REPORT NO. 72/System 11/34

FIRE AND OVERHEAT DETECTION

S.H. BROWN SEPT.'57

A. V. ROE CANADA LIMITED
MALTON - ONTARIO

~~CONFIDENTIAL~~ UNCLASSIFIED

TECHNICAL DEPARTMENT (Aircraft)

AIRCRAFT:

REPORT No. 72/System 11/34

FILE No.

NO. OF SHEETS: 2

TITLE:

FIRE AND OVERHEAT DETECTION

Classification cancelled/changed to .....
by authority of .....
Signature .....
(date) .....
Rank .....

UNCLASSIFIED

PREPARED BY S.H. Brown DATE Sept.'57.

CHECKED BY DATE

SUPERVISED BY DATE

APPROVED BY C.S.R. Marshall DATE Sept.'57.

ISSUE No.	REVISION No.	REVISED BY	APPROVED BY	DATE	REMARKS

~~CONFIDENTIAL~~ UNCLASSIFIED

FORM 1316A

AIRCRAFT:	FIRE AND OVERHEAT DETECTION.	PREPARED BY	DATE
		S.H. Brown	Sept.1957
		CHECKED BY	DATE

The following are the requirements

1. Fire Detection - Both engine compartments
   - Compartment between the engines (Hydraulics Bay)

2. Overheat Detection - Both engine compartments
   Compartment between the engines
   Joint leakage Air Cond. engine bleed lines.

To obtain a combination of overheat and fire detection system for Engine Compartments and the compartment between the engines a continuous wire detection system is proposed. The detection element would be installed similar to the Arrow I installation. To obtain the combination of overheat and fire warning a different control box would be necessary with two signal outputs i.e. one for overheat and the second for fire. The two circuits in the control box monitor the same sensing element. The overheat alarm would only be activated when the dropping resistance of the element reached a fixed signal setting for an overheat condition. The fire circuit, in addition to responding to the fixed setting for fire would also activate the fire alarm if the rate of change of temperature was of sufficient magnitude (representing a fire) providing the temperature was above the maximum ambient.

The joint leakage sensing for the Air Conditioning engine bleed lines will utilize either the point sensing system (thermostats) or continuous wire similar to the overheat detection quoted above. Tests will be conducted at Avro to decide which is the better of the two systems for detecting leakage at the joints.

A master warning system is incorporated in the Arrow A/C with two master lights (Red and Amber) positioned on the Pilot's main instrument panel. A separate indication panel housing the individual indicators is located on the Pilot's right hand forward console. Three separate combination switch and red indicator lights are positioned on the left hand console for fire indication in the right engine, left engine and Hydraulic bay compartments.

We propose to supply the master Amber warning together with an individual warning on the right hand panel for overheat conditions in the engine compartments and the compartment

between the engines and for a leakage warning on the air conditioning engine bleed lines, and the master Red warning together with an individual red indicator light on the left hand console for fire indication.

There is a condition in the master warning system whereby both the Master Red and Master Amber illuminate simultaneously. This condition applies when simultaneous or consecutive failure of the two flying control hydraulic systems occurs.

A Master Red Indication only - Fire - look to left to determine zone.

