## SPECIFICATIONS OF FIRE CONTROL SYSTEM

The Fire Control System of Kavach Mod II plays a pivotal role in controlling the rotation of the launchers and firing of selected chaff rockets from the launcher tubes. It is required to interface with other systems onboard the ship to collect various ship and target data on a continuous basis. The RPY effects of the ship have to be neutralized so that the chaff can be deployed at the desired location without any positioning errors.

The following is the block diagram of Fire Control System:
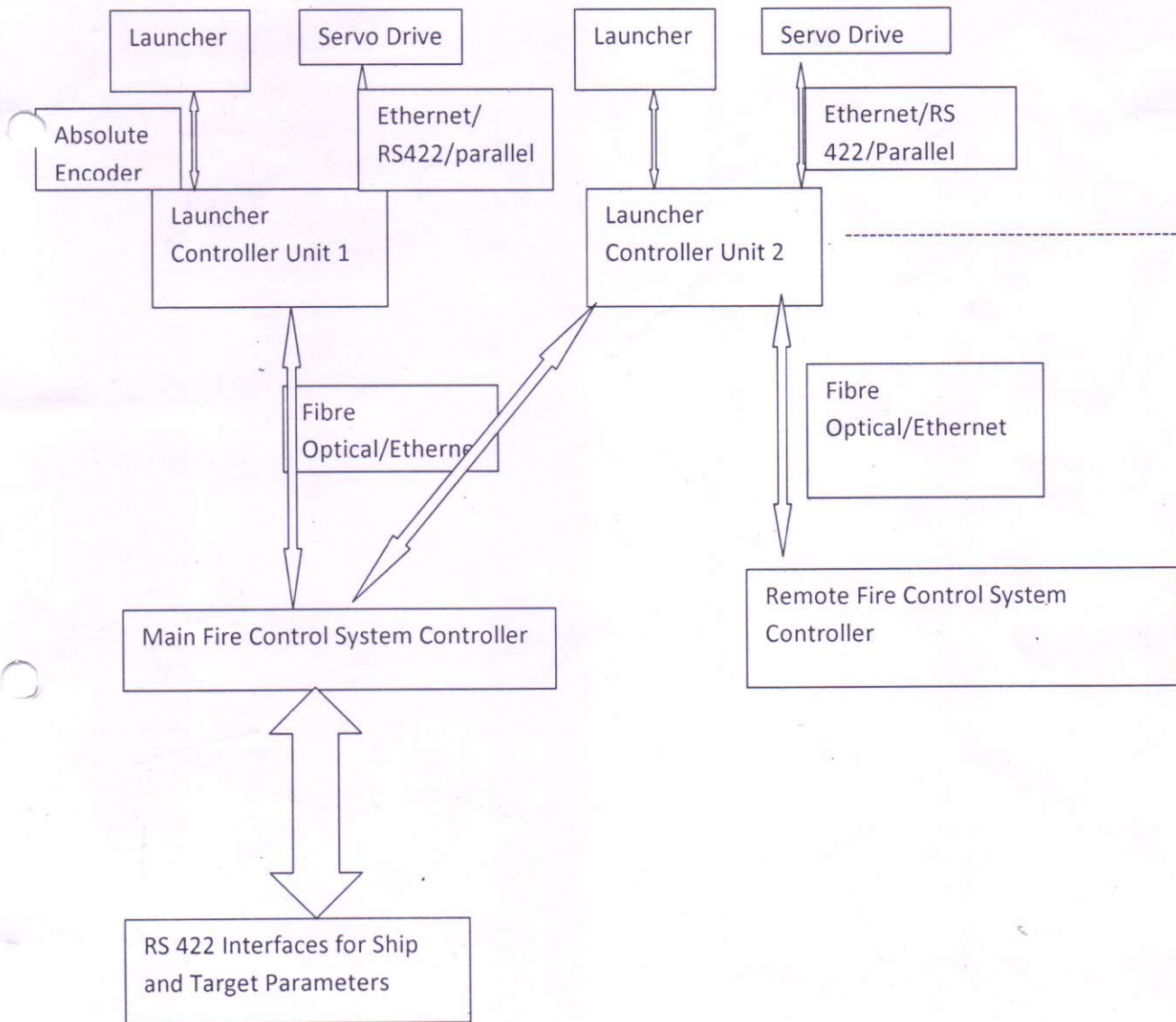
Interface Requirements:

The interface requirements for the FCS are as under
a) Ship Data, Target data: RS 422
b) Servo Drive: Ethernet/RS422/Parallel
c) Main Fire Control System Controller to Launcher Controller Unit: Fibre Optical/Ethernet
d) Launcher Controller Unit to Launcher: Parallel
The part numbers for the panel end connectors to be selected based on the cable end connectors the details of which are attached as annexure-'A'.

