

## PILOT'S CONTROL STICK ASSEMBLY



YF-22A control stick assembly

GEC Avionics Combat Aircraft Controls Division (CACD) is a world leader in the design, development and manufacture of high integrity, full authority Fly-By-Wire (FBW) Control Stick Assemblies (CSA's), for both side and centre console configurations.

Replacing the conventional mechanical stick, the pilot's control stick assembly forms an integral part of the Flight Control System (FCS). The CSA converts the pilot's pitch and roll demands into electrical or optical signals which are processed by the Flight Control Computer to drive the aircraft control surfaces.

The force/displacement and damping parameters of the CSA are provided by spring and damper assemblies in each axis and can be specified to create the required feel characteristics. Mass balancing can also be specified to minimise stick movement caused by aircraft acceleration. Isolated multiplex output signals for pitch and roll are generated by Linear Variable Differential Transformer (LVDT) position sensors incorporated within the unit. Alternatively, optical position sensors may be fitted if required.

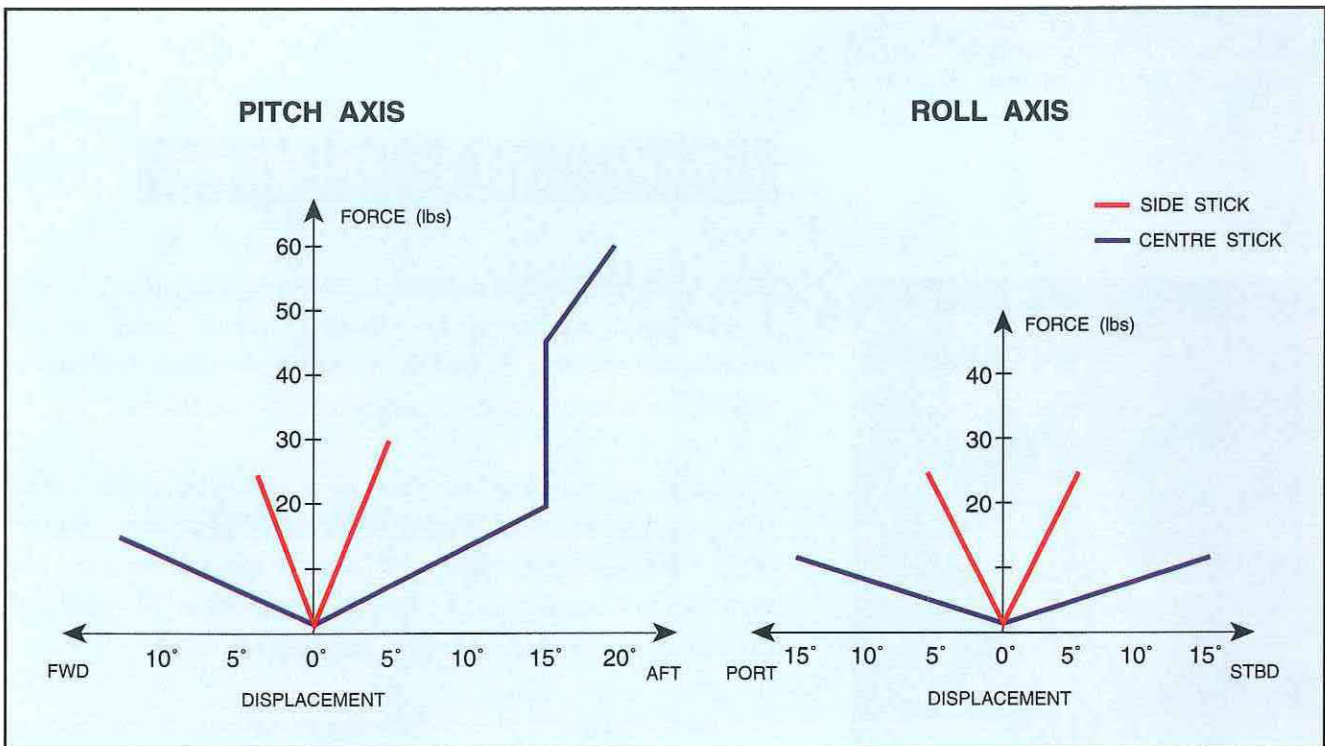
The CSA's are designed as compact Line Replaceable Units (LRU's) of modular construction to enable rapid installation and removal from the aircraft and to facilitate easy maintenance and repair. By careful choice of materials the strength/weight ratio of the units is optimised to meet aircraft weight constraints yet provide the robustness to withstand pilot applied loads in excess of 200lb and still give reliable precision manoeuvring throughout the flight envelope and life of the aircraft.

Recent programmes for which CACD has supplied CSA's include:

- ❑ **Centre stick for the British Aerospace Experimental Aircraft Programme (EAP) demonstrator aircraft.**
- ❑ **Side stick for the YF-22A, USAF Advanced Tactical Fighter (ATF).**
- ❑ **Centre stick for the USN A-12, Advanced Tactical Aircraft (ATA).**
- ❑ **Centre Stick Sensor and Interface Control Assembly (SSICA) for the European Fighter Aircraft (EFA) (Consortium leader).**



EAP centre stick



The above figure gives typical force displacement characteristics, for both centre and side sticks.



A-12 centre stick

The choice between centre stick and side stick depends largely on the space envelope available, weight restriction, required g-resistance and pilot preference.

In general the side stick configuration is lighter and smaller than the centre option with a shorter stick. The stick requires only small displacements produced by pilot wrist action to generate pitch and roll demands.

The longer, conventionally positioned centre stick is more familiar to pilots allowing operation with one or both hands. The centre stick displacement angles tend to be larger than those of a side stick and an additional feature of an aft "soft stop" is sometimes incorporated. This serves as a limit during normal flight manoeuvres but can be overridden in an emergency by the application of increased force to give further pitch aft input.

All CSA's can be customised to provide the displacement, force, damping and mass balancing performance to meet with specific customer and aircraft requirements.



**GEC AVIONICS**  
Combat Aircraft Controls Division

This brochure is intended only to give a general impression of the products and services which are available and none of the descriptions contained herein shall form part of any contract.

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