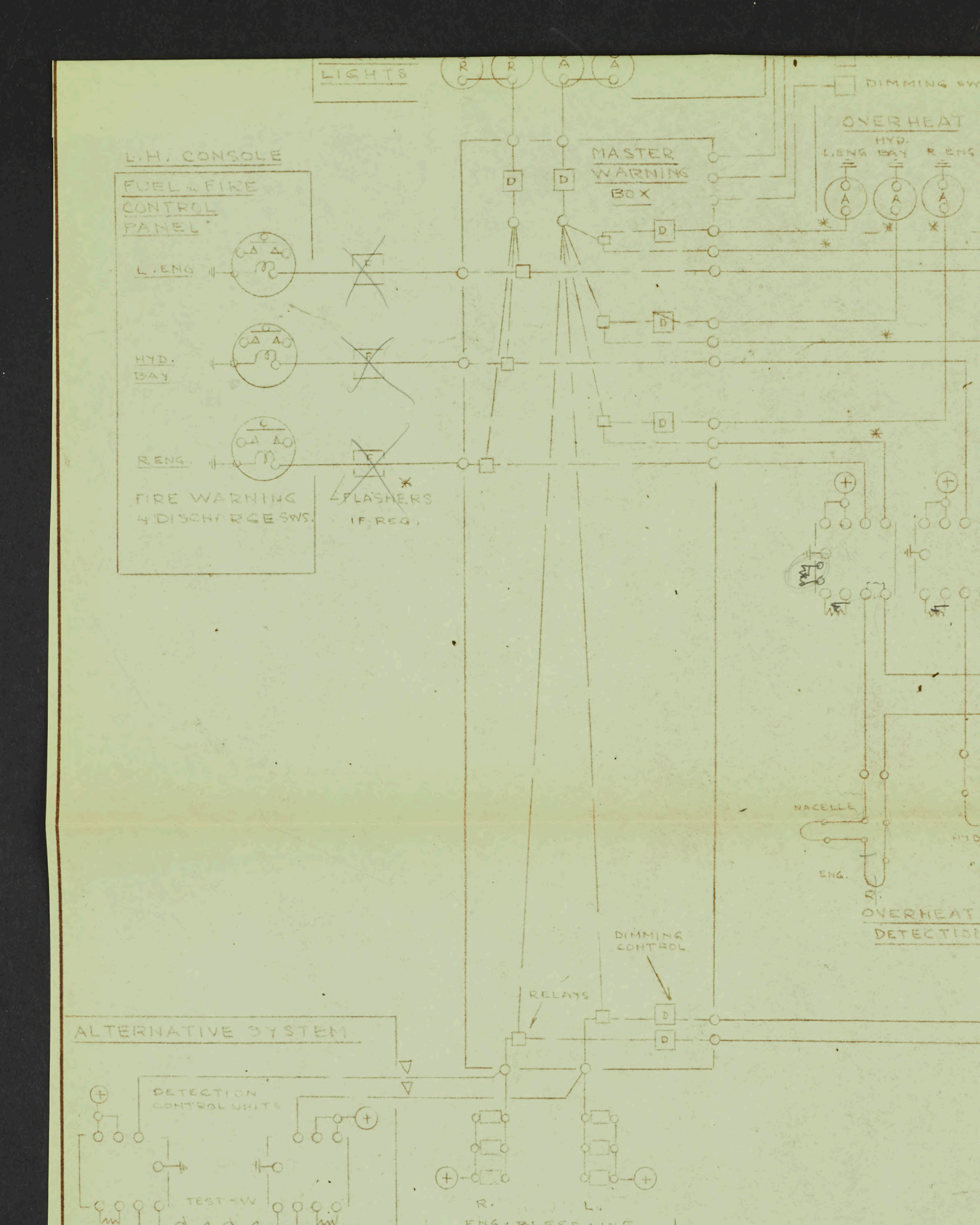
A Master Amber Indication only or both masters illuminated simultaneously - look to right to determine cause of indication.