HARDWARE REQUIREMENTS:

The hardware may be divided into two parts:
a) Launcher end (Launcher Controller Unit)
b) Operator end (Main Fire Control System Controller, Embedded Controller Unit).

Launcher end Requirements:
i) Controller:
a) As the launcher end controller interfaces with the Servo Drive on Ethernet interface/RS422, the launchers on Parallel Interface and the Operator end Controller over Fibre Optical/Ethernet interfaces, with data rates on a per second basis, a real time controller/FPGA would be required.
b) The system should be capable of accepting the positional feedback from the launchers through an absolute encoder.
c) The controller should be capable of handling the rocket status and firing of 16 numbers of barrels independently.
d) The controller should be able to communicate with the Servo Drive for BITE, Diagnostics, Enable/Disable, speed control and positioning based on the input received from the operator end controller.
e) The status of the launchers and the servo drives to be made available to the operator end controller on query basis and fixed interval basis.
f) The firing supply required for SR rockets is 12V±1% @ 1A and for LRMR is 24V±1% @ 1A. Both supplies to be made available and the desired supply to be software configurable.
g) The controller should be able to sense the end limit switches (electrical limits) so that the launchers do not go beyond the limits.

ii) Power Supply Unit:
a) The Power Supply Unit for the Launcher End Controller should be capable of operating @ 230V AC and 24V DC supply when both or either of them is available without any manual change over from AC to DC or vise versa
b) Adequate protection against short circuiting, over load, high voltage and low voltage have to be provided.
c) Standard power supply units which are readily available in the market off the shelf to be used instead of custom built power supplies.

Operator end (Main Fire Control System Controller, Embedded Controller Unit).

i) Controller:

a) Embedded Controller with high clock speeds upto 2 GHz for real time applications

b) Memory storage not less than 8 GB

c) Should be capable of interfacing other ship systems for data on RS 422 and the launcher end controller on Fibre optical/Ethernet Interface.

d) Standard Embedded Controller cards to be used instead of custom designed cards for easy availability of spares.

e) The Embedded Controller Card may have a plug-in for additional hardware i.e RS422 to RS232 and Fibre Optical to RS 232 or Ethernet extension

f) Should be capable of handling data from the ship systems and the launcher end controllers simultaneously.

ii) Power Supply Unit:

a) The Power Supply Unit for the Operator end Controller should be capable of operating @ 230V AC and 24V DC supply when both or either of them is available without any manual change over from AC to DC or vice versa

b) Adequate protection against short circuiting, over load, high voltage and low voltage have to be provided.

c) Standard power supply units which are readily available in the market off the shelf to be used instead of custom built power supplies.

Operator Console and Display

a) 20 inch LCD Display (min)

b) Backlit key board

c) Operator Panel to be similar to DMFC, with a small touch screen, night light, illuminated push button switches, flap based firing switch etc.

Software Requirements

a) RTOS based operating system preferably Linux

b) The User Interface GUI should be User Friendly, Modular, Menu based spread across multiple windows.

c) Logs of firing to be made available.

d) Configuration based software to be developed instead of hard coding.

e) Multi threading, Event based and interrupt driven approaches to be followed.

f) All the diagnostics of the Servo Drive and the launchers to be made available in different screens during BITE as well as on query

g) Should be capable of loading the bit file into the respective launcher end controllers from the operator end console.

h) All Warnings regarding MOL, Blind Sectors should be indicated by software as well as a LED on the operator hardware console

Functional and Operational Requirements of the Fire Control System:

a) The launcher positioning error should be less than 1 degree

b) Should be capable of firing the rockets in 3 modes

i) Centroid-SR

ii) Distraction-MR

iii) Confusion-LR

c) Update rate is 1 second or less.

Qualification requirements:

a) EMI/EMC as per MIL 461C/D or higher

b) ESS as per DQAN guidelines issued in 2013 (enclosed)

List of Deliverables.

a) Fire Control System

b) Simulators for various ship inputs

c) Firing test jig

d) Manuals

List of Spares:

a) Embedded Controller Unit-1 no

b) Power supply unit-CU-1no

c) Data Aquisition and Interface Unit-1no

d) Launcher Controller unit-2 nos

e) Power supply unit-LCU-2nos