2022/0363396	12/2021	Rowe et al.	N/A	N/A

FOREIGN PATENT DOCUMENTS

Patent No.	Application Date	Country	CPC
202257277	12/2011	CN	N/A

OTHER PUBLICATIONS

European Search Report received in EP Application No. 24191830, Nov. 8, 2024, 6 pages. cited by applicant

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Background/Summary

TECHNICAL FIELD
(1) The present invention generally relates to seats and more specifically to seats with moveable flight controllers.
BACKGROUND
(2) Helicopters include cyclic and collective flight controls. The cyclic and collective flight controls are fixed to a center column and are not allowed to move when the crew seats move. The pilot must then either reach for the flight control or experience a compacted reach depending on the seats being in fore/aft position relative to the flight controller. Therefore, it would be advantageous to provide a device, system, and method that cures the shortcomings described above.
SUMMARY
(3) An assembly is described. The assembly includes a first set of extenders. The assembly includes a first mounting bracket. The first set of extenders are rigidly coupled to the first mounting bracket. The assembly includes a first flight controller. The first flight controller is rigidly coupled to the first mounting bracket. The assembly includes a second set of extenders. The assembly includes a second mounting bracket. The second set of extenders are rigidly coupled to the second mounting bracket. The assembly includes a second flight controller. The second flight controller is rigidly coupled to the second mounting bracket. The assembly includes a prismatic joint. The first flight controller and the second flight controller are coupled by the prismatic joint. The first flight controller and the second flight controller are configured to translate relative to each other along the prismatic joint.
(4) A load path is maintained from the first set of extenders through the first mounting bracket, the first flight controller, the prismatic joint, the second flight controller, and the second mounting bracket to the second set of extenders.
(5) The first set of extenders, the first mounting bracket, and the first flight controller form a first rigid body. The second set of extenders, the second mounting bracket, and the second controller form a second rigid body.
(6) A first end of the first set of extenders are coupled to the first mounting bracket. A first end of the second set of extenders are coupled to the second mounting bracket.
(7) The first set of extenders are rigidly coupled to a first face of the first mounting bracket. The first flight controller is rigidly coupled to a second face of the first mounting bracket.
(8) The first face of the first mounting bracket is coplanar with the second face of the first mounting bracket.
(9) The prismatic joint is coupled to a side surface of the first flight controller and a side surface of the second flight controller.
(10) The prismatic joint is a linear bearing comprising a roller bracket and a receiver bracket.
(11) The roller bracket is coupled to one of the first flight controller or the second flight controller and the receiver bracket is coupled to a remaining of first flight controller and the second flight controller.

(12) A system is described. The system includes a first inboard floor track. The assembly includes a first seat comprising a first seat frame coupled to the first inboard floor track. The system includes a second inboard floor track. The first inboard floor track and the second inboard floor track are parallel. The system includes a second seat comprising a second seat frame coupled to the second inboard floor track. The system includes an assembly. The assembly includes a first set of extenders. The first set of extenders are rigidly coupled to the first seat frame. The assembly includes a first mounting bracket. The first set of extenders are rigidly coupled to the first mounting bracket. The assembly includes a first flight controller. The first flight controller is rigidly coupled to the first mounting bracket. The assembly includes a second set of extenders. The second set of extenders are rigidly coupled to the second seat frame. The assembly includes a second mounting bracket. The second set of extenders are rigidly coupled to the second mounting bracket. The assembly includes a second flight controller. The second flight controller is rigidly coupled to the second mounting bracket. The assembly includes a prismatic joint. The first flight controller and the second flight controller are coupled by the prismatic joint. The first flight controller and the second flight controller are configured to translate relative to each other along the prismatic joint.
(13) The first seat frame is configured to translate longitudinally along the first inboard floor track independent of the second seat frame. The second seat frame is configured to translate longitudinally along the second inboard floor track independent of the first seat frame.
(14) The first flight controller is configured to translate longitudinally with the first seat frame via the first set of extenders and the first mounting bracket. The second flight controller is configured to translate longitudinally with the second seat frame via the second set of extenders and the second mounting bracket. The first flight controller and the second flight controller remain coupled by the prismatic joint as the first flight controller translates longitudinally with the first seat frame and as the second flight controller translates longitudinally with the second seat frame.
(15) A load path is maintained from the first seat frame, through the first set of extenders, the first mounting bracket, the first flight controller, the prismatic joint, the second flight controller, the second mounting bracket, and the second set of extenders to the second seat frame.
(16) A first end of the first set of extenders are rigidly coupled to the first mounting bracket and a second end of the first set of extenders are rigidly coupled to the first seat frame. A first end of the second set of extenders are rigidly coupled to the second mounting bracket and a second end of the second set of extenders are rigidly coupled to the second seat frame.
(17) The first flight controller and the second flight controller are maintained at a constant height relative each other as the first flight controller and the second flight controller translate relative each other along the prismatic joint.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) Implementations of the concepts disclosed herein may be better understood when consideration is given to the following detailed description thereof. Such description makes reference to the included drawings, which are not necessarily to scale, and in which some features may be exaggerated and some features may be omitted or may be represented schematically in the interest of clarity. Like reference numerals in the drawings may represent and refer to the same or similar element, feature, or function. In the drawings:
(2) FIG. **1**A depicts a left-front isometric view of an assembly, in accordance with one or more embodiments of the present disclosure.
(3) FIG. **1**B depicts a front view of an assembly, in accordance with one or more embodiments of the present disclosure.
(4) FIG. **1**C depicts a right-front isometric view of an assembly, in accordance with one or more

