



TD74-FOP-TTE
REVISION: C
EFFECTIVE DATE: November 2, 2004

ORGANIZATIONAL ISSUANCE

TD74

EXPERIMENTAL FLUID DYNAMICS GROUP

Turbine Test Equipment Facility Operating Procedure

Revision C

<u>OPR</u>	<u>OPR Designee</u>
TD74	Jim Sieja
<u>Approved</u>	<u>By</u>
TD01	Doug Blackwell

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 2 of 108

DOCUMENT HISTORY LOG

Status (Baseline/ Revision/ Canceled)	Document Revision	Effective Date	Description
AS-IS	BASELINE	Oct/15/97	Baseline AS IS, combines the following documents: TTE-FP-001 Rev 2 Facility Electrical Power Operations TTE-HY-001 Rev 1 Hydraulic System Operation TTE-MH-001 Rev 2 Model/Facility Pre-Heat Operation TTE-MO-001 Rev 2 Model Oil Operation TTE-PT-001 Rev 5 Power Train Components Operation TTE-RT-001 Rev 7 Repetitive Test Procedure TTE-RH-001 Rev 2 Regenerative Heat System Operation TTE-SA-001 Rev 3 Service Air Systems Operation TTE-ST-001 Rev 0 Static Test Procedure TTE-SW-001 Rev 1 Service Water System Operation TTE-TA-001 Rev 5 Model Test Procedure These supersede memo ED35-54-90
AS-IS	A	7/19/99	Due to the reorg. this Baseline supersedes the document OWI-ED34-TTE-001 by the same title.
Revision	B	9/10/2000	Revising document to reflect the new organization and the OWI format. Add the updated certification and training requirements to Section 11.
Revision	C	11/2/2004	Revised due to CAITS 04-DA01-0387. Document ID changed from TD74-TTE-001 to TD74-FOP-TTE. Added FOP to title.

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 3 of 108

TURBINE TEST FACILITY OPERATING PROCEDURE

1.0 PURPOSE

This Facility Operating Procedure defines the multiple systems and their respective methods and instructions used to operate the TTE in bldg. 4777, Bay B.

2.0 APPLICABILITY

This Facility Operating Procedure applies to all personnel operating the TTE.

3.0 APPLICABLE DOCUMENTS

TD74-100, Experimental Fluid Dynamics Group Organizational Instruction

MWI 3410.1, Personnel Certification Program

TD-1410, Control of Organization Issuances and Records

4.0 DEFINITIONS

- 4.1 Calibration Contact: The person responsible for one or more pieces of calibration equipment. Responsibilities include tracking the usage of the equipment and scheduling calibration of the equipment with the calibration facility, in-house, or outside vendor.
- 4.2 Calibration Coordinator: Person who coordinates the activities of the calibration contacts and who is the custodian of the inventory of calibrated equipment.
- 4.3 Data: Electronic or written information (obtained during test programs) stored in any of several media (magnetic tapes, computer files, photographs, reports, etc.).
- 4.4 Data Acquisition Engineer: Individual responsible for a facility data acquisition system including transducers, data acquisition hardware and software, and on-site displays, printers, and data storage medium.
- 4.5 Facility: A group of mechanical, electrical, and control subsystems designed to prepare for, conduct, and acquire data for a test run of a test article.
- 4.6 Facility Engineer: Lead and point-of-contact for a specified facility that is responsible for the operation, maintenance, and development of that facility.
- 4.7 Facility Operator: Person authorized by the TD74 Group Leader to operate a specified facility.
- 4.8 Records Custodian: Individual who is responsible for controlling, storing, retrieving, and dispositioning of records.

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 4 of 108

- 4.9 Run Log: A Run Log is kept to document each test performance (run) in lieu of an “as-run” test procedure. For each run, entries including the time/date, unique run number, test-specific facility parameter set points, anomalous events and facility operator initials are required as a minimum. These logs also serve as an historical record on the use/run time of TD74 Facilities and aid in the analysis of data after the tests have been completed. Each facility’s operation Run Log shall be maintained and retained by the assigned Test Facility System Engineer for a period of 10 (ten) years.
- 4.10 Test Engineer: Person or persons responsible for the planning, data collection, and reporting for a specified test.
- 4.11 TTE: Turbine Test Equipment
- 4.12 Waiver: A written authorization to depart from specified requirements in a controlled document. See TD-1410.

5.0 INSTRUCTIONS

5.1 TTE-FP-001 Facility Electrical Power Operations	6
5.2 TTE-HY-001 Hydraulic System Operation	12
5.3 TTE-MH-001 Model/Facility Pre-Heat Operation	18
5.4 TTE-MO-001 Model Oil Operation.....	23
5.5 TTE-PT-001 Power Train Components Operation	29
5.6 TTE-RH-001 Regenerative Heat System Operation.....	36
5.7 TTE-SA-001 Service Air Systems Operation.....	41
5.8 TTE-SW-001 Service Water System Operation	46
5.9 TTE-ST-001 Static Test Procedure	50
5.10 TTE-TA-001 Model Test Procedure.....	66
5.11 TTE-RT-001 Repetitive Test Procedure	82

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 5 of 108

5.1 TTE-FP-001
FACILITY ELECTRICAL POWER OPERATIONS

CONTENTS

5.1.A	PURPOSE	6
5.1.B	START-UP	6
5.1.C	SHUTDOWN	6
TABLE A	.....	7
TABLE B	.....	10

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 6 of 108

TTE-FP-001 FACILITY ELECTRICAL POWER OPERATIONS

5.1A PURPOSE

This procedure contains instructions for aligning the turbine building electrical facilities.

5.1.B STARTUP

5.1.B.1 PREREQUISITES

Facility substation is operating and is aligned by the Army.

5.1.B.2 PROCEDURE

The Facility Operator shall

PERFORM facility electrical breaker alignment per Table A of this procedure.

5.1.C SHUTDOWN

5.1.C.1 PREREQUISITES

Power is not required to TTE components.

5.1.C.2 PROCEDURE

PERFORM facility electrical breaker alignment per Table B of this procedure.

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 7 of 108

Table A - START-UP

ELECTRICAL LINEUP

PANEL PDP1

BREAKER NUMBER	BREAKER NAME	POSITION REQUIRED	INITIALS
	MAIN	ON	
05	CONTROL ROOM ISOLATION TRANSFORMER	ON	
09	EATTE CRANE (4777-B)	ON	
10	PANEL AC-1 (4777-A)	ON	
12	PANEL C	ON	
POWER STRIP	UPS POWER SUPPLY (IN PRINTER STAND IN CONTROL ROOM)	ON	

PANEL LPA
(4777-A)

BREAKER NUMBER	BREAKER NAME	POSITION REQUIRED	INITIALS
21	AREA ALARM SYSTEM	ON	

CONTINUES

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 8 of 108

Table A (con.'t) - START-UP

ELECTRICAL LINEUP

PANEL C

BREAKER NUMBER	BREAKER NAME	POSITION REQUIRED	INITIALS
	MAIN	ON	
03	CONTROL ROOM LIGHTS	ON	
05	CONTROL ROOM RECEPTACLES	ON	
08	CONTROL ROOM RECEPTACLES	ON	
10	CONTROL ROOM AIR CONDITIONER	ON	
12	CONTROL ROOM AIR CONDITIONER	ON	
19	TTE OUTSIDE LIGHTS	ON	
21	TTE OUTSIDE LIGHTS	ON	
23	TTE OUTSIDE LIGHTS	ON	
24	TU PANEL (4777-A)	OFF	
31	PANEL LPA (4777-A)	ON	
TTE CRANE DISCONNECT	TTE CRANE DISCONNECT (EAST WALL TTE)	ON	

CONTINUES

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 9 of 108

Table A (con.'t) - START-UP

ELECTRICAL LINEUP

PANEL PDP2

BREAKER NUMBER	BREAKER NAME	POSITION REQUIRED	INITIALS
	MAIN	ON	
01	CONTROL ROOM PANEL G	ON	
02	CONTROL ROOM PANEL B	ON	
03	CONTROL ROOM PANEL C	ON	
04	CONTROL ROOM PANEL D	ON	
05	CONTROL ROOM PANEL E	ON	
06	CONTROL ROOM PANEL F	ON	
07	CONTROL ROOM PANEL A	ON	
08	CONTROL ROOM PANEL H	ON	
09	CONTROL ROOM PANEL I	ON	
10	CONTROL ROOM PRINTER STAND	ON	
12	CONTROL ROOM UPS POWER SUP	ON	
POWER STRIP	UPS POWER SUPPLY (IN PRINTER STAND IN CONTROL ROOM)	ON	

