CF-105 SERVICE DATA

R-Theta
Navigation-Computer

CONFIDENTIAL

CF-105 SERVICE DATA

52

ELECTRONICS

R-THETA NAVIGATION COMPUTER

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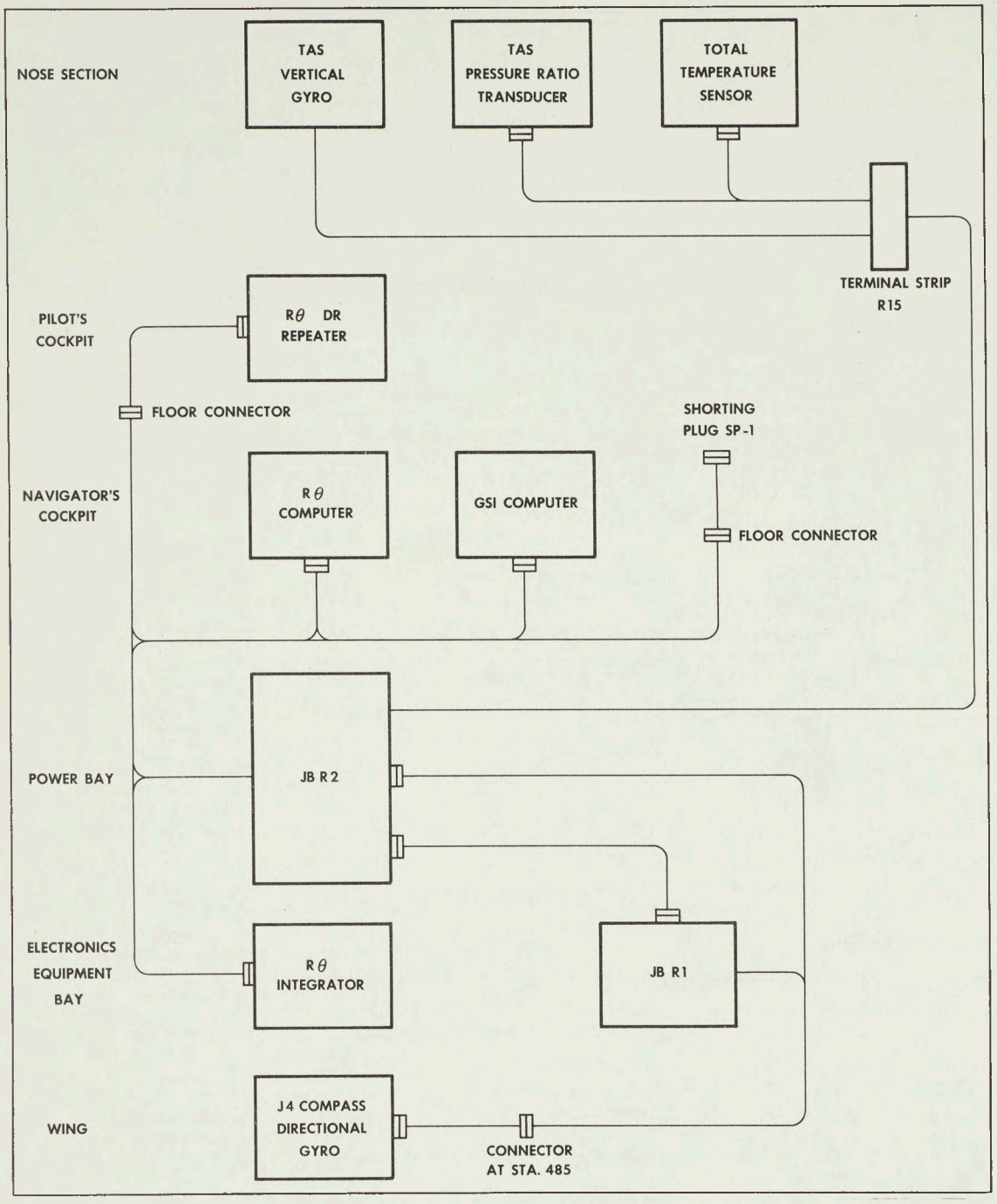