embodiments of the present disclosure.
(5) FIG. **1**D depicts a right-rear isometric view of an assembly, in accordance with one or more embodiments of the present disclosure.
(6) FIG. **1**E depicts a right-front isometric view of an assembly with an inboard pilot flight controller translated forwards relative to an inboard copilot flight controller, in accordance with one or more embodiments of the present disclosure.
(7) FIG. **1**F depicts a left-front isometric view of an assembly with an inboard pilot flight controller translated forwards relative to an inboard copilot flight controller, in accordance with one or more embodiments of the present disclosure.
(8) FIG. **1**G depicts a left-front isometric view of an assembly with an inboard copilot flight controller translated forwards relative to an inboard pilot flight controller, in accordance with one or more embodiments of the present disclosure.
(9) FIG. **1**H depicts a right-front isometric view of an assembly with an inboard copilot flight controller translated forwards relative to an inboard pilot flight controller, in accordance with one or more embodiments of the present disclosure.
(10) FIG. **2**A depicts a left-front isometric view of system including an assembly with an inboard pilot flight controller and an inboard copilot flight controller in an aft position, in accordance with one or more embodiments of the present disclosure.
(11) FIG. **2**B depicts a left-front isometric view of a system including an assembly with an inboard pilot flight controller in a fore position and an inboard copilot flight controller in an aft position, in accordance with one or more embodiments of the present disclosure.
(12) FIG. **2**C depicts a left-front isometric view of system including an assembly with an inboard pilot flight controller and an inboard copilot flight controller in a fore position, in accordance with one or more embodiments of the present disclosure.
(13) FIG. **2**D depicts a left-front isometric view of system including an assembly with an inboard pilot flight controller in an aft position and an inboard copilot flight controller in an fore position, in accordance with one or more embodiments of the present disclosure.
(14) FIG. **2**E depicts a partial right-front isometric view of system including an assembly, in accordance with one or more embodiments of the present disclosure.

DETAILED DESCRIPTION OF THE INVENTION

(15) Before explaining one or more embodiments of the disclosure in detail, it is to be understood that the embodiments are not limited in their application to the details of construction and the arrangement of the components or steps or methodologies set forth in the following description or illustrated in the drawings. In the following detailed description of embodiments, numerous specific details are set forth in order to provide a more thorough understanding of the disclosure. However, it will be apparent to one of ordinary skill in the art having the benefit of the instant disclosure that the embodiments disclosed herein may be practiced without some of these specific details. In other instances, well-known features may not be described in detail to avoid unnecessarily complicating the instant disclosure.
(16) As used herein a letter following a reference numeral is intended to reference an embodiment of the feature or element that may be similar, but not necessarily identical, to a previously described element or feature bearing the same reference numeral (e.g., **1**, **1***a*, **1***b*). Such shorthand notations are used for purposes of convenience only and should not be construed to limit the disclosure in any way unless expressly stated to the contrary.
(17) Further, unless expressly stated to the contrary, “or” refers to an inclusive or and not to an exclusive or. For example, a condition A or B is satisfied by any one of the following: A is true (or present) and B is false (or not present), A is false (or not present) and B is true (or present), and both A and B are true (or present).
(18) In addition, use of “a” or “an” may be employed to describe elements and components of embodiments disclosed herein. This is done merely for convenience and “a” and “an” are intended

to include “one” or “at least one,” and the singular also includes the plural unless it is obvious that it is meant otherwise.

(19) Finally, as used herein any reference to “one embodiment” or “some embodiments” means that a particular element, feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment disclosed herein. The appearances of the phrase “in some embodiments” in various places in the specification are not necessarily all referring to the same embodiment, and embodiments may include one or more of the features expressly described or inherently present herein, or any combination or sub-combination of two or more such features, along with any other features which may not necessarily be expressly described or inherently present in the instant disclosure.

(20) Reference will now be made in detail to the subject matter disclosed, which is illustrated in the accompanying drawings. Embodiments of the present disclosure are generally directed to seat mounted inboard flight controllers for aircraft pilot seats. The flight controllers in the helicopter cockpit move with the pilot and copilot seats as the seats are adjusted forward and aft. Differently sized pilots may adjust the seats while maintaining the flight controllers at a fixed length.

(21) Inboard flight controllers move with the seated occupant when the seat is adjusted forward and aft. The inboard flight controllers are tied to the seats and move with the seats via the extenders and flight controller mounting brackets. The collective flight controller is attached to a mounting bracket on the outboard side. The two flight controllers are coupled together using a linear bearing. One half of the linear bearing is attached to the inboard side of the flight controller. The other half of the linear bearing attaches to the inboard side of the copilot cyclic flight controller. The outboard side of this flight controller attaches to a mounting bracket that extends down to the extenders that attach to the copilot seat. A complete load path is formed between the pilot and copilot seats that support the flight controllers without mounting anything to the cockpit center column. The two seats freely move relative to each other via the linear bearing. The flight controls always move when the seat moves, preventing uncomfortable flight controller handling conditions. The pilot's position relative to the flight controls may be optimized to avoid fatigue.