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 10 of 108

Table B -SHUTDOWN

ELECTRICAL LINEUP

PANEL PDP1

BREAKER NUMBER	BREAKER NAME	POSITION REQUIRED	INITIALS
	MAIN	ON	
02	REGENERATIVE HEATER H-123 SUPPLY BREAKER	OFF	
03	HPU-700 POWER SUPPLY	OFF	
04	PRE-HEAT HEATER-125 SUPPLY BREAKER	OFF	
14	BLOWER B-122 SUPPLY BREAKER	OFF	
POWER STRIP	UPS POWER SUPPLY (IN PRINTER IN CONTROL ROOM)	ON	
MC-122 DISCONNECT	HPU-700 DISCONNECT (NORTH WALL TTE)	OFF	
JB11 DISCONNECT	B-122 DISCONNECT (EAST WALL TTE)	OFF	

SHUTDOWN

ELECTRICAL LINEUP

PANEL PDP2

BREAKER NUMBER	BREAKER NAME	POSITION REQUIRED	INITIALS
	MAIN	ON	
01	CONTROL ROOM PANEL G	OFF	
02	CONTROL ROOM PANEL B	OFF	
03	CONTROL ROOM PANEL C	OFF	
04	CONTROL ROOM PANEL D	OFF	
05	CONTROL ROOM PANEL E	OFF	
06	CONTROL ROOM PANEL F	OFF	
07	CONTROL ROOM PANEL A	OFF	
08	CONTROL ROOM PANEL H	OFF	
09	CONTROL ROOM PANEL I	OFF	
10	CONTROL ROOM PRINTER STAND	OFF	
12	CONTROL ROOM UPS POWER SUP	ON	

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November 2, 2004	Page 11 of 108

5.2 TTE-HY-001
HYDRAULIC SYSTEM OPERATION

CONTENTS

5.2.A	PURPOSE	13
5.2.B	START-UP	13
5.2.C	SHUTDOWN	13
TABLE C	.....	14
TABLE D	.....	16

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 12 of 108

TTE-HY-001 HYDRAULIC SYSTEM OPERATION

5.2.A PURPOSE

This procedure contains instructions for startup and shutdown of the hydraulic oil system including the hydraulic power unit.

5.2.B STARTUP

5.2.B.1 PREREQUISITES

5.2.B.1.1 Valves and electrical breakers aligned in accordance with Table C.

5.2.B.1.2 Verify Hydraulic Oil Storage Tank level, located at the north wall of the TTE high bay, is greater than 75% as indicated in the HPU oil reservoir sight glass.

5.2.B.1.3 Verify the blue OIL LEVEL/TEMP light on JB11, located on the north wall of the TTE high bay, is on.

5.2.B.2 PROCEDURE

The Facility Operator shall

START HPU-700, Hydraulic Power Unit, by pressing the start push-button on JB11.

5.2.C SHUTDOWN

5.2.C.1 PREREQUISITES

The hydraulic system is no longer required to be in operation.

5.2.C.2 PROCEDURE

5.2.C.2.1 STOP HPU-700, Hydraulic Power Unit, by pressing the stop push-button on JB11 located on the north wall of the TTE high bay.

5.2.C.2.2 Slowly OPEN V-205, PCV-115 Oil Supply Equalization Valve, located on Hydraulic Rack #1 at the east wall of the TTE high bay area, until PG-213 on Hydraulic Rack #1 indicates no pressure.

5.2.C.2.3 Align valves and electrical breakers in accordance with Table D.

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 13 of 108

TABLE C - START-UP

VALVE LINEUP

VALVE NUMBER	VALVE NAME	POSITION REQUIRED
V-212	HPU-700 DISCHARGE VALVE	OPEN
BBV-216	PRESSURE SWITCH ISOLATION	OPEN
BBV-409	PRESSURE SWITCH ISOLATION	OPEN
V-200	PCV-115 OIL SUPPLY ISOLATION	OPEN
BBV-206	PG-213 ISOLATION	OPEN
V-202	OIL SUPPLY TO PCV-115	OPEN
V-204	OIL RETURN FROM PCV-115	OPEN
V-205	PCV-115 OIL SUPPLY EQUALIZATION VALVE	CLOSED
V-207	PCV-115 ACCUMULATOR -208 ISOLATION	OPEN
V-223	PCV-110 ACCUMULATOR ACC-224 ISOLATION	OPEN
V-222	PCV-110 OIL SUPPLY ISOLATION	OPEN
BBV-215	PG-217 ISOLATION	OPEN
V-218	OIL SUPPLY TO PCV-110	OPEN
V-220	OIL RETURN FROM PCV-110	OPEN

CONTINUES

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 14 of 108

START-UP

VALVE LINEUP

VALVE NUMBER	VALVE NAME	POSITION REQUIRED
V-221	PCV-110 OIL SUPPLY EQUALIZATION VALVE	CLOSED
V-228	TCV-107B ACCUMULATOR ACC-238 ISOLATION	OPEN
V-229	TCV-107B OIL SUP ISOLATION	OPEN
BBV-230	PG-232 ISOLATION	OPEN
V-233	OIL SUPPLY TO TCV-107B	OPEN
V-235	OIL RETURN FROM TCV-107B	OPEN
V-236	TCV-107B OIL SUPPLY EQUALIZATION VALVE	CLOSED
V-242	TCV-107B ACCUMULATOR ACC-252 ISOLATION	OPEN
V-243	TCV-107A OIL SUP ISOLATION	OPEN
BBV-249	PG-251 ISOLATION	OPEN
V-245	OIL SUPPLY TO TCV-107A	OPEN
V-247	OIL RETURN TO TCV-107A	OPEN
V-244	TCV-107A OIL SUPPLY EQUALIZATION VALVE	CLOSED

START-UP

ELECTRICAL LINEUP

PANEL PDP1

BREAKER NUMBER	BREAKER NAME	POSITION REQUIRED	INITIALS
03	HPU-700 POWER SUPPLY	ON	
JB11 DISCONNECT	HPU-700 DISCONNECT(NORTH WALL TEE)	ON	

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 15 of 108

TABLE B - SHUTDOWN

VALVE LINEUP

VALVE NUMBER	VALVE NAME	POSITION REQUIRED
V-212	HPU-700 DISCHARGE VALVE	CLOSED
V-200	PCV-115 OIL SUPPLY ISOLATION	CLOSED
V-202	OIL SUPPLY TO PCV-115	CLOSED
V-204	OIL RETURN FROM PCV-115	CLOSED
V-205	PCV-115 OIL SUPPLY EQUALIZATION VALVE	CLOSED
V-207	PCV-115 ACCUMULATOR -208 ISOLATION	CLOSED
V-223	PCV-110 ACCUMULATOR ACC-224 ISOLATION	CLOSED
V-222	PCV-110 OIL SUPPLY ISOLATION	CLOSED
V-218	OIL SUPPLY TO PCV-110	CLOSED
V-220	OIL RETURN FROM PCV-110	CLOSED
V-221	PCV-110 OIL SUPPLY EQUALIZATION VALVE	CLOSED
V-228	TCV-107B ACCUMULATOR ACC-238 ISOLATION	CLOSED
V-229	TCV-107B OIL SUP ISOLATION	CLOSED
V-233	OIL SUPPLY TO TCV-107B	CLOSED
V-235	OIL RETURN FROM TCV-107B	CLOSED
V-236	TCV-107B OIL SUPPLY EQUALIZATION VALVE	CLOSED
V-242	TCV-107B ACCUMULATOR ACC-252 ISOLATION	CLOSED
V-243	TCV-107A OIL SUP ISOLATION	CLOSED
V-245	OIL SUPPLY TO TCV-107A	CLOSED
V-247	OIL RETURN TO TCV-107A	CLOSED
V-244	TCV-107A OIL SUPPLY EQUALIZATION VALVE	CLOSED

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 16 of 108

Table B (con.'t) SHUTDOWN

ELECTRICAL LINEUP

PANEL PDP1

VALVE NUMBER	VALVE NAME	POSITION REQUIRED
03	HPU-700 POWER SUPPLY	OFF
JB11 DISCONNECT	HPU-700 DISCONNECT (NORTH WALL TEE)	OFF

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 17 of 108

5.3 TTE-MH-001
MODEL/FACILITY PRE-HEAT OPERATION

CONTENTS

5.3.A	PURPOSE	19
5.3.B	START-UP	19
5.3.C	SHUTDOWN	20
Table E	.....	21
Table F	.....	22

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 18 of 108

TTE-MH-001 MODEL/FACILITY PRE-HEAT OPERATION

5.3A PURPOSE

This procedure contains instructions for start-up and shutdown of the test article pre-heat system.

5.3B START-UP

5.3.B.1 PREREQUISITES

5.3.B.1.1 Valves and breakers aligned in accordance with Table E

5.3.B.1.2 The Service Air System is operating per procedure TTE-SA-001, Service Air Systems Operation.