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FIG. 1 R-THETA NAVIGATION COMPUTER - GENERAL ARRANGEMENT

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SYSTEM DATA SHEET

SYSTEM	SUB-SYSTEM	AIRCRAFT EFF'TY	REF. NO.
ELECTRONICS	R-THETA NAVIGATION COMPUTER	25201	13-3

DESCRIPTION

General

1. The R-Theta (R - range, Theta - bearing) Navigation Computer System indicates continuously, irrespective of the aircraft track, the true bearing of and the direct distance in nautical miles to a reference point. The indicated distance is limited to 999 miles after which the system must be reset to a new reference point. In addition, during flight any point can be selected as an alternative reference, in which case the system will indicate the true bearing of, and direct distance to, the alternative reference point.

2. The system utilizes heading information supplied by the J4 Compass System but is otherwise independent of radio or other aids. However, provision is made to utilize such aids if required. In addition to the heading information supplied by the J4 Compass System, the computer requires the following information to compute the position of the aircraft:

(a) True Airspeed (supplied by TAS sensing components).

(b) Magnetic or Grid Variation (Applied manually).

(c) Wind Speed and Direction (Applied manually).

3. The system consists of the following component units:

(a) R-Theta Integrator Type 269 MK 1.

(b) Ground Speed and Interceptor (GSI) Computer Type 269 MK 4D.

(c) R-Theta (R-θ) Computer Type 269 MK 2.

(d) R-Theta (R-θ) DR Repeater Type 269 MK 2.

(e) The following TAS components which are not supplied as part of the system: Vertical gyro, pressure ratio transducer, total temperature sensor.

Integrator - Amplifier

4. The integrator serves as the power distributing point and interconnecting link between the component units of the R-Theta Navigation System.

5. Magnetic heading information from the J4 Compass and true airspeed from the pressure ratio transducer are received by the unit. The heading information and true airspeed are supplied to the GSI Computer. The heading information only is supplied to the R-Theta DR Repeater.

6. True heading, true track and ground speed data are received from the GSI Computer. The true heading information is supplied to the R-Theta DR Repeater. The true track and ground speed data are supplied to the R-Theta Computer.

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7. The unit incorporates three positional servo-amplifiers which are used in the true heading, true track and true airspeed data circuits. Also incorporated is a servo-amplifier and servo-motor unit used in the ground miles data circuit.

8. The integrator incorporates provision for future connection of a Radar Doppler System which automatically provides ground speed and wind drift data.

Ground Speed and Interceptor Computer

9. The Ground Speed and Interceptor (GSI) Computer deducts the variation correction from a magnetic heading and resolves the resultant true heading with true airspeed, wind speed and wind direction into true track and ground miles data. The magnetic heading information is received from the J4 Compass via the Integrator unit and true airspeed is received from the pressure ratio-transducer via the Integrator unit. Variation, wind speed and wind direction are applied manually by means of controls on the GSI Computer.

10. Magnetic heading information and the true heading are supplied via the Integrator unit to the R-Theta DR Repeater. True track and ground speed are supplied to the R-Theta Computer, via the Integrator unit.

R-Theta DR Computer

11. The R-Theta Computer indicates the true track of the aircraft and the true bearing of, and distance to, any selected reference point. Incorporated on the unit are the controls necessary to manipulate the system.

12. The bearing selected for reference can be the take-off point or a destination point. In either case a bearing pointer will indicate the selected bearing continuously, irrespective of the track of the aircraft. The bearing pointer is formed with two spaced index marks at one end and one index mark at the other. The single index mark points to the reciprocal of the bearing selected for reference. The track of the aircraft is indicated by a track pointer which is driven by tracking data received from the GSI Computer. As the track pointer and the bearing pointer are mounted on concentric shafts, aligning the track pointer between the two index marks of the bearing pointer will track the aircraft on the reference bearing to the reference point.

