CF-105 SERVICE DATA Utility Hydraulics System Wheel Brakes Circuit CONFIDENTIAL

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UTILITY HYDRAULICS SYSTEM

WHEEL BRAKES CIRCUIT

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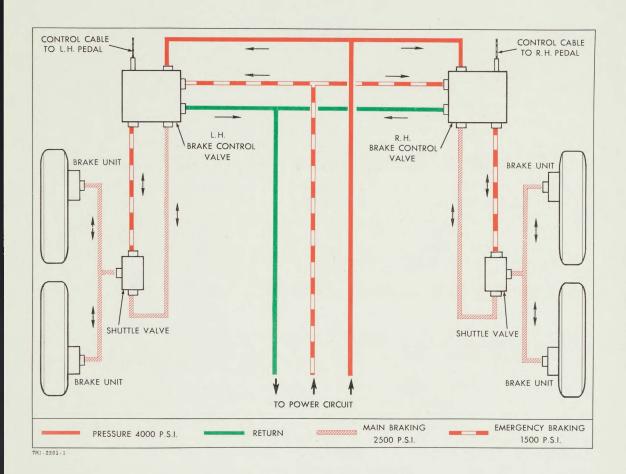


FIG. 1 WHEEL BRAKES - SCHEMATIC



SYSTEM DATA SHEET

SYSTEM	SUB-SYSTEM	AIRCRAFT EFF'TY	REF. NO.
UTILITY HYDRAULICS	WHEEL BRAKES	25201	19-3

DESCRIPTION

General

- 1. The wheel brakes circuit consists of a normal braking system and an emergency braking system. The emergency system takes over automatically from the normal system whenever the pressure to the normal system drops below 1000 psi. The brakes are automatically applied during retraction of the landing gear.
- 2. Each pair of brake units on the main landing gear is operated independently by control valves in the armament bay. Differential and proportional braking is obtained by foot pressure on a brake pedal on each of the pilot's rudder pedals. The brake pedals are mechanically connected to the control valves by cable runs. For parking, the brake pedals can be held in the on position by depressing the brake pedals, pulling a handle on the instrument panel marked FARKING, and releasing the brake pedals before releasing the parking brake handle.
- 3. Two warning lights on the pilot's right hand console are operated by pressure switches in the power circuit. One, marked UTIL HYD, warns the pilot that the emergency braking system is coming into operation and the other, marked EMERG BRAKE HYD, warns the pilot that the emergency brake pressure has failed or has been exhausted. A limited number of brake applications can be obtained after the engines have been shut down, from the charge in the accumulators in the power circuit.
- 4. Steel pipelines incorporating swivel and expanding joints are used to allow movement of the landing gear.

Brake Control Valves

- 5. Fluid from the power circuit main pressure line at pressures up to 4000 psi and from the power circuit reduced pressure line at pressures up to 1500 psi is delivered to each of the two brake control valves.
- 6. Two spring operated spool valves, one for normal braking and one for emergency braking are contained in each control valve. A pressure operated spring-loaded spool valve is also installed in each control valve to automatically change over from normal to emergency, or from emergency to normal, according to the pressure of the fluid in the power circuit.
- 7. When the pressure in the power circuit is above 1000 psi the change-over valve is held by fluid pressure in the normal braking position, allowing pressure fluid from the main pressure line in the power circuit to be delivered to the normal brake valve. From the normal brake valve pressure fluid at pressures up to 2500 psi is delivered into the main brake pipeline.
- 8. If the pressure in the main pressure line of the power circuit falls below 1000 psi, the pressure operated change-over valve is moved by spring pressure to the emergency braking position, allowing pressure fluid from the reduced pressure line in

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the power circuit to be delivered to the emergency brake valve. From the emergency brake valve, fluid at pressures up to 1500 psi is delivered into the emergency brake pipeline.

9. A solenoid valve, operated by a micro-switch on the main landing gear, is also installed in each control valve to operate the main braking system when the landing gear is being retracted. When the solenoid valve is energised, pressure fluid operates the main brake valve and applies the wheel brakes.

Shuttle Valves

10. From each control valve a main brake pipeline and an emergency brake pipeline is led to a shuttle valve on the rear brake torque rod of each main landing gear. The shuttle valve prevents fluid in the operative system from entering the non-operative system.

Brake Units

11. From the shuttle valves, brake pressure fluid is delivered to triple cylinder, multiple disc, brake units. Pressure is applied by pistons having a spring loaded return to overcome the pressure of the return fluid when braking pressure is released.