5.3.B.1.3 Green "Pressure Supply-OK" light on Heat Systems Control Inlet Preheat System, Panel E, is illuminated.

5.3.B.1.4 Ensure amber "Power On" light is illuminated on H-125 Heater Panel located south of the plenum.

5.3.B.1.5 The dynamometer/model is operating per procedure TTE-PT-001, Power Train Components Operation, and is running at a speed of 1000 rpm.

5.3.B.1.6 Test Systems Master Control Disable/Enable switch on Panel C is in the "Disable" position and key is removed and in place in the Pyrotechnic Disable/Enable switch, JB13, located on the south side of the plenum cart.

5.3.B.1.7 Pyrotechnic Disable/Enable switch is in the "Disable" position.

5.3.B.2 PROCEDURE

The Facility Operator shall

NOTE

For operation of the Chromalox controllers, refer to Table F of this procedure.

5.3.B.2.1 ADJUST H-125, Chromalox Temperature Indicating Controller, located on Panel E, to the temperature desired for model/facility preheat.

5.3.B.2.2 PLACE Heat Systems Control Disable/Enable switch on Panel E in the "Enable" position.

5.3.B.2.3 On the Heat Systems Control Inlet Preheat System, OPEN valve ROV-127, H-125 Isolation, using handswitch on Panel E.

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 19 of 108

5.3.B.2.4 When ROV-127 green open light is illuminated on Panel E, START Heat Systems Control Inlet Preheat System Heater, by pressing the heater "Start" push-button on Panel E.

5.3.C.0 SHUTDOWN

5.3.C.1 PREREQUISITES

The need for model/facility pre-heat no longer exists (i.e., test cancellation or proper temperature has been attained).

5.3.C.2 PROCEDURE

5.3.C.2.1 STOP Heat Systems Control Inlet Preheat System Heater, by pressing the heater "Stop" push-button on Panel E.

5.3.C.2.2 On the Heat Systems Control Inlet Preheat System, CLOSE valve ROV-127, H-125 Isolation, using handswitch on Panel E.

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 20 of 108

TABLE E - START-UP

ELECTRICAL LINEUP

PANEL PDP1

BREAKER NUMBER	BREAKER NAME	POSITION REQUIRED	INITIALS
	MAIN	ON	
04	PRE-HEAT HEATER H-125 SUPPLY BREAKER	ON	

VALVE LINEUP

VALVE NUMBER	VALVE NAME	POSITION REQUIRED
V-132	SUPPLY AIR ISOLATION	OPEN
ROV-127	PRE-HEATER ISOLATION	CLOSED
PCV-115	MODEL BACKPRESSURE VALVE	OPEN (NOTE 1)
ROV-101A&B	TEST AIR SUPPLY ISOLATION	CLOSED
PCV-110	MODEL INLET (Po) PRESSURE CONTROL VALVE	CLOSED (NOTE 1)
BBV-134	PG-136 ISOLATION	OPEN
BBV-137	PG-135 ISOLATION	OPEN

NOTE 1: If PCV-110 or PCV-115 is not in their correct position, the hydraulic system may have to be started per TTE-HY-001, Hydraulic System Operation (see section 5.2), to correctly position these valves.

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 21 of 108

TABLE F - CHROMALOX HEATER CONTROLLER OPERATION

1.0	PRESS the Menu/Val push-button to select "MENU" as indicated by the green light being illuminated above MENU on the "MENU/VAL" indicator.
2.0	SELECT Menu #1, as indicated by "1" in the lower window, by pressing the arrow push-buttons.
3.0	PRESS the Menu/Val push-button to select "VAL" as indicated by the green light being illuminated below VAL on the "MENU/VAL" indicator.
4.0	ADJUST the heater setpoint, as indicated in the lower window, with the arrow push-buttons.

(Refer to **Volume E** for further information on Chromalox.)

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 22 of 108

5.4 TTE-MO-001
MODEL OIL OPERATION

CONTENTS

5.4.A	PURPOSE	24
5.4.B	START-UP	24
5.4.C	SHUTDOWN	25
Table G	.....	26
Table H	.....	27
Table I	.....	28

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 23 of 108

TTE-MO-001 MODEL OIL OPERATION

5.4.A PURPOSE

This procedure contains instructions for start-up and shutdown of the test article oil system.

5.4.B START-UP

5.4.B.1 PREREQUISITES

5.4.B.1.1 Align valves and electrical breakers in accordance with Table G.

5.4.B.1.2 Verify Model Oil Storage Tank level, located at the model oil skid outside east of the TTE high bay, is greater than 50% as indicated on sight glass SG-521.

5.4.B.1.3 The Service Air System is operating per procedure TTE-SA-001, Service Air Systems Operation.

5.4.B.1.4 The service water system is aligned per TTE-SW-001, Service Water System Operation.

5.4.B.2 PROCEDURE

The Facility Operator shall

NOTE

For operation of the TCS controllers, refer to Table I of this procedure.

5.4.B.2.1 Set VIC-528, VCV-528 Vacuum Indicating Controller on Panel F, to the desired bearing cavity delta pressure (generally 1.500 on "VACUUM - loop 1") required for the current test.

5.4.B.2.2 Set VIC-528 to the desired oil flow rate (generally a valve position of approximately 20% on "FLOW - loop 2") required for the current test.

5.4.B.2.3 PLACE Loop 1 of VIC-528 in automatic by pressing the "A" push-button on the controller.

5.4.B.2.4 START VP-517, Vacuum Pump, using push-button located at the model oil skid.

5.4.B.2.5 START P-512, Scavenge Pump, using push-button located at the model oil skid.

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 24 of 108

5.4.B.2.6 START P-501, Supply Pump, using push-button located at the model oil skid.

5.4.B.2.7 ENERGIZE H-524, Tank Heater, using push-button located at the model oil skid.

5.4.B.2.8 ADJUST TIC-526, Model Oil Temperature Indicating Controller located at southeast door of TTE high bay, as necessary, to maintain desired oil inlet temperature (generally 90 degrees F as indicated on Model Lube Inlet Temp located on Panel G).

5.4.B.2.9 As necessary, ADJUST VIC-528 to maintain desired oil inlet flow rate.

5.4.C SHUTDOWN

5.4.C.1 PREREQUISITES

The dynamometer/model is no longer turning.

5.4.C.2 PROCEDURE

5.4.C.2.1 STOP P-501, Supply Pump, using push-button located at the model oil skid outside east of the TTE high bay.

5.4.C.2.2 STOP P-512, Scavenge Pump, using push-button located at the model oil skid.

5.4.C.2.3 STOP VP-517, Vacuum Pump, using push-button located at the model oil skid.

5.4.C.2.4 DE-ENERGIZE H-524, Tank Heater, using push-button located at the model oil skid.

5.4.C.2.5 ALIGN valves and electrical breakers in accordance with Table H.

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 25 of 108

TABLE G - START-UP

ELECTRICAL LINEUP

PANEL PDP1

BREAKER NUMBER	BREAKER NAME	POSITION REQUIRED	INITIALS
	MAIN	ON	
15	MODEL OIL SUPPLY & SCAVENGE PUMP	ON	

PANEL C

BREAKER NUMBER	BREAKER NAME	POSITION REQUIRED	INITIALS
25	MODEL OIL VACUUM PUMP	ON	
27/29	MODEL OIL TANK HEATER	ON	

START-UP

VALVE LINEUP

VALVE NUMBER	VALVE NAME	POSITION REQUIRED
V-508	FMS-508 INLET ISOLATION	OPEN
V-509	TTE MODEL INLET ISOLATION	OPEN
BBV-510	PG-511 ISOLATION	OPEN
V-520	OIL STORAGE TANK ISOLATION VALVE	CLOSED
V-545	OIL STORAGE TANK ISOLATION VALVE	OPEN
V-546	OIL SYSTEM DRAIN VALVE	CLOSED

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 26 of 108

TABLE H - SHUTDOWN

ELECTRICAL LINEUP

PANEL PDP1

BREAKER NUMBER	BREAKER NAME	POSITION REQUIRED	INITIALS
	MAIN	ON	
15	MODEL OIL SUPPLY & SCAVENGE PUMP	OFF	

PANEL C

BREAKER NUMBER	BREAKER NAME	POSITION REQUIRED	INITIALS
25	MODEL OIL VACUUM PUMP	OFF	
27/29	MODEL OIL TANK HEATER	OFF	

VALVE LINEUP

VALVE NUMBER	VALVE NAME	POSITION REQUIRED
V-509	TTE MODEL INLET ISOLATION	CLOSED

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 27 of 108

TABLE I - TCS CONTROLLER AUTOMATIC OPERATION

1.0	SET VIC-528, Vacuum Indicating Controller on Panel F, to the desired model oil flow and model bearing cavity delta pressure required for the current test as follows:
1.1	SELECT Loop 1 on VIC-528 by pressing the " " push-button.
1.2	PLACE Loop 1 of VIC-528 in manual by pressing the "M" push-button on the controller
1.3	SELECT Loop 2 on VIC-528 by pressing the " " push-button.
1.4	PLACE Loop 2 of VIC-528 in manual by pressing the "M" push-button on the controller.
1.5	For controlling the model bearing cavity delta pressure:
1.5.1	SELECT Loop 1 on VIC-528 by pressing the " " push-button.
1.5.2	ADJUST VIC-528 to the desired model bearing cavity delta pressure by pressing the "SP" push-button and the setpoint increase (" ") or decrease (" ") push-button simultaneously.
1.6	For controlling the model oil flow:
1.6.1	SELECT Loop 2 on VIC-528 by pressing the " " push-button.
1.6.2	ADJUST VIC-528 to the oil flow rate by pressing the "M" push-button and the setpoint increase (" ") or decrease (" ") push-button simultaneously.