13. Due primarily to the fact that the reference bearing changes rapidly as the aircraft approaches close to the reference point, the bearing pointer is automatically rendered inoperative when the aircraft is inside a radius of two miles from the reference point. In this state an automatic reciprocal circuit becomes operative and the bearing pointer commences to fluctuate about the track indication. When the range counter reaches zero, the bearing pointer rotates through 180 degrees to the reciprocal of the track indication and fluctuates about this indication. The range counter will commence to add mileage and when the radius of two miles is passed, the bearing pointer will operate normally but will maintain the 180 degree reciprocal.

14. The distance to the reference point is indicated on a counter which can be set up in one of two ways. The counter can be set to zero prior to take-off in which case the counter will indicate, continuously, the direct distance in nautical miles to the take-off point. Alternatively, if the bearing pointer is preset to the destination point the counter can be preset to the mileage of the destination point

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ELECTRONICS	R-THETA NAVIGATION COMPUTER	25201	13-3

relative to the take-off point in which case the counter will indicate a decreasing mileage during flight. If an alternative reference point is selected during flight, the counter will automatically indicate the distance to the alternative reference.

15. The computer is set for the required bearing and range by means of a SET RΘ switch, two range (R) switches and two bearing (Θ) switches. When the SET RΘ switch is pulled out, the range counter can be adjusted by depressing the R increase or decrease switch. Similarly, the bearing can be increased or decreased by depressing the appropriate Θ switch. The selected range and bearing is locked as a reference for the computer when the SET RΘ switch is depressed.

16. Confirmation that ground speed data is being received from the GSI Computer is provided by a green coloured indicator light which blinks continuously during computation.

17. Computation of an alternative reference is accomplished by inserting into the computer, as a vector, the bearing of and distance to the alternative reference from the original reference. The vector length is set up on the computer by means of a VECTOR LENGTH control and the vector bearing by means of a VECTOR BRG control. The vector can be inserted, when desired, by means of a VECTOR ADD switch. When the vector is inserted, the bearing pointer and the range counter will automatically indicate the bearing of and distance to the new reference point. It should be noted that deviation from the true track, during the time the computer is computing the alternative reference, will introduce errors into the range and bearing indications.

18. The vector can be cancelled at any time by pulling out the VECTOR ADD switch or, alternatively, an additional vector may be inserted. If the first vector is cancelled, the bearing pointer reverts to the original reference bearing and the range counter will be adjusted for the number of miles flown on the alternative reference. If a second vector is inserted, the first vector cancels and takes the place of the original reference. It should be noted that bearing and range will be computed from the first vector.

19. A counter marked VEC RECORD indicates, for reference, the vector length inserted into the computer. The counter clears when the vector is cancelled.

20. A memory circuit is incorporated in the computer to store ground miles information under certain conditions. The circuit is operative automatically when an alternative reference point is selected during flight, or the indicated range exceeds 999 miles. The circuit can be selected manually by means of a HOLD switch mounted on the R-Theta Computer.

21. The circuit is necessary due to the fact that when an alternative reference point is set up on the computer there is an indeterminate time, in which the computer is computing the new range data, when the miles flown is not counted. The memory circuit records this mileage and applies them to the counter upon the completion of the new computation. The operation of the memory circuit when 999 miles is indicated on the range counter serves to provide a warning that the original computation will be lost if a new reference point is not selected.

22. Selecting the HOLD switch to the Hold position renders the range counter stationary and the memory circuit operative. This facilitates comparing computed and observed positions.

23. When 120 miles has been accumulated by the memory circuit, a red coloured indicator light on the computer starts to blink. When 150 miles has been accumulated, the indicator light remains on continuously denoting that the original computation has been lost.

24. During the time the memory circuit is operative, deviation from the indicated track will introduce errors into the computed indications.

R-Theta DR Repeater

25. The R-Theta DR Repeater is slaved to the R-Theta Computer to indicate the true track, reference bearing and range. A range counter reset control is provided to preset the range counter in agreement with the R-Theta Computer range counter. In addition, a selector switch is provided which permits magnetic heading or true heading, in lieu of true track, to be indicated by the track pointer. The magnetic heading and the true heading are received directly from the integrator unit.