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COMPONENT DATA SHEET

SYSTEM	SUB-SYSTEM		COMPO	NENT	REF. NO
UTILITY HYDRAULICS	WHEEL BRAKE	S	Valve - Brake	Control	19-3-1
AVRO PART NO. 7-1954-11	MANUFACTURER Hydra-Power		R'S PART NO.	AIRCRAFT	EFFECTIVIT
OVERHAUL LIFE: KNO	WN-	ES	TIMATED- 500 1	nours	
FUNCTION					
To appl	ly hydraulic pressure t	o the whe	eel brakes.		
LOCATION In the	armament bay, station	469.			
ACCESS	10M -			N	IEN X MINUTE
Unobstr	ucted when missile pac	k is remo	oved.		
REPLACEMENT PROCEDUF	RE			М	IEN X MINUTE
Connect Connect Connect	with four attachment the electrical cable. the cable from the ruther the six hydraulic pipthe system.	dder peda	1.		
3143-2-5					

INSPECTI	ON		MEN X	MINUTES
		Check for security, damage, cracks, corrosion and leaks.		
FUNCTIO	NAL CHECKS		MEN X	MINUTES
GROUND	HANDLING AND GF	ROUND TEST EQUIPMENT		
		Hydraulic ground test rig. Electrical ground power circuit.		
SPECIAL	TOOLS TO REMOVE	OR SERVICE		
REMARKS	6			
				4
				1 -4
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*								
SYSTEM		SUB-SYSTEM		COMPON	NENT		REF. NO	
UTILITY HYDRA	AULICS	WHEEL BRAKES		Valve - S	huttle		19-3-2	
AVRO PART NO 7-1992-107	0.	MANUFACTURER Hydra-Power		"R'S PART NO. 51800		RAFT EFFECTIV 25201		
OVERHAUL LIFE:	KNOWI	V-	ES	TIMATED- 1500	hours			
FUNCTION	**	· · · · · · · · · · · · · · · · · · ·				7040		
	To supply failure of	r emergency pressure of the normal system.	to the b	rakes on				
LOCATION	Rear brak	ke torque rod.				T.		
ACCESS	******			***************************************		MEN	X MINUTE	
	Unobstruc	eted.						
	Unobstruc	eted.						
REPLACEMENT P						MEN :	X MINUTE	
REPLACEMENT P	ROCEDURE Install :	with two bolts.				MEN :	X MINUTE	
REPLACEMENT P	ROCEDURE Install :		•			MEN :	X MINUTE	
REPLACEMENT P	ROCEDURE Install :	with two bolts.	•			MEN :	X MINUTE	
REPLACEMENT P	ROCEDURE Install :	with two bolts.	•			MEN :	X MINUTE	
REPLACEMENT P	ROCEDURE Install :	with two bolts.	•			MEN :	X MINUTE	

INSPECTI	ON		MEN X	MINUTES
		Check for security, damage, cracks, corrosion and leaks.		
FUNCTIO	NAL CHECKS		MEN X	MINUTES
ĠROUND	HANDLING AN	ND GROUND TEST EQUIPMENT		
		Hydraulic ground test rig.		
SPECIAL	TOOLS TO REM	MOVE OR SERVICE		
REMARKS	5			
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		· · · · · · · · · · · · · · · · · · ·								
SYSTEM		SUB-SYSTEM COMPONE			NENT	REF. NO				
UTILITY HYDRAU	LICS	WHEEL BRAKE	WHEEL BRAKES Unit - Brake		L BRAKES Unit - Brake		WHEEL BRAKES Unit - Brake		19-3-3	
AVRO PART NO. 7-1092-15		MANUFACTURER MAN'F'R'S PART NO. Goodyear PD 732					FT EFFECTIVIT 25201			
OVERHAUL LIFE:	KNOW	N-	ESTIM	ATED-		· ·				
FUNCTION										
	To reduce	e aircraft speed on t	he ground.							
LOCATION										
	On main :	undercarriage leg.								
ACCESS					МЕ	N X MINUTE				
	Unobstru	cted when wheels are	removed.							
REPLACEMENT P	ROCEDURE				ME	N X MINUTE				
		orake unit on the axl orake link to the bac wheel.			4					