(Refer to **Volume D** for further information on TCS controllers.)

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 28 of 108

5.5 TTE-PT-001
POWER TRAIN COMPONENTS OPERATION

CONTENTS

5.5.A	PURPOSE	30
5.5.B	STARTUP	30
5.5.C	SHUTDOWN	31
Table J	.....	33
Table K	.....	34
Table L	.....	35

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 29 of 108

TTE-PT-001 POWER TRAIN COMPONENTS OPERATION

5.5.A PURPOSE

This procedure contains instructions for startup and shutdown of the power train components including the dynamometer and gear box.

5.5.B STARTUP

5.5.B.1 PREREQUISITES

- 5.5.B.1.1 The proper shaft has been installed in the torquemeter for the test/run to be performed.
- 5.5.B.1.2 Electrical breakers are aligned in accordance with Table J.
- 5.5.B.1.3 The model oil system is operating per TTE-MO-001, Model Oil Operation.
- 5.5.B.1.4 The service water system is aligned per TTE-SW-001, Service Water System Operation.
- 5.5.B.1.5 The Dynamometer Control switch, Panel C, is in the "Remote" position.

5.5.B.2 PROCEDURE

The Facility Operator shall

- 5.5.B.2.1 START the gearbox oil system by pressing the "Start" push-button on MC-900 located on the north side of the gearbox.
- 5.5.B.2.2 START the dynamometer fans and oil pump by turning the Dynamometer Field switch, Panel C, to "FWD".

NOTE

Refer to Table L of this procedure for operation of the Microstar model speed controller.

- 5.5.B.2.3 ADJUST the Microstar controller, located on Panel F, per Table L of this procedure.
- 5.5.B.2.4 RESET the dynamometer by pressing the Dynamometer Reset push-button on Panel C.
- 5.5.B.2.5 Perform one of the following:
 - 5.5.B.2.5.1 If the dynamometer has been shutdown for more than seven (7) days, ensure the dynamometer fans/oil pump runs for at least thirty (30) minutes and START the

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 30 of 108

dynamometer by pressing the Dynamometer "ON" push-button, on Panel C.

OR

5.5.B.2.5.2 If the dynamometer has been shutdown for less than seven (7) days, ensure the dynamometer fans/oil pump runs for at least fifteen (15) minutes and START the dynamometer by pressing the Dynamometer "ON" push-button, on Panel C.

5.5.B.2.6 PRESS the Manual/Auto push-button on the Microstar controller to extinguish the "Manual" light.

CAUTION
MONITOR TORQUE READINGS ON THE TORQUETRONIC TORQUE READOUT
LOCATED ON PANEL D.

5.5.B.2.7 PRESS the "Start/Pyro Enabled" push-button until the test article begins to increase to 1000 rpm.

5.5.C SHUTDOWN

5.5.C.1 PREREQUISITES

5.5.C.1.1 NONE

5.5.C.2 PROCEDURE

NOTE
Refer to Table L of this procedure for operation of the Microstar model speed controller.

5.5.C.2.1 ADJUST the test article speed, as indicated on the Torquetric speed readout on Panel D, to 0 rpm with the Microstar controller on Panel F.

5.5.C.2.2 STOP the dynamometer by pressing the Dynamometer "OFF" push-button, on Panel C.

5.5.C.2.3 STOP the dynamometer fans and oil pump by turning the Dynamometer Field switch, Panel C, to "OFF".

5.5.C.2.4 STOP the gearbox oil system by pressing the "Stop" push-button on MC-900.

5.5.C.2.5 SHUTDOWN the model oil system per TTE-MO-001, Model Oil Operation section 5.4.

5.5.C.2.6 SHUTDOWN the service water system per TTE-SW-001, Service Water System Operation section 5.8.

5.5.C.2.7 ALIGN electrical breakers in accordance with Table K.

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 31 of 108

TABLE J - START-UP

ELECTRICAL LINEUP

PANEL PDP1

BREAKER NUMBER	BREAKER NAME	POSITION REQUIRED	INITIALS
	MAIN	ON	
07	GEAR BOX OIL PUMP	ON	
11	DYNAMOMETER CONTROL CABINET	ON	
AC	AC DISCONNECT	ON	
	DISCONNECT DYNAMOMETER PANEL	ON	
POWER TO GRID	BIG DISCONNECT	ON	
	DYNAMOMETER PANEL	ON	

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 32 of 108

TABLE K - SHUTDOWN

ELECTRICAL LINEUP

PANEL PDP1

BREAKER NUMBER	BREAKER NAME	POSITION REQUIRED	INITIALS
	MAIN	OFF	
07	GEAR BOX OIL PUMP	OFF	
12	DYNAMOMETER CONTROL CABINET	OFF	
AC	AC DISCONNECT	ON	
	DISCONNECT DYNAMOMETER PANEL	OFF	
POWER TO GRID	BIG DISCONNECT	ON	
	DYNAMOMETER PANEL	OFF	

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 33 of 108

TABLE L - MICROSTAR MODEL CONTROLLER OPERATION

AUTOMATIC OPERATION

1.0	If necessary, PRESS the Hold push-button to illuminate the "Hold" light and extinguish the "Run" light.
2.0	PRESS the Recipe Start push-button.
3.0	PRESS the Enter push-button to begin Recipe 1.
4.0	If necessary, PRESS the Manual/Auto push-button to illuminate the "Manual" light.
5.0	If not on 'zero' ,(0), PRESS the Scroll arrows to select "% Output".
6.0	PRESS the Enter push-button.
7.0	Using the arrow push-buttons located below the Enter push-button, ADJUST the % output to 0.

MANUAL OPERATION

1.0	PRESS the Scroll arrows to select "% Output".
2.0	PRESS the Manual/Auto push-button to illuminate the "Manual" light.
3.0	PRESS the Enter push-button.
4.0	Using the arrow push-buttons located below the Enter push-button, ADJUST the % output to adjust the test article to the speed desired as indicated on the Torquetronic speed readout on Panel D.

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 34 of 108

5.6 TTE-RH-001
REGENERATIVE HEAT SYSTEM OPERATION

CONTENTS

5.6.A	PURPOSE	37
5.6.B	START-UP	37
5.6.C	SHUTDOWN	38
Table M	.....	39
Table N	.....	40

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 35 of 108

TTE-RH-001 REGENERATIVE HEAT SYSTEM OPERATION

5.6.A PURPOSE

This procedure contains instructions for the start-up and shutdown of the regenerative heat system.

25.6.B START-UP

5.6.B.1 PREREQUISITES

5.6.B.1.1 Valves are aligned in accordance with Table M.

5.6.B.1.2 Electrical breakers are aligned in accordance with Table M.

5.6.B.1.3 Ensure amber "Power On" light is illuminated on H-123 Heater Panel located south of the plenum.

5.6.B.1.4 Test Systems Master Control Disable/Enable switch on Panel C is in the "Disable" position and key is removed and in place in the Pyrotechnic Disable/Enable switch, JB13, located on the south side of the plenum cart.

5.6.B.1.5 Pyrotechnic Disable/Enable switch is in the "Disable" position.

5.6.B.1.6 The Service Air System is operating per procedure TTE-SA-001, Service Air Systems Operation.

5.6.B.1.7 The Regenerative Heat System area is clear of personnel and interferences.

5.6.B.2 PROCEDURE

The Facility Operator shall

NOTE

For operation of the Chromalox controllers, refer to Table N of this procedure.

5.6.B.2.1 ADJUST H-123, Chromalox Temperature Indicating Controller, located on Panel E, to the temperature desired for regenerative heat.

5.6.B.2.2 PLACE Heat Systems Control Disable/Enable Switch on Panel E in the "Enable" position.