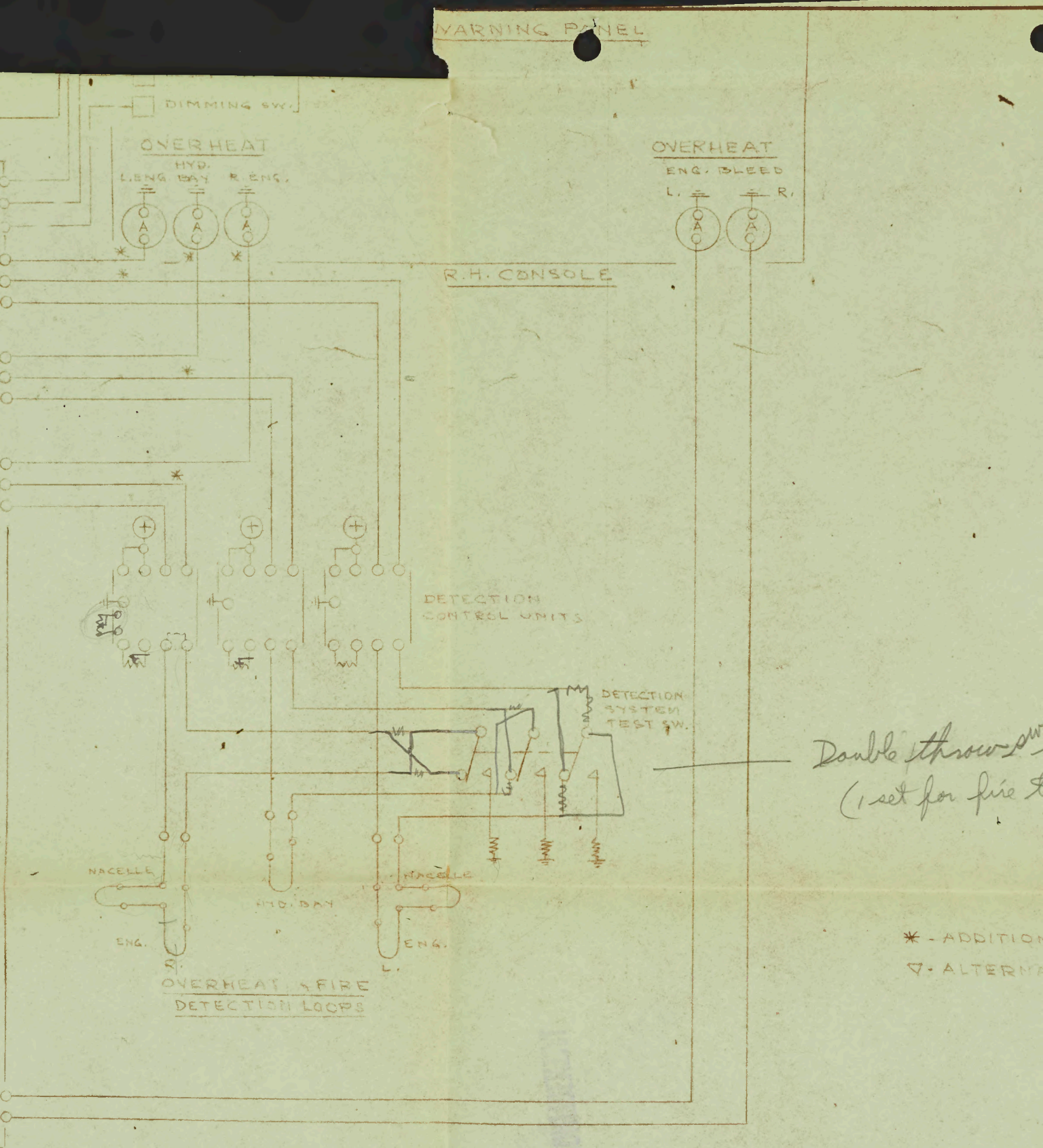
An additional feature of the combination overheat and fire indication system is that if the rate of rise in temperature is relatively slow the overheat warning will activate at its predetermined point and, if the temperature continues to rise, remain on until the point is reached where the fire signal is given at which time the overheat signal is cut out. If the rate of temperature rise, when above maximum ambient, is fast enough the fire alarm is activated as soon as the first signal setting is reached. The overheat signal is bypassed and does not appear.

It has been indicated that we consider a flashing signal for fire, however, we have not proposed a flashing red in the foregoing due to the unreliability of the flasher units used in warning circuits and it is felt that the Master warning light is sufficiently eye-catching to render flashing lights unnecessary.