INSPECTI	ON						MEN	X MINUTES
		Check bra	kes for le ke clearar	eaks, over	heating an	d wear.		
FUNCTIO	NAL CHECKS						MEN :	X MINUTES
GROUND	HANDLING AND G	ROUND TEST	EQUIPMEN	Т				
		Hydraulic	ground te	st rig.				
SPECIAL	TOOLS TO REMOVE	OR SERVICE						
REMARKS								
ISSUE	1							
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SYSTEM UTILITY HYDRAULICS		SUB-SYSTEM WHEEL BRAKES		COMPON		REF. NO. 19=3=4
AVRO PART NO. 7-1992-25		MANUFACTURER	MAN'F'F	R'S PART NO.	AIRCRAFT	
OVERHAUL LIFE:	KNOV	VN-	EST	IMATED- 1500	hours	
FUNCTION	To conn- structu	ect hydraulic supply l re to line on main lan	ines on a	rcraft leg.		
LOCATION	Upper en	nd main landing gear	.eg.			
ACCESS					M	EN X MINUTES
REPLACEMENT P	ROCEDUR	E			мі	EN X MINUTES
	on airf	four bolts securing a rame structure and lea hydraulic pipelines. ne system.	ssembly to	brackets		

INSPECT	ION	MEN X	MINUTES
	Check for leakage and security.		
		1 14	
FUNCTIO	NAL CHECKS	MEN X	MINUTES
GROUNE	HANDLING AND GROUND TEST EQUIPMENT		
	Hydraulic ground test rig.		
SPECIAL	TOOLS TO REMOVE OR SERVICE		
REMARK	S		
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	0 200 70		

SYSTEM	SUB-SYSTEM		COMPO	NENT	F	REF. NO.
UTILITY HYDRAULICS	WHEEL BRAKES		Fitting -	Trombone		19=3-5
AVRO PART NO. 7-1992-21	MANUFACTURER Dowty	MAN'F'I	R'S PART NO.	AIRCRAFT	EFF1 5201	ECTIVITY
OVERHAUL LIFE: KN	OWN-	EST	MATED- 150	0 hours		
FUNCTION Slidi	ng joint in brake hydrau	lic lines	4			
LOCATION On ma	in landing gear leg.			v v v v v v v v v v v v v v v v v v v		
ACCESS		- Fair 5			MEN X	MINUTES
Unobs	tructed.					
REPLACEMENT PROCEDU	JRE .	· · · · · · · · · · · · · · · · · · ·		1	MEN X	MINUTES
Conne	ct the fitting to the lact four hydraulic lines. the system.	nding gea	r leg.			

INSPECT	ON	MEN X	MINUTES
	Check for damage, wear, security and leakage.		
FUNCTIO	NAL CHECKS	MEN X	MINUTES
	Hydraulic ground test rig.		
SPECIAL	TOOLS TO REMOVE OR SERVICE		
REMARKS			
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SYSTEM	SUB-SYSTEM		СОМРО	NENT	REF. NO.
UTILITY HYDRAULIC	S SPEED BRAKES	3	Valve - Speed Selec	Brakes	19-4-2
AVRO PART NO. 7-1956-13	MANUFACTURER Weston Hydraulics		r's part no. 4130		EFFECTIVITY 5201
OVERHAUL LIFE: K	NOWN-	ES.	TIMATED- 500	hours	
FUNCTION		-			
	direct flow of hydraulic eed brake jacks.	fluid to	the		
LOCATION	the fuselage, station 538	ð.			
ACCESS				N	MEN X MINUTE
Th	rough hydraulic access par	nel - 52	camlocs.		
REPLACEMENT PROCE	DURE			N	MEN X MINUTE
Co Co	tach the valve to the mour nnect six hydraulic pipeli nnect one electrical conne ime the system.	ines.	h four bolts.		

SYSTEM DATA SHEET

SYSTEM	SUB-SYSTEM	AIRCRAFT EFF'TY	REF. NO.
UTILITY HYDRAULICS	SPEED BRAKES	25201	19-4

DESCRIPTION

General

- 1. Pressure fluid from the power circuit is delivered via a selector valve to two speed brake jacks, which operate two speed brakes located on the underside of the fuselage.
- 2. Steel pipelines incorporating swivel and expanding joints are used to allow movement between the speed brake jacks and the aircraft structure.