5.6.B.2.3 OPEN the following valves (switches on Panel E) one at a time:

5.6.B.2.3.1 OPEN ROV-119, B-122 Suct Isol Valve, using handswitch located on Panel E.

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 36 of 108

5.6.B.2.3.2 OPEN ROV-118, B-122 Suct Isol Valve, using handswitch located on Panel E.

5.6.B.2.3.3 OPEN ROV-126, H-123 Disch Isol Valve, using handswitch located on Panel E.

5.6.B.2.3.4 OPEN ROV-124, H-123 Disch Isol Valve, using handswitch located on Panel E.

5.6.B.2.4 START Heat Systems Control Regenerative Heat System blower by pressing the blower "Start" push-button on Panel E.

5.6.B.2.5 START Heat Systems Control Regenerative Heat System heater by pressing the heater "Start" push-button on Panel E.

5.6.C SHUTDOWN

5.6.C.1 PREREQUISITES

The thermal mass has attained the desired temperature or regeneration is no longer needed.

5.6.C.2 PROCEDURE

5.6.C.2.1 STOP Heat Systems Control Regenerative Heat System heater by pressing the heater "Stop" push-button on Panel E.

5.6.C.2.2 STOP Heat Systems Control Regenerative Heat System blower by pressing the blower "Stop" push-button on Panel E.

5.6.C.2.3 CLOSE the following valves (switches on Panel E):

5.6.C.2.3.1 CLOSE ROV-119, B-122 Suct Isol Valve, using handswitch located on Panel E.

5.6.C.2.3.2 CLOSE ROV-118, B-122 Suct Isol Valve, using handswitch located on Panel E.

5.6.C.2.3.3 CLOSE ROV-126, H-123 Disch Isol Valve, using handswitch located on Panel E.

5.6.C.2.3.4 CLOSE ROV-124, H-123 Disch Isol Valve, using handswitch located on Panel E.

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 37 of 108

TABLE M - START-UP

VALVE LINEUP

VALVE NUMBER	VALVE NAME	POSITION REQUIRED	INITIALS
ROV-101A/B	TEST AIR SUPPLY ISOLATION	CLOSED	
PCV-110	MODEL INLET (Po) PRESSURE CONTROL VALVE	CLOSED (NOTE 1)	
PCV-115	MODEL BACKPRESSURE VALVE	OPEN (NOTE 1)	
TCV-107A	TEST AIR TEMPERATURE CONTROL VALVE - HOT	OPEN (NOTE 1)	
TCV-107B	TEST AIR TEMPERATURE CONTROL VALVE - COLD	CLOSED (NOTE 1)	

NOTE 1: If PCV-110, TCV-107A, TCV-107B or PCV-115 are not in their correct position, the hydraulic system may have to be started per TTE-HY-001, Hydraulic System Operation section 5.2, to correctly position these valves.

ELECTRICAL LINEUP

PANEL PDP1

BREAKER NUMBER	BREAKER NAME	POSITION REQUIRED	INITIALS
	MAIN	ON	
02	REGENERATIVE HEATER H-123 SUPPLY BREAKER	ON	
14	BLOWER B-122 SUPPLY BREAKER	ON	
	BLOWER B-122 DISCONNECT DISCONNECT (EAST WALL TTE)	ON	

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 38 of 108

TABLE N - CHROMALOX HEATER CONTROLLER OPERATION

1.0	PRESS the Menu/Val push-button to select "MENU" as indicated by the green light being illuminated above MENU on the "MENU/VAL" indicator.
2.0	SELECT Menu #1, as indicated by "1" in the lower window, by pressing the arrow push-buttons.
3.0	PRESS the Menu/Val push-button to select "VAL" as indicated by the green light being illuminated below VAL on the "MENU/VAL" indicator.
4.0	ADJUST the heater setpoint, as indicated in the lower window, with the arrow push-buttons.

(Refer to **Volume E** for further information on Chromalox.)

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 39 of 108

5.7 TTE-SA-001
SERVICE AIR SYSTEMS OPERATION

CONTENTS

5.7.A	PURPOSE	42
5.7.B	START-UP	42
5.7.C	SHUTDOWN	43
Table O	.....	44
Table P	.....	45

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 40 of 108

TTE-SA-001 SERVICE AIR SYSTEMS OPERATION

5.7.A PURPOSE

This procedure contains instructions for start-up and shutdown of the facility air and service air systems.

5.7.B START-UP

5.7.B.1 PREREQUISITES

5.7.B.1.1 T-100 and/or T-101, Test Air Storage Tanks, are available for receiving air.

5.7.B.1.2 Service Air system aligned per Table O.

5.7.B.1.3 Missile grade air pressure is greater than 1800 psi as indicated on PG-105 on T-100 air regulator panel.

5.7.B.2 PROCEDURE

The Facility Operator shall

5.7.B.2.1 If necessary, OPEN V-408, T-100 Air Supply Isolation Valve, located under T-100, to charge the tank.

5.7.B.2.2 If necessary, OPEN V-407, Service Air Isolation Valve, on T-100 air regulator panel.

5.7.B.2.3 If necessary, ADJUST V-405, PRV-151 Pressure Adjusting Regulator, to obtain 400 psi as indicated on PG-107, Test Air Storage Tanks Pressure located on T-100 air regulator panel.

5.7.B.2.4 If necessary, ADJUST V-302, PRV-300 Pressure Adjusting Regulator, to obtain approximately 80 psi as indicated on PG-305 located on the Service Air Panel.

5.7.B.2.5 If necessary, OPEN V-325, Model Service Air Manifold Isolation Valve, located at the northeast corner of the TTE high bay.

5.7.B.2.6 If necessary, ADJUST PRV-350, Regenerative Heater Purge Air Regulator, to obtain 1 - 3 S.C.F.H as indicated on FM-934 located on the Regenerative Heater.

5.7.B.2.7 If necessary, ADJUST V-326, Model Service Air Manifold Pressure Adjusting Regulator, to obtain approximately 250 psi as indicated on PG-336 located on the Model Service Air Manifold.

NOTE

Steps 5.7.B.2.8 through 5.7.B.2.13 may be omitted (N/A'd) if not needed to support model

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 41 of 108

operation.

5.7.B.2.8 If necessary, ADJUST PRV-333, located on the Model Service Air Manifold, to obtain approximately 70 psi.

5.7.B.2.9 If necessary, ADJUST PRV-334, located on the Model Service Air Manifold, to obtain approximately 70 psi.

5.7.B.2.10 If necessary, ADJUST PRV-335, located on the Model Service Air Manifold, to obtain approximately 5 psi.

5.7.B.2.11 If necessary, OPEN V-332, located on the Model Service Air Manifold.

5.7.B.2.12 If necessary, OPEN V-331, located on the Model Service Air Manifold.

5.7.B.2.13 If necessary, OPEN V-330, located on the Model Service Air Manifold.

5.7.C SHUTDOWN

5.7.C.1 PREREQUISITES

Service Air and missile grade air are no longer required to support testing.

5.7.C .2 PROCEDURE

NOTE

If tank T-100 is needed by the Air Flow facility for blowdowns, N/A step 5.7.C.2.1.

5.7.C .2.1 CLOSE V-400, T-100 Air Regulator Panel Missile Grade Isolation located at the missile grade air charging panel, is open.

5.7.C .2.2 PERFORM Service Air system alignment per Table P.

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 42 of 108

TABLE O - START-UP

VALVE LINEUP

VALVE NUMBER	VALVE NAME	POSITION REQUIRED
V-407	SERVICE AIR PANEL ISOLATION	CLOSED (NOTE 1)
V-408	T-100 AIR ISOLATION	CLOSED (NOTE 1)
V-400	MISSILE GRADE TO SERVICE AIR ISOLATION	OPEN
V-401	PG-105 ISOLATION	OPEN
V-402	PG-106 ISOLATION	OPEN
V-403	PG-107 ISOLATION	OPEN
V-406	T-100 BLOWDOWN TO ATMOSPHERE	CLOSED
V-301	SENSING LINE PRESSURE ISOLATION	OPEN
BBV-304	PG-305 ISOLATION	OPEN
BBV-307	PS-150 ISOLATION	OPEN
V-317	ROV-118 ACTUATING AIR ISOLATION	OPEN
V-318	ROV-119 ACTUATING AIR ISOLATION	OPEN
V-313	ROV-126 ACTUATING AIR ISOLATION	OPEN

NOTE 1: If these valves are open for the air flow facility to use tank T-100, N/A these valves.