(22) U.S. Pat. No. 8,052,097, titled “Flying control device for a rotorcraft”; U.S. Pat. No. 11,167,837, titled “Aircraft with outboard throttle quadrant arrangements”; U.S. Pat. No. 9,764,830, titled “Pilot control system with adjustable pedals”; U.S. Pat. No. 9,452,839, titled “Assembly for aircraft cockpit, aircraft cockpit equipped with such assembly and aircraft”; U.S. Pat. No. 11,117,653, titled “System and method for tactile cueing through rotorcraft pilot controls using variable friction and force gradient”; U.S. Pat. No. 4,763,860, titled “Cockpit provided with a lateral control stick adapted to be actuated one-handed and seat for such a cockpit”; U.S. Pat. No. 9,908,614, titled “Crew seat integral inceptor system for aircraft”; U.S. Patent Publication Number 2014/0138492, titled “Integrated seat mounted inceptor”; U.S. Pat. No. 3,580,636, titled “Dual side arm controller”; are incorporated herein by reference in the entirety.

(23) Referring now to FIGS. **1**A-**1**H, an assembly **100** is described, in accordance with one or more embodiments of the present disclosure. The assembly **100** may include one or more components, such as, but not limited to, a set of extenders **102**, set of extenders **104**, mounting bracket **106**, mounting bracket **108**, flight controller **110**, flight controller **112**, prismatic joint **114**, and the like.

(24) The assembly **100** includes the set of extenders **102**. The set of extenders **102** may also be referred to as a first set of extenders or a pilot seat base extender. The set of extenders **102** may include any number of extenders. For example, the set of extenders **102** may have two or more extenders. In some embodiments, the set of extenders **102** are tubes. The set of extenders **102** include an end **120** and an end **122**. The end **120** may also be referred to as a first end. The end **122** may also be referred to as a second end. The end **120** is opposite to the end **122**.

(25) The assembly **100** includes the mounting bracket **106**. The mounting bracket **106** may also be referred to as a first mounting bracket or a pilot seat mounting bracket. The mounting bracket **106** includes a face **124** and a face **126**. The face **124** may also be referred to as a first face. The face

126 may also be referred to as a second face. The face **124** is opposite to the face **126**. The face **124** and the face **126** may also include one or more recesses (not depicted). The recesses may reduce a weight of the mounting bracket **106**. As depicted, the face **124** and the face **126** are coplanar. For example, the mounting bracket **106** may be shaped as a panel.

(26) The set of extenders **102** are coupled to the mounting bracket **106**. The set of extenders **102** are rigidly coupled to the mounting bracket **106**. The end **120** of the set of extenders **102** are coupled to the mounting bracket **106**. The set of extenders **102** are coupled to the face **124** of the mounting bracket **106**. In some embodiments, the end **120** of the set of extenders **102** are coupled to the face **124** of the mounting bracket **106** proximate to a bottom-most surface of the mounting bracket **106**. In some embodiments, the set of extenders **102** are orthogonal to the mounting bracket **106**. For example, a length of the set of extenders **102** between the end **120** and the end **122** is orthogonal to the face **124** of the mounting bracket **106**.

(27) The assembly **100** includes the flight controller **110**. The flight controller **110** may also be referred to as a first flight controller, inceptor (e.g., active inceptor), inboard flight controller, pilot flight controller, inboard pilot flight controller, collective flight controller, inboard collective flight controller, pilot collective flight controller, or the like. The flight controller **110** may include a joystick **128** or the like. The joystick **128** may be a collective joystick. The flight controller **110** is configured to interface with a fly-by-wire system of an aircraft to transmit inputs of the joystick **128** to the fly-by-wire system. The flight controller **110** may include an armrest surface **130**. The armrest surface **130** is a topmost surface of the flight controller **110**. In some embodiments, the flight controller **110** includes a mechanism (not depicted) to adjust a height of the armrest surface **130** relative to the joystick **128**.

(28) The flight controller **110** is coupled to the mounting bracket **106**. The flight controller **110** is rigidly coupled to the mounting bracket **106**. The flight controller **110** is coupled to the face of the mounting bracket **106**. As depicted, a face of the flight controller **110** is coupled to the face **126** of the mounting bracket **106**. The face of the flight controller **110** is coupled to the face **126** of the mounting bracket **106** when the face **124** of the flight controller **110** is coplanar with the face **126** of the flight controller **110** (i.e., when the mounting bracket is shaped as a panel).