If the R.C.A.F. are not in agreement with this thinking and prefer a flashing light then we would recommend the flasher be installed in the individual red fire warning lines as these three lights are not dimmed by the master dimming switch. We would definitely not recommend a flasher in the master red circuit for the following reasons:-

The complication in circuitry to supply only the fire signal flashing on the master red and still retain a continuous signal on the master red in the event of a double flying control hydraulic failure and the complication in circuitry to make the flasher operate when dimming has been selected (A series parallel combination of resistors are necessary to ensure the flasher retains the same current flow for operation during dimming).

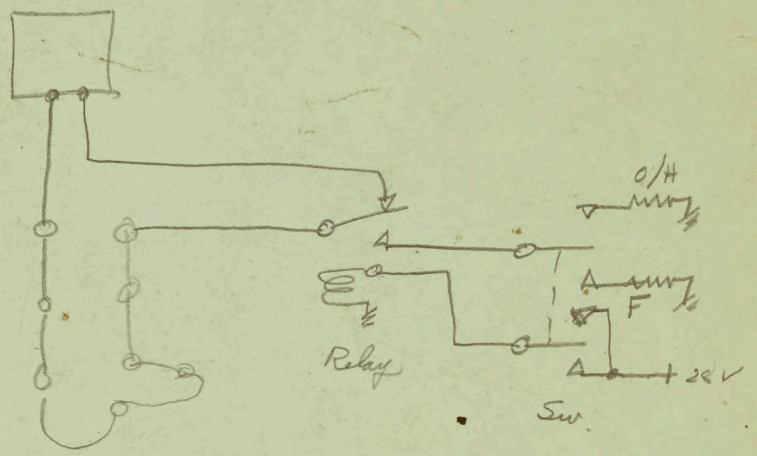

LIGHTS
R
R
A
A
DIMMING SY
OVERHEAT
HYD.
L.ENG
BAY
R.ENG
L.H. CONSOLE
FUEL & FIRE
CONTROL
PANEL
MASTER
WARNING
BOX
D
L.ENG
HYD.
BAY
R.ENG
FIRE WARNING
& DISCHARGE SWS.
FLASHERS
IF REQ.
NACELLE
ENG.
OVERHEAT
DETECTION
DIMMING
CONTROL
RELAYS
ALTERNATIVE SYSTEM
DETECTION
CONTROL UNITS
TEST SW
R.
L.


WARNING PANEL
DIMMING SW.
OVERHEAT
HYD.
L. ENG
BAY
R. ENG.
OVERHEAT
ENG. BLEED
L.
R.
R.H. CONSOLE
DETECTION
CONTROL UNITS
DETECTION
SYSTEM
TEST SW.
Double throw SW
(1 set for fire
NACELLE
MID. BAY
NACELLE
ENG.
ENG.
OVERHEAT & FIRE
DETECTION LOOPS
* - ADDITION
▽ - ALTERNA