START-UP

VALVE LINEUP

VALVE NUMBER	VALVE NAME	POSITION REQUIRED
V-314	ROV-124 ACTUATING AIR ISOLATION	OPEN
V-323	VCV-528 ACTUATING AIR ISOLATION	OPEN
V-321	ROV-101 A & B ACTUATING AIR ISOLATION	OPEN
V-310	ROV-127 ACTUATING AIR ISOLATION	OPEN
V-602	REGENERATIVE HEATER PURGE AIR VENT	OPEN

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 43 of 108

TABLE P - SHUTDOWN

VALVE LINEUP

VALVE NUMBER	VALVE NAME	POSITION REQUIRED
V-407	SERVICE AIR PANEL ISOLATION	CLOSED (NOTE 1)
V-408	T-100 AIR ISOLATION	CLOSED (NOTE 1)
V-406	T-100 BLOWDOWN TO ATMOSPHERE	CLOSED
V-317	ROV-118 ACTUATING AIR ISOLATION	CLOSED
V-318	ROV-119 ACTUATING AIR ISOLATION	CLOSED
V-313	ROV-126 ACTUATING AIR ISOLATION	CLOSED
V-314	ROV-124 ACTUATING AIR ISOLATION	CLOSED
V-323	VCV-528 ACTUATING AIR ISOLATION	CLOSED
V-321	ROV-101 A & B ACTUATING AIR ISOLATION	CLOSED
V-310	ROV-127 ACTUATING AIR ISOLATION	CLOSED
V-325	MODEL SERVICE AIR MANIFOLD ISOLATION	CLOSED

NOTE 1: If these valves are open for the air flow facility to use tank T-100, N/A these valves.

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 44 of 108

5.8 TTE-SW-001
SERVICE WATER SYSTEM OPERATION

CONTENTS

5.8.A	PURPOSE	47
5.8.B	START-UP	47
5.8.C	SHUTDOWN	47
Table Q	.....	48
Table R	.....	49

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 45 of 108

TTE-SW-001 SERVICE WATER SYSTEM OPERATION

5.8.A PURPOSE

This procedure contains instructions for startup and shutdown of the facility service water system.

5.8.B STARTUP

5.8.B.1 PREREQUISITES

NONE

5.8.B.2 PROCEDURE

The Facility Operator shall

Perform service water system alignment per Table Q of this procedure.

5.8.C SHUTDOWN

5.8.C.1 PREREQUISITES

NONE

5.8.C .2 PROCEDURE

Perform service water system alignment per Table R of this procedure.

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 46 of 108

TABLE Q - START-UP

VALVE LINEUP

VALVE NUMBER	VALVE NAME	POSITION REQUIRED	INITIALS
V-450	TTE SUPPLY ISOLATION	OPEN	
V-452	TTE SUPPLY ISOLATION	OPEN	
V-453	TTE RETURN ISOLATION	OPEN	
V-454	FUTURE SUPPLY ISOLATION	CLOSED	
V-455	FUTURE RETURN ISOLATION	CLOSED	
V-463	RETURN VENT ISOLATION	CLOSED	
V-466	PG-551 ISOLATION	OPEN	
V-460	FUTURE SUPPLY ISOLATION	CLOSED	
V-459	FUTURE RETURN ISOLATION	CLOSED	
V-458	L.O. SYTEMS SUPPLY VENT	CLOSED	
V-457	L.O. SYSTEMS RETURN ISOL	OPEN	
V-478	L.O. SYSTEMS SUPPLY ISOL	OPEN	
V-479	MODEL OIL PRESSURE REGULATOR ISOLATION	OPEN	
V-480	MODEL OIL HEAT ISOLATION	OPEN	
V-470	SUPPLY DRAIN	CLOSED	
V-467	RETURN DRAIN	CLOSED	

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 47 of 108

TABLE R - SHUTDOWN

VALVE LINEUP

VALVE NUMBER	VALVE NAME	POSITION REQUIRED	INITIALS
V-450	TTE SUPPLY ISOLATION	CLOSED	
V-452	TTE SUPPLY ISOLATION	CLOSED	
V-453	TTE RETURN ISOLATION	CLOSED	

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 48 of 108

5.9 TTE-ST-001
STATIC TEST PROCEDURE

CONTENTS

5.9.A PURPOSE	51
5.9.B SHORT TERM STARTUP	51
Table S	57
Table T	58
Table U	59
Table V	60
Table W	61
Table X	62
Table Y (ANNUNCIATOR TRIP)	64
Table Z (EMERGENCY).....	65

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 49 of 108

TTE-ST-001 STATIC TEST PROCEDURE

5.9.A PURPOSE

This procedure contains instructions for performing a model test blowdown following a short-term shutdown.

5.9.B SHORT TERM STARTUP

5.9.B.1 PREREQUISITES

5.9.B.1.1 Test Systems Master Control Disable/Enable switch on Panel C is in the "Disable" position and key is removed and in place in the Pyrotechnic Disable/Enable switch, JB13, located on the south side of the plenum cart.

5.9.B.1.2 Pyrotechnic Disable/Enable switch is in the "Disable" position.

5.9.B.1.3 Heat Systems Control Disable/Enable switch on Panel E is in the "Disable" position.

5.9.B.1.4 V-400, T-100 Air Regulator Panel Missile Grade Isolation located at the missile grade air charging panel, is open.

5.9.B.1.5 Electrical breakers are aligned in accordance with Table S.

5.9.B.1.6 Valves are aligned in accordance with Table T.

5.9.B.1.7 Light bulb check has been performed on Annunciator No. 1 Test Systems on Panel A and Annunciator No. 2 Drive Systems on Panel G per Table V of this procedure.

5.9.B.1.8 Verify Model Oil Storage Tank level, located at the model oil skid outside east of the TTE high bay, is greater than 50% as indicated on sight glass SG-521.

5.9.B.1.9 The Dynamometer Control switch, Panel C, is in the "Remote" position.

5.9.B.1.10 Verify Hydraulic Oil Storage Tank level, located at the north wall of the TTE high bay, is greater than 75% as indicated in the HPU oil reservoir sight glass.

5.9.B.1.11 Verify the blue OIL LEVEL/TEMP light on JB11, located on the north wall of the TTE high bay, is on.

5.9.B.1.12 Model support systems are aligned and operational per Test Engineer.

5.9.B.1.13 Remote talking headsets are fully functional.

5.9.B.2 PROCEDURE

The Facility Operator shall

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 50 of 108
NOTE		
For operation of the TCS controllers, refer to Table U of this procedure.		

5.9.B.2.1 Set VIC-528, VCV-528 Vacuum Indicating Controller on Panel F, to the desired bearing cavity delta pressure (generally 1.500 on "VACUUM - loop 1") required for the current test.

5.9.B.2.2 Set VIC-528 to the desired oil flow rate (generally a valve position of approximately 20% on "FLOW - loop 2") required for the current test.

5.9.B.2.3 PLACE Loop 1 of VIC-528 in automatic by pressing the "A" push-button on the controller.

5.9.B.2.4 ALIGN and CALIBRATE the model data acquisition systems as required by the Test Engineer.

5.9.B.2.5 START VP-517, Vacuum Pump, using push-button located at the model oil skid.

5.9.B.2.6 START P-512, Scavenge Pump, using push-button located at the model oil skid.

5.9.B.2.7 START P-501, Supply Pump, using push-button located at the model oil skid.

5.9.B.2.8 ENERGIZE H-524, Tank Heater, using push-button located at the model oil skid.

5.9.B.2.9 If necessary, ADJUST TIC-526, Model Oil Temperature Indicating Controller located at southeast door of TTE high bay, as necessary, to maintain desired oil inlet temperature (generally 90 degrees F as indicated on Model Lube Inlet Temp located on Panel G).

5.9.B.2.10 If necessary, ADJUST VIC-528 to maintain desired oil inlet flow rate.

5.9.B.2.11 START the gearbox lube oil system by pressing the "Start" push-button on MC-900 located on the north side of the gearbox.

5.9.B.2.12 START HPU-700, Hydraulic Power Unit, by pressing the start push-button on JB11.

5.9.B.2.13 START the dynamometer fans and oil pump by turning the Dynamometer Field switch, Panel C, to "FWD".

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 51 of 108

NOTE

Refer to Table X of this procedure for operation of the Microstar model speed controller.

5.9.B.2.14 ADJUST the Microstar controller, located on Panel F, per Table X of this procedure.

5.9.B.2.15 RESET the dynamometer by pressing the Dynamometer Reset push-button on Panel C.

5.9.B.2.16 Perform one of the following:

5.9.B.2.16.1 If the dynamometer has been shutdown for more than seven (7) days, ensure the dynamometer fans/oil pump runs for at least thirty (30) minutes and START the dynamometer by pressing the Dynamometer "ON" push-button, on Panel C.

OR

5.9.B.2.16.2 If the dynamometer has been shutdown for less than seven (7) days, ensure the dynamometer fans/oil pump runs for at least fifteen (15) minutes and START the dynamometer by pressing the Dynamometer "ON" push-button, on Panel C.