(29) Although the face **124** and the face **126** are described as being coplanar, this is not intended as a limitation of the present disclosure. It is further contemplated that the face **126** may be orthogonal to the face **124**. For example, the mounting bracket **106** may be a Γ-shape (e.g., inverse L-shape). In this example, the face **126** is the top surface of the Γ-shape. Similarly, although the face of the flight controller **110** is described as being coupled to the face **126** of the mounting bracket **106**, this is not intended as a limitation of the present disclosure. For example, a bottom surface of the flight controller **110** is coupled to the face **126** of the mounting bracket **106**. The bottom surface of the flight controller **110** is coupled to the face **126** of the mounting bracket **106** where the face **126** of the flight controller **110** is orthogonal to the face **124** of the flight controller **110** (i.e., when the mounting bracket **106** is a Γ-shape). However, it is contemplated that coupling the face of the flight controller **110** to the face **126** of the mounting bracket **106** may be more desirable than coupling the bottom surface of the flight controller **110** to the face **126** of the mounting bracket **106** to reduce the height of the flight controller **110** relative to the set of extenders **102** (and similarly reduce a height of the flight controller **110** within an aircraft).

(30) The set of extenders **102**, the mounting bracket **106**, and the flight controller **110** form a rigid body. Linear translation of any of the set of extenders **102**, the mounting bracket **106**, and the flight controller **110** induces linear translation of a remainder of the set of extenders **102**, the mounting bracket **106**, and the flight controller **110**.

(31) The previous discussion of the set of extenders **102**, the mounting bracket **106**, and the flight controller **110** is incorporated herein by reference in the entirety as to the set of extenders **104**, the mounting bracket **108**, and the flight controller **112** respectively.

(32) The assembly **100** includes the set of extenders **104**. The set of extenders **104** may also be

referred to as a second set of extenders or a copilot seat base extender. The set of extenders **104** may include any number of extenders. For example, the set of extenders **104** may have two or more extenders. In some embodiments, the set of extenders **104** are tubes. The set of extenders **104** include an end **132** and an end **134**. The end **132** may also be referred to as a first end. The end **134** may also be referred to as a second end. The end **132** is opposite to the end **134**.

(33) The assembly **100** includes the mounting bracket **108**. The mounting bracket **108** may also be referred to as a second mounting bracket or a copilot mounting bracket. The mounting bracket **108** includes a face **136** and a face **138**. The face **136** may also be referred to as a first face. The face **138** may also be referred to as a second face. The face **136** is opposite to the face **138**. The face **136** and the face **138** may also include one or more recesses (not depicted). The recesses may reduce a weight of the mounting bracket **108**. As depicted, the face **136** and the face **138** are coplanar. For example, the mounting bracket **108** may be shaped as a panel.

(34) The set of extenders **104** are coupled to the mounting bracket **108**. The set of extenders **104** are rigidly coupled to the mounting bracket **108**. The end **132** of the set of extenders **104** are coupled to the mounting bracket **108**. The set of extenders **104** are coupled to the face **136** of the mounting bracket **108**. In some embodiments, the end **132** of the set of extenders **104** are coupled to the face **136** of the mounting bracket **108** proximate to a bottom-most surface of the mounting bracket **108**. In some embodiments, the set of extenders **104** are orthogonal to the mounting bracket **108**. For example, a length of the set of extenders **104** between the end **132** and the end **134** is orthogonal to the face **136** of the mounting bracket **108**.

(35) The assembly **100** includes the flight controller **112**. The flight controller **112** may also be referred to as a second flight controller, inceptor (e.g., active inceptor), inboard flight controller, copilot flight controller, inboard copilot flight controller, cyclic flight controller, inboard cyclic flight controller, copilot cyclic flight controller, or the like. The flight controller **112** may include a joystick **140** or the like. The joystick **140** may be a cyclic joystick. The flight controller **112** is configured to interface with a fly-by-wire system of the aircraft to transmit inputs of the joystick **140** to the fly-by-wire system. The flight controller **112** may include an armrest surface **142**. The armrest surface **142** is a topmost surface of the flight controller **112**. In some embodiments, the flight controller **112** includes a mechanism (not depicted) to adjust a height of the armrest surface **142** relative to the joystick **140**.

(36) The flight controller **112** is coupled to the mounting bracket **108**. The flight controller **112** is rigidly coupled to the mounting bracket **108**. The flight controller **112** is coupled to the face of the mounting bracket **108**. As depicted, a face of the flight controller **112** is coupled to the face **138** of the mounting bracket **108**. The face of the flight controller **112** is coupled to the face **138** of the mounting bracket **108** when the face **136** of the flight controller **112** is coplanar with the face **138** of the flight controller **112** (i.e., when the mounting bracket is shaped as a panel).

(37) Although the face **136** and the face **138** are described as being coplanar, this is not intended as a limitation of the present disclosure. It is further contemplated that the face **138** may be orthogonal to the face **136**. For example, the mounting bracket **108** may be a Γ-shape (e.g., inverse L-shape). In this example, the face **138** is the top surface of the Γ-shape. Similarly, although the face of the flight controller **112** is described as being coupled to the face **138** of the mounting bracket **108**, this is not intended as a limitation of the present disclosure. For example, a bottom surface of the flight controller **112** is coupled to the face **138** of the mounting bracket **108**. The bottom surface of the flight controller **112** is coupled to the face **138** of the mounting bracket **108** where the face **138** of the flight controller **112** is orthogonal to the face **136** of the flight controller **112** (i.e., when the mounting bracket **108** is a Γ-shape). However, it is contemplated that coupling the face of the flight controller **112** to the face **138** of the mounting bracket **108** may be more desirable than coupling the bottom surface of the flight controller **112** to the face **138** of the mounting bracket **108** to reduce the height of the flight controller **112** relative to the set of extenders **104** (and similarly reduce a height of the flight controller **112** within an aircraft).