Speed Brakes Selector Valve

- 3. A solenoid operated selector valve, controlled by a three position switch marked OUT, HOLD and IN, on the inboard throttle lever, controls the flow of pressure and return fluid between the power circuit and the speed brake jacks.
- 4. A relief valve in the selector valve, set to open at a differential pressure of 4200 psi allows the speed brakes to blow back on all selections of the selector valve, should the airload on the speed brakes become excessive.

Speed Brake Jacks

- 5. The speed brake jacks are of the single cylinder double-acting type. Extension of the jacks retracts the speed brakes.
- 6. When the speed brakes are selected OUT, pressure fluid is directed to the rod end of each jack and the opposite end is connected to return.
- 7. When the speed brakes are selected IN, pressure fluid is directed to both ends of each jack, utilizing differential pressure on the piston and the airload on the speed brakes, to close the speed brakes.
- 8. On a HOLD selection, the rod end of each jack is closed to form a hydraulic lock and the opposite end is connected to return.

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SYSTEM	SUB-SYSTEM		COMPON	ENT	REF. NO.
UTILITY HYDRAULIC	S SPEED BRAKES	Jack	k - Speed B	rakes	19-4-1
AVRO PART NO. 7-1956-7	MANUFACTURER Jarry Hydraulics	MAN'F'R'S PA	ART NO.	AIRCRAFT E	
OVERHAUL LIFE: K	NOWN-	ESTIMATE	ED- 500	hours	
FUNCTION To	operate speed brakes.				
LOCATION	the fuselage, station 485	5-510.			
ACCESS				ME	N X MINUTES
REPLACEMENT PROCE	DURE stall the attachment bolts			МЕ	N X MINUTES
	nnect swivel elbows with time the system.	wo attachment	bolts.		
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INSPECT	ON						MEN	X MINUTES
		Check fo	or securit	y, damage,	cracks, o	corrosion		
FUNCTIO	NAL CHECKS						MEN	X MINUTES
GROUND	HANDLING AND GR	ROUND TEST	EQUIPMEN	IT				
		Hydraul	ic ground	test rig.				
SPECIAL	TOOLS TO REMOVE	OR SERVICE						
REMARKS	5							
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COMPONENT DATA SHEET

AVRO PART NO. 7-1956-13 Weston Hydraulics DOVERHAUL LIFE: KNOWN- To direct flow of hydraulic fluid to the speed brake jacks. LOCATION In the fuselage, station 538. ACCESS Through hydraulic access panel - 52 camlocs.	SYSTEM		SUB-SYSTEM	1	СОМРО		REF. NO.
OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours FUNCTION To direct flow of hydraulic fluid to the speed brake jacks. LOCATION In the fuselage, station 538. ACCESS Through hydraulic access panel - 52 camlocs. MEN X MINUTE Attach the valve to the mounting with four bolts. Connect six hydraulic pipelines. Connect one electrical connector. Prime the system.	UTILITY HYDRAU	ILICS	SPEED BRAKE	S			19-4-2
To direct flow of hydraulic fluid to the speed brake jacks. LOCATION In the fuselage, station 538. ACCESS Through hydraulic access panel - 52 camlocs. MEN X MINUTE Attach the valve to the mounting with four bolts. Connect six hydraulic pipelines. Connect one electrical connector. Prime the system.							
To direct flow of hydraulic fluid to the speed brake jacks. LOCATION In the fuselage, station 538. ACCESS Through hydraulic access panel - 52 camlocs. MEN X MINUTE MEN X MINUTE Attach the valve to the mounting with four bolts. Connect six hydraulic pipelines. Connect one electrical connector. Prime the system.	OVERHAUL LIFE:	KNOW	V-	ES	TIMATED- 500	hours	
In the fuselage, station 538. ACCESS Through hydraulic access panel - 52 camlocs. MEN X MINUTE MEN X MINUTE Attach the valve to the mounting with four bolts. Connect six hydraulic pipelines. Connect one electrical connector. Prime the system.	FUNCTION	To dire	ct flow of hydraulic	fluid to	the		
Through hydraulic access panel - 52 camlocs. REPLACEMENT PROCEDURE Attach the valve to the mounting with four bolts. Connect six hydraulic pipelines. Connect one electrical connector. Prime the system.	LOCATION	In the	fuselage, station 53	8.			
Attach the valve to the mounting with four bolts. Connect six hydraulic pipelines. Connect one electrical connector. Prime the system.	ACCESS					N	MEN X MINUTE
Attach the valve to the mounting with four bolts. Connect six hydraulic pipelines. Connect one electrical connector. Prime the system.							
Connect six hydraulic pipelines. Connect one electrical connector. Prime the system.	REPLACEMENT PRO	OCEDURE				N	MEN X MINUTE
		Connect Connect	six hydraulic pipel one electrical conn	ines.	h four bolts.		