5.9.B.2.17 PRESS the Manual/Auto push-button on the Microstar controller to extinguish the "Manual" light.

CAUTION

MONITOR TORQUE READINGS ON THE TORQUETRONIC TORQUE READOUT
LOCATED ON PANEL D.

NOTE

For operation of the TCS controllers, refer to Table U of this procedure.

5.9.B.2.18 PUSH the "Start/pyro Enabled" push button located on Panel C.

5.9.B.2.19 SET TIC-107, TCV-107A/B Temperature Indicating Controller on Panel D, to the desired temperature (To) required for the current test.

5.9.B.2.20 SET PIC-110, PCV-110 Pressure Indicating Controller on Panel D, to a pressure (Po) as determined by Test Engineer.

5.9.B.2.21 SET PRIC-115, Pressure Ratio Indicating Controller on Panel D, to a ratio determined by Test Engineer.

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 52 of 108

5.9.B.2.22 PLACE Loop 1 of TIC-107 in automatic by pressing the "A" push-button on the controller.

5.9.B.2.23 PLACE Loop 1 of PIC-110 in automatic by pressing the "A" push-button on the controller.

5.9.B.2.24 Place Loop 1 of PRIC-115 in automatic by pressing the "A" pushbutton on the controller.

5.9.B.2.25 RESET the annunciator panels by turning the Annunciator Acknowledge/Reset switch on panel C to "Acknowledge" first and then to "Reset".

5.9.B.2.26 VERIFY all annunciator lights on Annunciator No. 1 Test Systems located on Panel A and Annunciator No. 2 Drive Systems located on Panel G are not illuminated.

5.9.B.2.27 ENSURE T-100 and/or T-101, Test Air Storage Tanks, are adequately charged as indicated on PG-107, Test Air Storage Tanks Pressure located at the missile grade air charging panel.

5.9.B.2.28 Plug handheld terminal into PRIC 115.

5.9.B.2.29 Ensure two blinking dots in display.

5.9.B.2.30 Perform the following on the handheld terminal:

PRESS	DISPLAY
"SHIFT" KEY	^
"SPACE" KEY	?? BCMD
"B" "T" KEYS	BT ??
"S" "P" KEYS	BT SP
"L++" (ENTER) KEY	BT SP ("S" is BLINKING)
"W " KEY	BN1 or BN2

5.9.B.2.31 Ensure terminal is in BN1.

5.9.B.2.32 If terminal is in "BN2", perform the following:

5.9.B.2.32.1 Press the "1" key.

5.9.B.2.32.2 Press the "L++"(ENTER) key.

5.9.B.2.33 Press the "W " key until display on handheld terminal reads 'LR' and some

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 53 of 108

number.

5.9.B.2.34 Press "0", "5", "0", "0" keys.

5.9.B.2.35 Press the "L++"(ENTER) key. PCV-115 should close.

NOTE:
PCU-115 WILL BE IN CONTROL.HYDRAULIC AND MANUAL LOCKED OUT.

5.9.B.2.36 PLACE Pyrotechnic Disable/Enable switch,JB13, located on the south side of the plenum cart in the "Enable" position and remove the key.

5.9.B.2.37 ENERGIZE the area alarm and warning system by placing the Bells switch on Panel C to "On".

5.9.B.2.38 PLACE Test Systems Master Control Disable/Enable switch on Panel C in the "Enable" position.

NOTE
Refer to Table W of this procedure for operation of the facility data acquisition computer

5.9.B.2.39 START recording facility data with the facility data acquisition computer.

5.9.B.2.40 START the 'Static Run' by pushing the test "Start/Pyro Enabled" push-button located on Panel C.

5.9.B.2.41 Operator verbally instructs the valve operator to OPEN V-101, Manual Isolation Valve, until setpoint pressure has been reached and stabilized.

5.9.B.2.42 When the data collection process is completed, STOP the 'Static Run' by pushing the test "STOP" push-button located on Panel C.

5.9.B.2.43 PLACE the Test Systems Master Control Disable/Enable switch on Panel C in the "Disable" position and remove key.

5.9.B.2.44 CLOSE V-101, Test Air Supply Manual Isolation Valve.

5.9.B.2.45 When pressure has adequately bled off model, PRESS "1", "0", "0", "0".

5.9.B.2.46 PRESS "L++"(ENTER) key. PCV-115 should OPEN.

5.9.B.2.47 Unplug handheld terminal.

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 54 of 108

5.9.B.2.48 DEENERGIZE the area alarm and warning system by placing the Bells switch on Panel C to "Off".

5.9.B.2.49 STOP the facility computer monitoring facility components.

5.9.B.2.50 Perform ONE of the following:

5.9.B.2.50.1 If testing is complete, perform one of the following:

5.9.B.2.50.1.1 Proceed to Section 5.10.C of procedure TTE-TA-001, Model Test Procedure, if long term shutdown is necessary.

OR

5.9.B.2.50.1.2 Proceed to Section 5.11.D of procedure, TTE-RT-001, Repetitive Test Procedure.

OR

5.9.B.2.50.1.3 If testing is to be continued, proceed to procedure TTE-RT-001, Repetitive Test Procedure Section 5.11.

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 55 of 108

TABLE S - START-UP

ELECTRICAL LINEUP

PANEL PDP2

BREAKER NUMBER	BREAKER NAME	POSITION REQUIRED	INITIALS
	MAIN	ON	
01	CONTROL ROOM PANEL G	ON	
02	CONTROL ROOM PANEL B	ON	
03	CONTROL ROOM PANEL C	ON	
04	CONTROL ROOM PANEL D	ON	
05	CONTROL ROOM PANEL E	ON	
06	CONTROL ROOM PANEL F	ON	
07	CONTROL ROOM PANEL A	ON	
08	CONTROL ROOM PANEL H	ON	
09	CONTROL ROOM PANEL I	ON	
10	CONTROL ROOM PRINTER STAND	ON	
12	CONTROL ROOM UPS POWER SUP	ON	
POWER STRIP	UPS POWER SUPPLY--IN PRINTER STAND IN CONTROL ROOM	ON	

CONTINUES

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 56 of 108

TABLE T - START-UP

VALVE LINEUP

VALVE NUMBER	VALVE NAME	POSITION REQUIRED
ROV-101A/B	TEST AIR SUPPLY ISOLATION	CLOSED
PCV-110	MODEL INLET (Po) PRESSURE CONTROL VALVE	CLOSED (NOTE 1)
PCV-115	MODEL BACKPRESSURE VALVE	CLOSED (NOTE 1)
TCV-107A	TEST AIR TEMPERATURE CONTROL VALVE - HOT	OPEN (NOTE 1)
TCV-107B	TEST AIR TEMPERATURE CONTROL VALVE - COLD	CLOSED (NOTE 1)
V-101	TEST AIR SUPPLY MANUAL ISOLATION VALVE	CLOSED
V-102	TEST AIR SUPPLY MANUAL ISOLATION VALVE	CLOSED

NOTE 1: If PCV-110, TCV-107A, TCV-107B or PCV-115 are not in their correct position, the hydraulic system may have to be started per TD74-NTF-001, TTE-HY-001, Hydraulic System Operation section 5.2, to correctly position these valves.

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 57 of 108

TABLE U - TCS CONTROLLER AUTOMATIC OPERATION

1.0	SET TIC-107, TCV-107A/B Temperature Indicating Controller on Panel D, to the desired temperature (To) required for the current test as follows:
1.1	SELECT Loop 1 on TIC-107 by pressing the " " push-button.
1.2	PLACE Loop 1 of TIC-107 in manual by pressing the "M" push-button on the controller.
1.3	SELECT Loop 2 on TIC-107 by pressing the " " push-button.
1.4	PLACE Loop 2 of TIC-107 in manual by pressing the "M" push-button on the controller.
1.5	SELECT Loop 1 on TIC-107 by pressing the " " push-button.
1.6	ADJUST TIC-107 to the desired temperature setpoint by pressing the "SP" push-button and the setpoint increase (" ") or decrease (" ") push-button simultaneously.
2.0	SET PIC-110, PCV-110 Pressure Indicating Controller, to the desired pressure as follows:
2.1	PLACE PIC-110 in manual by pressing the "M" push-button on the controller.
2.2	ADJUST PIC-110 to desired pressure setpoint by pressing the "SP" push-button and the setpoint increase (" ") or decrease (" ") push-button simultaneously.
3.0	SET PRIC-115, Pressure Ratio Indicating Controller on Panel D, to the desired pressure ratio or delta pressure required for the current test as follows:
3.1	SELECT Loop 1 on PRIC-115 by pressing the " " push button.
3.2	PLACE Loop 1 of PRIC-115 in manual by pressing the "M" push-button on the controller.
3.3	SELECT Loop 2 on PRIC-115 by pressing the " " push-button.
3.4	PLACE Loop 2 of PRIC-115 in manual by pressing the "M" push-button on the controller.
3.5	For controlling the pressure ratio:
3.5.1	SELECT Loop 1 on PRIC-115 by pressing the " " push-button.
3.5.2	ADJUST PRIC-115 to the desired pressure ratio by pressing the "SP" push-button and the setpoint increase (" ") or decrease (" ") push-button simultaneously.
	<u>OR</u>
3.6	For controlling the delta pressure:
3.6.1	SELECT Loop 2 on PRIC-115 by pressing the " " push-button.
3.6.2	PLACE PRIC-115 in manual by pressing the "M" push-button on the controller.
3.6.3	ADJUST PRIC-115 to the desired delta pressure by pressing the "SP" push-button and the setpoint increase (" ") or decrease (" ") push-button simultaneously.
4.0	SET VIC-528, Vacuum Indicating Controller on Panel F, to the desired model oil flow and model bearing cavity delta pressure required for the current test as follows:
4.1	SELECT Loop 1 on VIC-528 by pressing the " " push-button.
	CONTINUES

