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A MOTION ACTIVATED ARTICULATING SEAT (MAAS) - A DYNAMIC CONCEPT FOR COCKPIT SEAT DESIGN IN HIGH PERFORMANCE AIRCRAFT

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FOR THE COMMANDER

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The motion activated articulating seat (MAAS) is a pilot aid in lifting the shoulder/upper torso while flying an aircraft. The MAAS system has the ability to respond rapidly should the pilot require a different shoulder/upper torso position in response to changing mission requirements, such as checking "6". The approach uses a high speed desk top computer, a video camera, a specialized video processing capture board, a set of specifically geometrically designed air bags (three independently functionable) with operational valving, a modified cockpit seat with a 30 degree seat back angle, a flight helmet with identifiable indicators, and an in house developed operating software program. The system has been demonstrated statically and successfully processed head/helmet movements for generating seat motion. The video capture technique is being applied to other laboratory research efforts.

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A Motion Activated Articulating Seat (MAAS)- A Dynamic Concept For Cockpit Seat Design In High Performance Aircraft

BACKGROUND: In air to air combat, it is assumed that the aircraft having the highest agility and G maneuvering capability have a decided tactical advantage over less capable systems. If two aircraft have the same operational flight characteristics there is another area that can influence the outcome; this is the position of the pilot in his seat. One of the most effective techniques for increasing man's tolerance to +Gz sustained acceleration is the use of reclined seats. Such seats, if properly designed, markedly decrease the effective length of the hydrostatic column of blood between the heart and the eyes, consequently reducing the pressure required to maintain retinal and cerebral perfusion.

To date, no design for such a seat has taken into account the fundamental objection voiced by fighter pilots to the effect that reclined seats do not permit them aftward vision into the plane normal to the lift vector of their aircraft. When seated in a radically reclined seat, rotating the head and torso (in order to look aft) results in an intrapupillary plane that is tilted away from vertical by an amount approximately equal to the back angle of the seat. Thus, in order to look into the required plane, the head must be rotated in the forward direction relative to the aircraft longitudinal axis while simultaneously rotated to the left or right. Unfortunately this is physically impossible.

A number of attempts have been made to improve mobility in a reclined seat. A Restraint and Mobility Test Fixture (RMTF) has been built with a swiveling back pan to make it easier to rotate the torso in a reclined position. Unfortunately, this concept does nothing to improve aftward vision.

PURPOSE: To evaluate the concept of a nonintrusive motion activated shoulder/upper torso articulating high performance cockpit seat.

OBJECTIVE: To develop a MAAS capable of rapidly shifting the pilot's shoulder position in response to changing mission requirements. In air combat, the ability of the pilot to check "6" may be enhanced with the assistance of a shoulder lift device. In either flying to a mission or in an air/ground engagement the operator may desire an upper torso aid.

APPROACH: Involved the use of a system, driven by a 386 computer, which consisted of a video camera, a specialized video processing capture board, a set of specifically geometrically designed air bags (3 independently functionable) with operational valving, a modified cockpit seat with a 30 degree back angle, a flight helmet with identifiable indicators, and an in house developed operating software program.

RESULTS Dynamic testing of the total integrated system demonstrated the ability of this methodology to respond to the shoulder/upper torso lift demands of the user. The video capture technique using head position detection was successful and an Air Force invention and patent have been applied for. The video capture technique is also being used in another laboratory application. This technology may be used in future reclined/articulating seat research at AAMRL and at USAFSAM.

CONCLUSIONS The use of this technology requires no verbal or manual input from the pilot (two channels which are often oversaturated and cannot be used). Helmet motion is used to trigger the system. Thus, a system has been demonstrated which can afford the pilot increased operational capability during mission accomplishment with minimal increase in workload.