OVERHEAT

ENG. BLEED

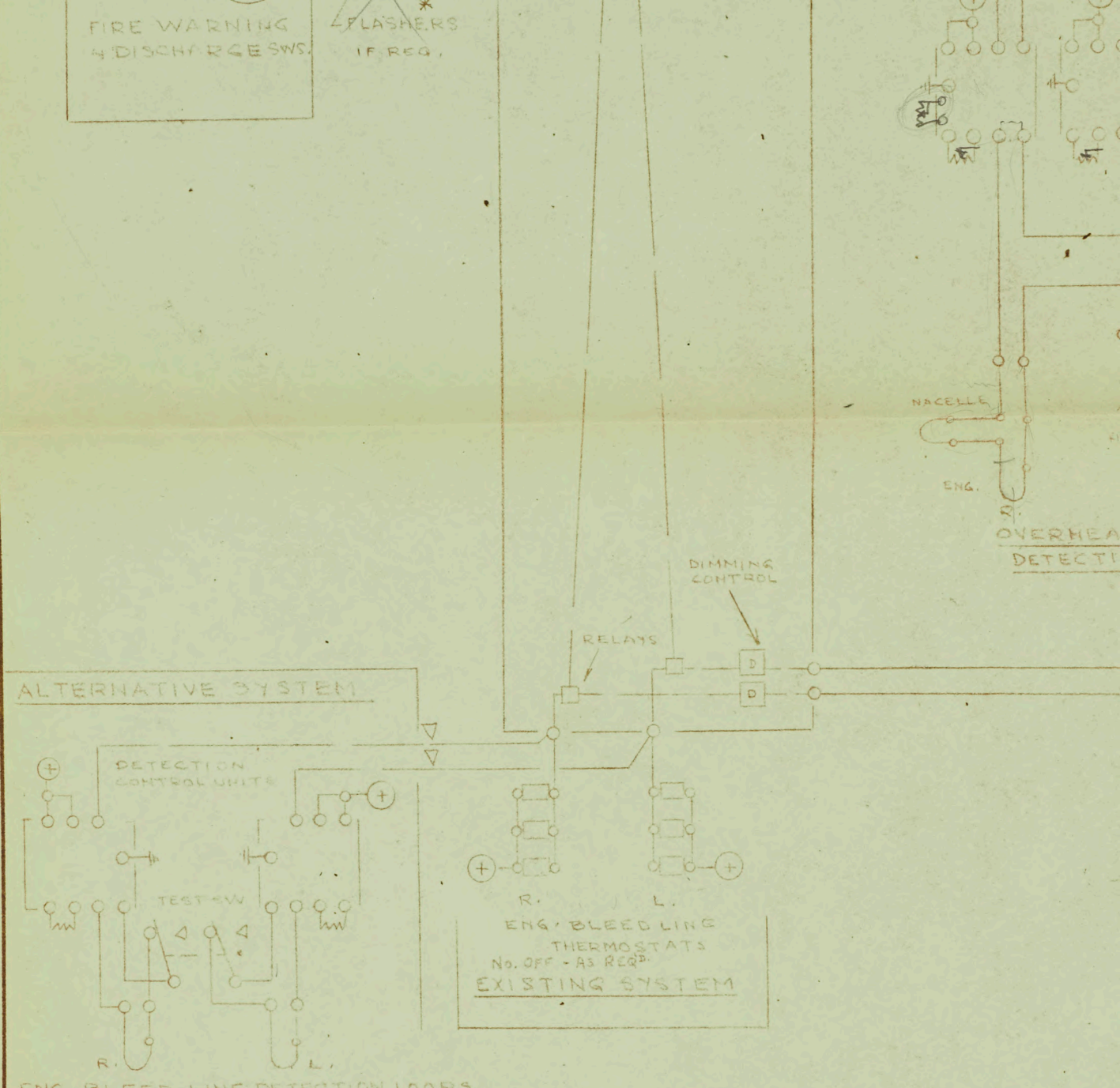
L. R.