(38) The set of extenders **104**, the mounting bracket **108**, and the flight controller **112** form a rigid body. Linear translation of any of the set of extenders **104**, the mounting bracket **108**, and the flight controller **112** induces linear translation of a remainder of the set of extenders **104**, the mounting bracket **108**, and the flight controller **112**.

(39) The assembly **100** includes the prismatic joint **114**. The prismatic joint **114** may also be referred to as a slider, a sliding joint, or the like. The flight controller **110** and the flight controller **112** are coupled by the prismatic joint **114**. The prismatic joint **114** is coupled between the flight controller **110** and the flight controller **112**. The prismatic joint **114** is coupled to a side surface of each of the flight controller **110** and the flight controller **112**. For example, the prismatic joint **114** is coupled to a side surface **144** of the flight controller **110** and to a side surface **146** of the flight controller **112**. The side surface **144** is orthogonal to the armrest surface **130**. The side surface **146** is orthogonal to the armrest surface **142**. The side surface **144** is coplanar with the side surface **146**.

(40) The flight controller **110** and the flight controller **112** are configured to translate relative to each other by the prismatic joint **114**. For example, the prismatic joint **114** may permit rectilinear translation or the like. The prismatic joint **114** constrains the flight controller **110** and the flight controller **112** to one degree-of-freedom relative to each other. The one degree-of-freedom is translation of the flight controller **110** and the flight controller **112** along the prismatic joint **114**. The flight controller **110** and the flight controller **112** are prevented from translating in another axis and from rotating relative to each other. Thus, the flight controller **110** and the flight controller **112** are configured to translate relative to each other along the prismatic joint **114**. For example, the flight controller **110** and the flight controller **112** are configured to rectilinearly translate relative to each other along the prismatic joint **114**.

(41) The prismatic joint **114** supports the flight controller **110** and the flight controller **112**. In particular, the prismatic joint **114** removes a cantilever load or cantilever action from the flight controller **110** and the flight controller **112**. The prismatic joint **114** allows the flight controller **110** and the flight controller **112** to translate linearly relative to each other while maintaining the support.

(42) The assembly **100** maintains a load path from the set of extenders **102** through the mounting bracket **106**, the flight controller **110**, the prismatic joint **114**, the flight controller **112**, and the mounting bracket **108** to the set of extenders **104**. The term load path may refer to a bidirectional transfer of loads through a path. Thus, a load of the flight controller **110** and the flight controller **112** are borne by the set of extenders **102** and the set of extenders **104**. Bearing the load of the flight controller **110** and the flight controller **112** by the set of extenders **102** and the set of extenders **104** is particularly desirable where a pilot leans on or otherwise impacts with the flight controller **110** or the flight controller **112** during a high-g impact event.

(43) In some embodiments, the prismatic joint **114** is a linear bearing. The linear bearing includes a roller bracket **116** and a receiver bracket **118**. As depicted, the roller bracket **116** is coupled to the flight controller **110** and the receiver bracket **118** is coupled to the flight controller **112**. It is further contemplated that the roller bracket **116** may be coupled to the flight controller **112** and the receiver bracket **118** may be coupled to the flight controller **110**. In this regard, the roller bracket **116** is coupled to one of the flight controller **110** or the flight controller **112** and the receiver bracket **118** is coupled to a remaining of flight controller **110** and the flight controller **112**.

(44) In some embodiments, the receiver bracket **118** defines one or more channels. As depicted, the receiver bracket **118** includes two channels. The channels extend along a length of the receiver bracket **118**. In some embodiments, the roller bracket **116** includes one or more rollers. For example, the roller bracket **116** is depicted as including eight of the rollers, although this is not intended to be limiting. The rollers are configured to rotate. The rollers are disposed within the channels of the receiver bracket **118**. The rollers are configured to roll along the channel when the receiver bracket **118** translates relative to the roller bracket **116**.

(45) Although the prismatic joint **114** is described as including the roller bracket **116** and the

receiver bracket **118**, this is not intended as a limitation of the present disclosure. It is contemplated that the prismatic joint **114** may include any form of a linear guide mechanism. For example, the prismatic joint **114** may include, but is not limited to, a linear bearing, a reciprocating ball type linear bearing, a linear bushing, or the like.

(46) Referring now to FIGS. **2**A-**2**E, a system **200** is described, in accordance with one or more embodiments of the present disclosure. The system **200** includes one or more components, such as, but not limited to, the assembly **100**, a set of floor tracks **202**, a set of floor tracks **204**, a seat **206**, a seat **208**, and the like.

(47) The system **200** includes the assembly **100**. The discussion of the assembly **100** is incorporated herein by reference in the entirety.