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COMPONENT DATA SHEET

SYSTEM	SUB-SYSTEM	COMPONENT	REF. NO.
ELECTRONICS	R-THETA NAVIGATION COMPUTER	Integrator - Amplifier Type 269 MK 1	13-3-1

AVRO PART NO.	MANUFACTURER	MAN'F'R'S PART NO.	AIRCRAFT EFFECTIVITY
	PSC Applied Research (RCAF Supply)	101-05387	25201

OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours

FUNCTION

To house a servo-motor and a servo-amplifier used in the ground miles data circuit and three servo-amplifiers used in the true heading, true track and true airspeed circuits. In addition the integrator serves as the interconnecting link between the component units of the system.

LOCATION

Electronics Equipment Bay - LH side.

ACCESS

	MEN X MINUTES	
Release and lower the Electronics Equipment Bay centre access door - 33 camlocs.		

REPLACEMENT PROCEDURE

	MEN X MINUTES	
Fit and secure connector R1008/5-(K03-21-20SN). Fit unit to mounting and secure with two lock nuts.		

7WI-3413-2-5

INSPECTION	MEN X MINUTES	
Check that the connector is securely and properly connected. Check that the unit is securely mounted.		

FUNCTIONAL CHECKS	MEN X MINUTES	

GROUND HANDLING AND GROUND TEST EQUIPMENT

Pitot and Static pressures simulator.
Navigation System Test Set - Type T601, RCAF Ref. 6C/970
Stop Watch.

SPECIAL TOOLS TO REMOVE OR SERVICE

REMARKS

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COMPONENT DATA SHEET

SYSTEM	SUB-SYSTEM	COMPONENT	REF. NO.
ELECTRONICS	R-THETA NAVIGATION COMPUTER	Integrator Mounting	13-3-2

AVRO PART NO.	MANUFACTURER	MAN'F'R'S PART NO.	AIRCRAFT EFFECTIVITY
	PSC Applied Research (RCAF Supply)		25201

OVERHAUL LIFE: KNOWN– ESTIMATED– 500 hours

FUNCTION

Mounts the Integrator Unit of the system.

LOCATION

Electronics Equipment Bay - LH side.

ACCESS

MEN X MINUTES

Release and lower the Electronics Equipment Bay, centre access door - 33 camlocs.

REPLACEMENT PROCEDURE

MEN X MINUTES

Fit mounting to airframe with four mounting bolts.

7M1-3413-2-5

INSPECTION	MEN X MINUTES	
Check that the mounting is securely fitted and is not distorted.		

FUNCTIONAL CHECKS	MEN X MINUTES	

GROUND HANDLING AND GROUND TEST EQUIPMENT

SPECIAL TOOLS TO REMOVE OR SERVICE

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COMPONENT DATA SHEET

SYSTEM	SUB-SYSTEM	COMPONENT	REF. NO.
ELECTRONICS	R-THETA NAVIGATION COMPUTER	Ground Speed and Interceptor Computer Type 269 MK 4D	13-3-3

AVRO PART NO.	MANUFACTURER	MAN'F'R'S PART NO.	AIRCRAFT EFFECTIVITY
	PSC Applied Research (RCAF Supply)	101-02731	25201

OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours

FUNCTION

To deduct a variation correction from a magnetic heading and resolve the resultant true heading with true airspped, wind speed and direction into true track and ground miles data which is required by the R-Theta Computer.

LOCATION

Instrument panel - Rear cockpit.

ACCESS — MEN X MINUTES

Unobstructed.

REPLACEMENT PROCEDURE — MEN X MINUTES

Fit and secure connector R1046/1-(K03-21-30SN).
Fit unit to instrument panel with four mounting screws.

7M1-3413-2-5

INSPECTION	MEN X MINUTES	
Check that the connector is securely and properly fitted. Check that the unit is securely mounted.		

FUNCTIONAL CHECKS	MEN X MINUTES	

GROUND HANDLING AND GROUND TEST EQUIPMENT

Pitot and Static pressures simulator.
Navigation System Test Set, Type 601 RCAF Ref. 6C/970
Stop Watch.