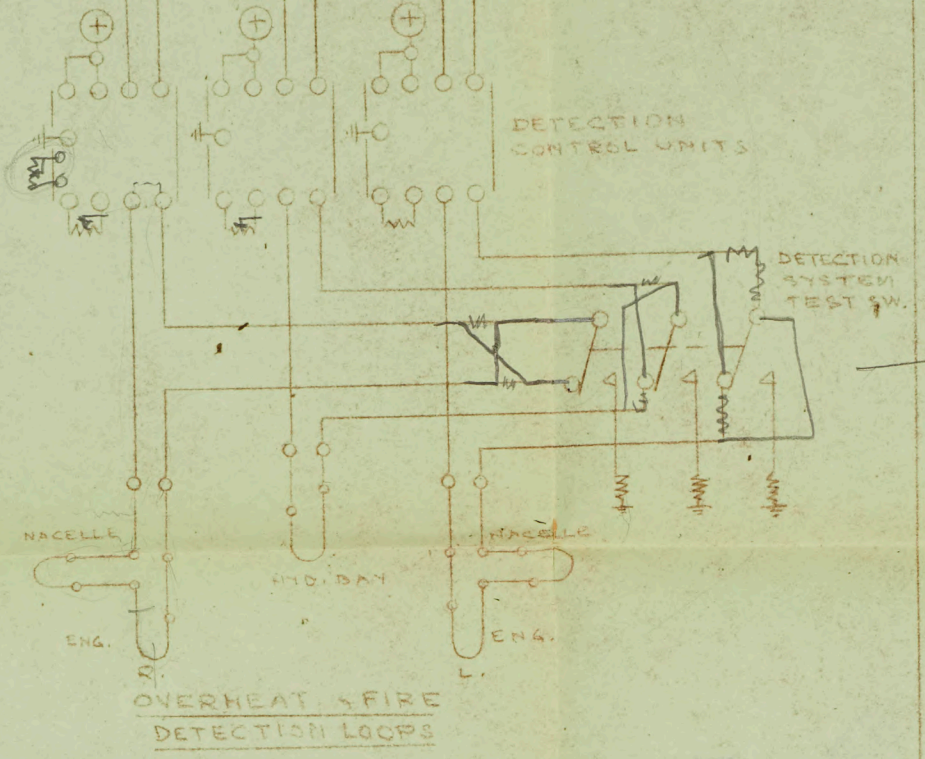
Double throw sw with 2 sets resistors
(1 set for fire test, 1 set for overheat test)

* - ADDITIONS

▽ - ALTERNATIVE



									A	ISSUE No.
										MOD. No.
										E.R.N. No.
									E. WYLIE	DRAWN BY
									AUG. 6 1957	DATE
									SAB	CHECKED
										STRENGTH APP.
										DESIGN APP.



Double throw SW wit
(1 set for fire test

* - ADDITIONS
▽ - ALTERNAT

REF.	PART No.	DESCRIPTION	L.H. UNIT No.	R.H. OFF	DESC FIN

DRAWING PARTS

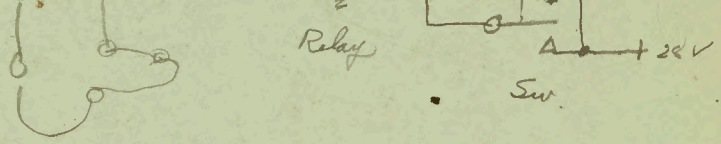
(A)	ISSUE No.
	MOD. No.
	E.R.N. No.
E. WYLIE	DRAWN BY
AUG. 6 1957	DATE
SHD	CHECKED
	STRENGTH APP.
	DESIGN APP.

REFERENCE DRAWINGS	
DWG. No.	DESCRIPTION

DESCRIPTION

FIRE & OVERHEAT PROTECT
SYSTEMS

AVRO AIRCRAFT LI
MALTON ONTA



DETECTION SYSTEM TEST SW.

Double throw SW with 2 sets resistors
(1 set for fire ~~test~~, 1 set for overheat ~~test~~)

* - ADDITIONS
▽ - ALTERNATIVE

DESCRIPTION	L.H.	R.H.	DESCRIPTION	SPEC^{N}—COND^{N}	LOFT REF.	EST.	ACT.

UNIT No. OFF — FINISHED PART SPECIFICATION — WEIGHT/PART LB.

DRAWING PARTS LIST

TARGET WEIGHT LB.

DESCRIPTION

FIRE & OVERHEAT PROTECTION SYSTEMS

SCALE

FINISH TO DWG.

LIMITS UNLESS NOTED

TYPE/MARK	SHOWN ON DRAWING
ARROW 2	

DRAWING NUMBER

AVRO AIRCRAFT LIMITED
MALTON ONTARIO

72 SYSTEM 1134