(48) The system **200** includes the set of floor tracks **202**. The set of floor tracks **202** may also be referred to as pilot floor tracks. The set of floor tracks **202** are coupled to a floor (not depicted) of an aircraft. The set of floor tracks **202** may include any configuration of floor track, such as, but not limited to, an L-track or the like. The set of floor tracks **202** may include an inboard floor track **202***a* and an outboard floor track **202***b*.

(49) The system **200** includes the seat **206**. The seat **206** may also be referred to as a pilot seat. The seat **206** includes one or more components, such as, but not limited to, a seat frame **210**, a seat pan **212**, a seat back **214**, and the like. The seat frame **210** may also be referred to as a seat base. The seat **206** may include two of the seat frames **210**. The two of the seat frames **210** may be referred to as an inboard seat frame and an outboard seat frame. The inboard seat frame is between the outboard seat frame and the seat **208**. The seat frame **210** is coupled to the inboard floor track **202***a*. The seat frame **210** bears the weight of the seat pan **212** and the seat back **214** into the inboard floor track **202***a*. As may be understood, the depiction of the seat **206** is not intended to be limiting.

(50) The seat frame **210** is configured to translate longitudinally (e.g., translate forward and aft) along the inboard floor track **202***a*. For example, the seat frame **210** may slide on the inboard floor track **202***a*. The translation of the seat frame **210** along the inboard floor track **202***a* causes the seat **206** to translate along the inboard floor track **202***a*.

(51) The assembly **100** includes the extenders **102**. The extenders **102** are coupled to the seat frame **210**. The extenders **102** are rigidly coupled to the seat frame **210**. The end **122** of the extenders **102** are coupled to the seat frame **210**. In this regard, the end **120** of the set of extenders **102** are rigidly coupled to the mounting bracket **106** and the end **122** of the set of extenders **102** are rigidly coupled to the seat frame **210**. The extenders **102** are coupled to an inboard face of the seat frame **210**, or in other words, a face of the seat frame **210** closest to the seat **208**. The extenders **102** are coupled to the inboard seat frame of the seat frames **210**.

(52) The seat frame **210**, the set of extenders **102**, the mounting bracket **106**, and the flight controller **110** form a rigid body. Linear translation of any of the seat frame **210** then induces linear translation of the set of extenders **102**, the mounting bracket **106**, and the flight controller **110**. In this regard, the seat frame **210** may be translated along the inboard floor track **202***a*. The set of extenders **102**, the mounting bracket **106**, and the flight controller **110** translate relative to the inboard floor track **202***a* with the seat frame **210**. By coupling the extenders **102** to the seat frame **210**, the flight controller **110** translates longitudinally with the seat frame **210**. The flight controller **110** moves forward and aft with the seat **206**. In this regard, the flight controller **110** may always be reachable by a pilot seated on the seat **206** when the seat frame **210** is translated.

(53) The set of extenders **102**, the mounting bracket **106**, and the flight controller **110** are maintained at a constant height relative to the seat frame **210**. In this regard, the flight controller **110** is maintained at a fixed-height in both the fore configuration and aft configuration.

(54) The discussion of the set of floor tracks **202** and the seat **206** is incorporated herein by reference in the entirety as to the set of floor tracks **204** and the seat **208** respectively.

(55) The system **200** includes the set of floor tracks **204**. The set of floor tracks **204** may also be referred to as copilot floor tracks. The set of floor tracks **204** are coupled to a floor (not depicted) of

an aircraft. The set of floor tracks **204** may include any configuration of floor track, such as, but not limited to, an L-track or the like. The set of floor tracks **204** may include an inboard floor track **204***a* and an outboard floor track **204***b*. The inboard floor track **202***a* and the inboard floor track **204***a* are parallel.

(56) The system **200** includes the seat **208**. The seat **208** may also be referred to as a copilot seat. The seat **208** includes one or more components, such as, but not limited to, a seat frame **216**, a seat pan **218**, a seat back **220**, and the like. The seat frame **216** may also be referred to as a seat base. The seat **208** may include two of the seat frames **216**. The two of the seat frames **216** may be referred to as an inboard seat frame and an outboard seat frame. The inboard seat frame is between the outboard seat frame and the seat **206**. The seat frame **216** is coupled to the inboard floor track **204***a*. The seat frame **216** bears the weight of the seat pan **218** and the seat back **220** into the inboard floor track **204***a*. As may be understood, the depiction of the seat **208** is not intended to be limiting.

(57) The seat frame **216** is configured to translate longitudinally (e.g., translate forward and aft) along the inboard floor track **204***a*. For example, the seat frame **216** may slide on the inboard floor track **204***a*. The translation of the seat frame **216** along the inboard floor track **204***a* causes the seat **208** to translate along the inboard floor track **204***a*.

(58) The assembly **100** includes the extenders **104**. The extenders **104** are coupled to the seat frame **216**. The extenders **104** are rigidly coupled to the seat frame **216**. The end **134** of the extenders **104** are coupled to the seat frame **216**. In this regard, the end **132** of the set of extenders **104** are rigidly coupled to the mounting bracket **108** and the end **134** of the set of extenders **104** are rigidly coupled to the seat frame **216**. The extenders **104** are coupled to an inboard face of the seat frame **216**, or in other words, a face of the seat frame **216** closest to the seat **206**. The extenders **104** are coupled to the inboard seat frame of the seat frames **216**.