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INSPECTION	MEN X MINUTES
Check for security, damage, cracks, corrosion and leaks.	
FUNCTIONAL CHECKS	MEN X MINUTES
GROUND HANDLING AND GROUND TEST FOUIPMENT	
GROUND HANDLING AND GROUND TEST EQUIPMENT	
GROUND HANDLING AND GROUND TEST EQUIPMENT Hydraulic ground test rig.	
Hydraulic ground test rig.	
Hydraulic ground test rig.	
Hydraulic ground test rig.	
Hydraulic ground test rig.	
Hydraulic ground test rig. SPECIAL TOOLS TO REMOVE OR SERVICE	
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Hydraulic ground test rig. SPECIAL TOOLS TO REMOVE OR SERVICE	
Hydraulic ground test rig. SPECIAL TOOLS TO REMOVE OR SERVICE	

SYSTEM UTILITY HYDRAULICS		SUB-SYSTEM SPEED BRAKES		COMPONENT Coupling - Expansion		19 - 4-3	
AVRO PART NO. 7-1956-35	AT A STATE OF THE			MAN'F'R'S PART NO. A		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:	KNOWI	V	ES	TIMATED- 500	hours		
FUNCTION	***************************************				_		
		pensate for extension raulic lines.	n and con-	traction			
LOCATION		44.4	• • •				
	On spee	ed brake 'up' and 'do	own' line:	3.			
ACCESS	20.11					MEN X MINUTE	
	Through	n electrical access	door = 11	cemlocs			
		ate inboard of the j					
				screws.			
REPLACEMENT PRO	OCEDURE			screws.		MEN X MINUTE	
REPLACEMENT PRO	Connect the jac Connect the con	t the coupling to th	e swivel :	fitting on		MEN X MINUTE:	
REPLACEMENT PRO	Connect the jac Connect the con	t the coupling to the ck. t the hydraulic pipe upling with a wrench	e swivel :	fitting on		MEN X MINUTE:	
REPLACEMENT PRO	Connect the jac Connect the con	t the coupling to the ck. t the hydraulic pipe upling with a wrench	e swivel :	fitting on		MEN X MINUTES	

INSPECT	ION					MEN X	MINUTES
			Check fo	or leaks.			
			Oncon 10	or roams.			
FUNCTIO	NAL CHEC	KS				MEN X	MINUTES
GROUND	HANDLING	AND GRO		EQUIPMEN			
				0-1			
SPECIAL	TOOLS TO	REMOVE C	R SERVICE				
REMARKS	5						
7,=0,7,0,0							
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SYSTEM	SUB-S	SYSTEM	COMPO	NENT	REF. NO
UTILITY HYDRAUL	ICS SPEEL	SPEED BRAKES		ivel	19-4-4
AVRO PART NO. 7-1956-31 7-1956-33	NO. MANUFACTURER MAN'F'R'S PART NO. AIRC Barco Mfg. Co. 10-51091 10-51093			RCRAFT EFFECTIVITY	
OVERHAUL LIFE:	KNOWN-			hours	
FUNCTION	~	10-0			
	To transfer fluid bet relative to each othe		having movement		
LOCATION (On speed brake jack.				
ACCESS		,		м	EN X MINUTE
	Through electrical acand plate inboard of				
REPLACEMENT PROC	CEDURE			М	EN X MINUTES
	EDURE Install with two atta Connect hydraulic pip Prime the system.			М	EN X MINUTE

INSPECTION			MEN X MINUTES
	Charle for counity	. Jacks and James	
	Check for security	, leaks and damage.	
FUNCTIONAL CHECKS			MEN X MINUTES
	0.00		
	Hydraulic ground t	est rig.	
SPECIAL TOOLS TO REMOV	/E OR SERVICE		
REMARKS			
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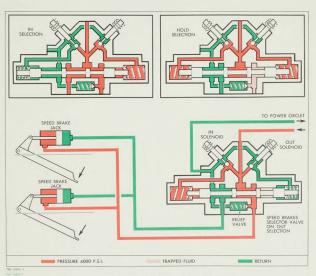


FIG. 1 SPEED BRAKES - SCHEMATIC