SPECIAL TOOLS TO REMOVE OR SERVICE

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COMPONENT DATA SHEET

SYSTEM	SUB-SYSTEM	COMPONENT	REF. NO.
ELECTRONICS	R-THETA NAVIGATION COMPUTER	R-Theta Computer - Type 269 MK 2	13-3-4

AVRO PART NO.	MANUFACTURER	MAN'F'R'S PART NO.	AIRCRAFT EFFECTIVITY
	PSC Applied Research (RCAF Supply)	101-02730	25201

OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours

FUNCTION

Indicates the true track of the aircraft and computes and indicates the true bearing of, and distance to, any selected reference point. Mounts the controls necessary to manipulate the system.

LOCATION

Instrument panel - Rear cockpit.

ACCESS

MEN X MINUTES

Unobstructed.

REPLACEMENT PROCEDURE

MEN X MINUTES

Fit and secure connector R1047/1 (K03-21-30SV).
Fit and secure unit to instrument panel with four mounting bolts.

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INSPECTION	MEN X MINUTES	
Check that the connector is securely and properly fitted. Check that the unit is securely mounted.		

FUNCTIONAL CHECKS	MEN X MINUTES	

GROUND HANDLING AND GROUND TEST EQUIPMENT

Pitot and Static pressures simulater.
Navigation System Test Set Type 601-RCAF
Ref 6C/970.

SPECIAL TOOLS TO REMOVE OR SERVICE

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CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM	SUB-SYSTEM	COMPONENT	REF. NO.
ELECTRONICS	R-THETA NAVIGATION COMPUTER	DR Repeater Type 269 MK 2	13-3-5

AVRO PART NO.	MANUFACTURER	MAN'F'R'S PART NO.	AIRCRAFT EFFECTIVITY
	PSC Applied Research (RCAF Supply)	101-02624	25201

OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours

FUNCTION

To slave to the R-Theta Computer and provide true track and the true bearing of and distance to a selected reference point. In addition a switch is provided which permits magnetic heading or true heading, in lieu of true track, to be indicated by the track pointer.

LOCATION

Instrument Panel - Front Cockpit.

ACCESS — MEN X MINUTES

Unobstructed.

REPLACEMENT PROCEDURE — MEN X MINUTES

Fit and secure connector R1031/1 (K03-21-30SN).
Fit unit to instrument panel with four mounting screws.

7M1-3413-2-5

INSPECTION	MEN X MINUTES	
Check that the connector is securely and properly fitted. Check that the unit is securely mounted.		

FUNCTIONAL CHECKS	MEN X MINUTES	

GROUND HANDLING AND GROUND TEST EQUIPMENT

Pitot and Static pressures simulator.
Navigation System Test Set, Type 601-RCAF Ref. 6C/970.

SPECIAL TOOLS TO REMOVE OR SERVICE

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CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM	SUB-SYSTEM	COMPONENT	REF. NO.
ELECTRONICS	R-THETA NAVIGATION COMPUTER	Shorting Plug SP-1	13-3-6

AVRO PART NO.	MANUFACTURER	MAN'F'R'S PART NO.	AIRCRAFT EFFECTIVITY
7-1352-85	Cannon Electric Canada Ltd.	KO2-21-30SN	25201

OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours

FUNCTION

Completes the computer circuits connected to a receptacle which facilitates the connection of ground test equipment.

LOCATION

RH Console in Rear Cockpit.

ACCESS

Mounted in rear cockpit on RH console.

MEN X MINUTES

REPLACEMENT PROCEDURE

MEN X MINUTES

Fill plug with potting compound.
Connect and secure plug to receptacle on RH console.

TM1-3413-2-5

INSPECTION	MEN X MINUTES	
Check that the plug is securely and properly fitted.		

FUNCTIONAL CHECKS	MEN X MINUTES	

GROUND HANDLING AND GROUND TEST EQUIPMENT

SPECIAL TOOLS TO REMOVE OR SERVICE

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