(59) The seat frame **216**, the set of extenders **104**, the mounting bracket **108**, and the flight controller **112** form a rigid body. Linear translation of any of the seat frame **216** then induces linear translation of the set of extenders **104**, the mounting bracket **108**, and the flight controller **112**. In this regard, the seat frame **216** may be translated along the inboard floor track **204***a*. The set of extenders **104**, the mounting bracket **108**, and the flight controller **112** translate relative to the inboard floor track **204***a* with the seat frame **216**. By coupling the extenders **104** to the seat frame **216**, the flight controller **112** translates longitudinally with the seat frame **216**. The flight controller **112** moves forward and aft with the seat **208**. In this regard, the flight controller **112** may always be reachable by a pilot seated on the seat **208** when the seat frame **216** is translated.

(60) The set of extenders **104**, the mounting bracket **108**, and the flight controller **112** are maintained at a constant height relative to the seat frame **216**. In this regard, the flight controller **112** is maintained at a fixed-height in both the fore configuration and aft configuration.

(61) The flight controller **110** and the flight controller **112** translate relative to each other. The translation of the flight controller **110** and the flight controller **112** relative to each other is parallel with the translation of the seats along the floor tracks. The seat **206** and the seat **208** independently translate between a fully aft and a fully forward position. The seat frame **210** is configured to translate longitudinally along the inboard floor track **202***a* independent of the seat frame **216**. The seat frame **216** is configured to translate longitudinally along the inboard floor track **204***a* independent of the seat frame **210**.

(62) The flight controller **110** translates with the seat **206**. The flight controller **110** is configured to translate longitudinally with the seat frame **210** via the set of extenders **102** and the mounting bracket **106**. The flight controller **112** translates with the seat **208**. The flight controller **112** is configured to translate longitudinally with the seat frame **216** via the set of extenders **104** and the mounting bracket **108**. In this regard, the flight controllers move when the seats move. The flight controllers are then always at the same position relative to the seat preventing uncomfortable flight controller handling conditions. It is contemplated that moving the flight controller with the seat

may prevent fatigue and increase safety. The assembly **100** allows the pilot and copilot seats to move independently of each other while retaining the prismatic joint **114** between the flight controller **110** and the flight controller **112**.

(63) The seat **206** and the seat **208** can freely move relative to each other via the prismatic joint **114** that couples the flight controller **110** and the flight controller **112**. The flight controller **110** and the flight controller **112** remain coupled by the prismatic joint **114** as the flight controller **110** translates longitudinally with the seat frame **210** and as the flight controller **112** translates longitudinally with the seat frame **216**.

(64) The assembly **100** maintains a load path between the seat frame **210** and the seat frame **216**. In this regard, the seat **206** is connected to the seat **208** by the assembly **100**. All of the load of the assembly **100** is borne into the seat frame **210** and the seat frame **216**. Bearing all of the load of the assembly into the seat frame **210** and the seat frame **216** may be desirable for certification purposes. For example, a complete load path is formed between the pilot and copilot seats that supports the flight controllers without mounting anything to a landing gear cover (not depicted). A load path is maintained from the seat frame, through the set of extenders **102**, the mounting bracket **106**, the flight controller **110**, the prismatic joint **114**, the flight controller **112**, the mounting bracket **108**, and the set of extenders **104** to the seat frame **216**. The loads may then be distributed to the seat tracks **202** and the seat tracks **204**, and subsequently to an airframe.

(65) Each of the seat **206** and the seat **206** may include a lock assembly. The lock assembly may also be referred to as a floor tracking system. The lock assemblies lock each of the seats to the floor track and prevents relative motion of the flight controllers. Either of the lock assemblies may be disengaged to permit translation of the seat relative to the floor track and translation of the flight controllers. For example, the lock assembly may include one or more pop pins or the like. Locking the seat frame to the set of floor tracks then prevents motion of the seat relative to the set of floor tracks.

(66) In some embodiments, the system **100** is housed in a cockpit of an aircraft (not depicted). The aircraft may include a transmission tunnel (not depicted). The transmission tunnel is disposed at a centerline of the cockpit. The transmission tunnel is configured to receive a landing gear or the like. The transmission tunnel may occupy a portion of the space between the mounting bracket **106** and the mounting bracket **108**. The inboard floor tracks are offset from the centerline of the cockpit due to the transmission tunnel. In this regard, the extenders **102** and the extenders **104** may extend from the floor tracks to compensate for the offset in the inboard floor tracks. The length of the set of extenders **102** and the set of extenders **104** is selected to compensate for the offset. It is further contemplated that a length of the extenders may be reduced where the inboard floor tracks are less offset from the centerline of the cockpit.

(67) In some embodiments, the assembly **100** provides sufficient structural rigidity to ensure the flight controller is maintained in position. A pilot may then access the flight controller to control the flight of the aircraft. In some embodiments, the seat and the assembly is configured to withstand a dynamic load of **35**G or greater.

(68) As used herein, a component may be rigidly coupled to another component. The components may be rigidly coupled using any suitable technique, such as, but not limited to, one or more fasteners, a weld, or the like. The components which are rigidly coupled may then form a rigid body with zero-degrees of freedom.

(69) From the above description, it is clear that the inventive concepts disclosed herein are well adapted to carry out the objects and to attain the advantages mentioned herein as well as those inherent in the inventive concepts disclosed herein. While presently preferred embodiments of the inventive concepts disclosed herein have been described for purposes of this disclosure, it will be understood that numerous changes may be made which will readily suggest themselves to those skilled in the art and which are accomplished within the broad scope and coverage of the inventive concepts disclosed and claimed herein.

Claims

1. An assembly comprising: a first set of extenders; a first mounting bracket; wherein the first set of extenders are rigidly coupled to the first mounting bracket; a first flight controller; wherein the first flight controller is rigidly coupled to the first mounting bracket; a second set of extenders; a second mounting bracket; wherein the second set of extenders are rigidly coupled to the second mounting bracket; a second flight controller; wherein the second flight controller is rigidly coupled to the second mounting bracket; and a prismatic joint; wherein the first flight controller and the second flight controller are coupled by the prismatic joint; wherein the first flight controller and the second flight controller are configured to translate relative to each other along the prismatic joint.
2. The assembly of claim 1, wherein a load path is maintained from the first set of extenders through the first mounting bracket, the first flight controller, the prismatic joint, the second flight controller, and the second mounting bracket to the second set of extenders.
3. The assembly of claim 1, wherein the first set of extenders, the first mounting bracket, and the first flight controller form a first rigid body; wherein the second set of extenders, the second mounting bracket, and the second controller form a second rigid body.
4. The assembly of claim 1, wherein a first end of the first set of extenders are coupled to the first mounting bracket; wherein a first end of the second set of extenders are coupled to the second mounting bracket.
5. The assembly of claim 1, wherein the first set of extenders are rigidly coupled to a first face of the first mounting bracket; wherein the first flight controller is rigidly coupled to a second face of the first mounting bracket.
6. The assembly of claim 5, wherein the first face of the first mounting bracket is coplanar with the second face of the first mounting bracket.
7. The assembly of claim 1, wherein the prismatic joint is coupled to a side surface of the first flight controller and a side surface of the second flight controller.
8. The assembly of claim 1, wherein the prismatic joint is a linear bearing comprising a roller bracket and a receiver bracket.
9. The assembly of claim 8, wherein the roller bracket is coupled to one of the first flight controller or the second flight controller and the receiver bracket is coupled to a remaining of first flight controller and the second flight controller.
10. A system comprising: a first inboard floor track; a first seat comprising a first seat frame coupled to the first inboard floor track; a second inboard floor track; wherein the first inboard floor track and the second inboard floor track are parallel; a second seat comprising a second seat frame coupled to the second inboard floor track; and an assembly comprising: a first set of extenders; wherein the first set of extenders are rigidly coupled to the first seat frame; a first mounting bracket; wherein the first set of extenders are rigidly coupled to the first mounting bracket; a first flight controller; wherein the first flight controller is rigidly coupled to the first mounting bracket; a second set of extenders; wherein the second set of extenders are rigidly coupled to the second seat frame; a second mounting bracket; wherein the second set of extenders are rigidly coupled to the second mounting bracket; a second flight controller; wherein the second flight controller is rigidly coupled to the second mounting bracket; and a prismatic joint; wherein the first flight controller and the second flight controller are coupled by the prismatic joint; wherein the first flight controller and the second flight controller are configured to translate relative to each other along the prismatic joint.
11. The system of claim 10, wherein the first seat frame is configured to translate longitudinally along the first inboard floor track independent of the second seat frame; wherein the second seat frame is configured to translate longitudinally along the second inboard floor track independent of the first seat frame.

12. The system of claim 11, wherein the first flight controller is configured to translate longitudinally with the first seat frame via the first set of extenders and the first mounting bracket; wherein the second flight controller is configured to translate longitudinally with the second seat frame via the second set of extenders and the second mounting bracket; wherein the first flight controller and the second flight controller remain coupled by the prismatic joint as the first flight controller translates longitudinally with the first seat frame and as the second flight controller translates longitudinally with the second seat frame.
13. The system of claim 12, wherein a load path is maintained from the first seat frame, through the first set of extenders, the first mounting bracket, the first flight controller, the prismatic joint, the second flight controller, the second mounting bracket, and the second set of extenders to the second seat frame.
14. The system of claim 10, wherein a first end of the first set of extenders are rigidly coupled to the first mounting bracket and a second end of the first set of extenders are rigidly coupled to the first seat frame; wherein a first end of the second set of extenders are rigidly coupled to the second mounting bracket and a second end of the second set of extenders are rigidly coupled to the second seat frame.
15. The system of claim 10, wherein the first flight controller and the second flight controller are maintained at a constant height relative each other as the first flight controller and the second flight controller translate relative each other along the prismatic joint.