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 58 of 108

TABLE U (con.'t) - TCS CONTROLLER AUTOMATIC OPERATION

4.2	PLACE Loop 1 of VIC-528 in manual by pressing the "M" push-button on the controller.
4.3	SELECT Loop 2 on VIC-528 by pressing the " " push button.
4.4	PLACE Loop 2 of VIC-528 in manual by pressing the "M" push-button on the controller.
4.5	For controlling the model bearing cavity delta pressure:
4.5.1	SELECT Loop 1 on VIC-528 by pressing the " " push-button.
4.5.2	ADJUST VIC-528 to the desired model bearing cavity delta pressure by pressing the "SP" push-button and the setpoint increase (" ") or decrease (" ") push-button simultaneously.
4.6	For controlling the model oil flow:
4.6.1	SELECT Loop 2 on VIC-528 by pressing the " " push-button.
4.6.2	ADJUST VIC-528 to the oil flow rate by pressing the "M" push-button and the setpoint increase (" ") or decrease (" ") push-button simultaneously.

(Refer to **Volume D** for further information on TCS controllers.)

TABLE V - TCS CONTROLLER MANUAL OPERATION

1.0	Manually ADJUST valve PCV-110 to the desired position by pressing the "M" push-button and the setpoint increase (" ") or decrease (" ") push-button simultaneously on PIC-110, PCV-110 Pressure Indicating Controller.
2.0	Manually ADJUST valve PCV-115 to the desired position by pressing the "M" push-button and the setpoint increase (" ") or decrease (" ") push-button simultaneously on PRIC-115, Pressure Ratio Indicating Controller on Panel D.
3.0	Manually ADJUST valve TCV-107A/B to the desired position by pressing the "M" push-button and the setpoint increase (" ") or decrease (" ") push-button simultaneously on TIC-107, TCV-107A/B Temperature Indicating Controller on Panel D.

(Refer to **Volume D** for further information on TCS controllers.)

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 59 of 108

TABLE W - ANNUNCIATOR PANEL LIGHT CHECK

1.0	On Annunciator No. 1 Test Systems, Panel A, PRESS the "Test" push-button.
2.0	VERIFY all annunciator windows are illuminated.
3.0	REPLACE any light bulbs that are not illuminated.
4.0	On Annunciator No. 1 Test Systems, PRESS the "Ack" push-button.
5.0	On Annunciator No. 1 Test Systems, PRESS the "Reset" push-button.
6.0	On Annunciator No. 2 Drive Systems, Panel G, PRESS the "Test" push-button.
7.0	VERIFY all annunciator windows are illuminated.
8.0	REPLACE any light bulbs that are not illuminated.
9.0	On Annunciator No. 2 Drive Systems, PRESS the "Ack" push-button.
10.0	On Annunciator No. 2 Drive Systems, PRESS the "Reset" push-button.

(Refer to **Volume B** for further information on annunciators.)

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 60 of 108

TABLE X - FACILITY DATA ACQUISITION COMPUTER OPERATION

<p>The facility data acquisition (DAQ) system consists of three computers and numerous transducers and signal conditioners. The facility operator's computer is located in the TTE control room. It is connected to the other two computers by an Ethernet LAN. The operator's computer has a GPIB connection to a PSI rack and a NI plug-in data acquisition board connected to a signal conditioning chassis.</p>
<p>The second computer is located in the valve room, adjacent to the test chamber. It also has a GPIB connection to a PSI rack and a NI plug-in DAQ board connected to a signal conditioning chassis. During operation, this computer will operate in remote mode, meaning that it will be controlled by the operator's computer from the TTE control room.</p>
<p>The third computer will be for test engineer use and located in the TTE control room. It will receive data from the operator's computer over the LAN, which can be displayed in real-time. This computer will also have an Ethernet connection to the Marshall domain.</p>
<p>1) To operate the DAQ software, the operator must first log into the Windows NT workstation. The DSO (data systems operator) account should be used with the appropriate password (consult the system administrator to receive the password). Once appropriately logged into Windows, there should be an icon on the desktop labeled, "NTF DAQ Software." Double click on this icon to launch the application.</p>
<p>As the software launches, it will automatically look to the template file to determine what data acquisition hardware is connected. The text, "Reading Template File..." will appear on the status bar. If the template is read successfully, the status bar will so indicate. If the file cannot be located or read properly, a popup dialog will alert the operator</p>
<p>After the template file is successfully read, the application on the valve room computer must be launched. The status bar will indicate when this launch is in progress. There is also a circular indicator below the status bar that will blink yellow as the launch is in progress. If the launch is successful, the indicator will turn green and indicate, "Remote Application Running..." If there is any problem, the indicator will turn red. Note that this launch may take about a minute.</p>
<p>2) The next step is to verify the setup. From the "setup" menu select and verify the configurations for each of the following:</p> <ul style="list-style-type: none"> PSI System SCXI → Facility DAQ SCXI → Facility T/C SCXI → Remote DAQ SCXI → Remote T/C <p>If there are any problems with the configuration, an Instrumentation/ DAQ Engineer must be consulted. As the software becomes more sophisticated, all required channels will be blocked out. Operators will then have access to add available channels at will.</p>
<p>3) Once the setup has been verified, measurement can begin. Press the "Record" button (arrow shaped). After initializing the hardware (and communicating with the remote machine), data should be available. Data will be continuously updated from all SCXI sources. PSI data operates in snapshot mode. Once the button is pressed, a single measurement will be conducted and updated to the screen. Note that the PSI must first be calibrated.</p>

CONTINUES

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 61 of 108

TABLE X (con.'t) - FACILITY DATA ACQUISITION COMPUTER OPERATION

To change settings for SCXI measurements, the DAQ must be stopped and restarted. Do this by clicking the "Record" button to the off state, then clicking it again to restart the DAQ.
4) When the test setpoint is successfully achieved, data may be captured to a file. To capture a snapshot of the data (including PSI), choose the "Capture Data" button. This will capture data to an ASCII file that can be read with a word processor or spreadsheet application.
5) When testing procedure is completed, push the "Quit" button or select "Quit" from the File menu. Confirmation is required. Quitting will stop the application running on the remote computer and close the connection.

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 62 of 108

TABLE Y - ANNUNCIATOR TRIP SHUTDOWN PROCEDURE

In the event that an annunciator trip occurs during a static, perform the following:
--

1.0	STOP the "Static" by pushing the test "STOP" push-button located on Panel C.
2.0	Instruct the valve operator to CLOSE V-101, Test Air Supply Manual Isolation Valve.
3.0	Allow pressure to decay to ambient (14.7 psi).
4.0	Place the Test Systems Master Control Disable/ Enable switch on Panel C in the "DISABLE" position and remove key.
5.0	With the handheld terminal, PRESS "1", "0", "0", "0" keys.
6.0	PRESS "L++"(ENTER) key. PCV-115 should open.
7.0	Unplug handheld terminal.

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 63 of 108

TABLE Z - LOSS OF POWER/BROKEN SHAFT SHUTDOWN PROCEDURE

In the event that loss of power or a broken shaft occurs during a static, perform the following:
--

1.0	STOP the "Static" by pushing the test "STOP" push-button located on Panel C.
2.0	Instruct the valve operator to CLOSE V-101, Test Air Supply Manual Isolation Valve.
3.0	Allow pressure to decay to ambient (14.7 psi).
4.0	Place the Test Systems Master Control Disable/Enable switch on Panel C in the "DISABLE" position and remove key.
5.0	With the handheld terminal, PRESS "1", "0", "0", "0" keys.
6.0	PRESS "L++"(ENTER) key. PCV-115 should open.
7.0	Unplug handheld terminal.

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 64 of 108

5.10 TTE-TA-001
MODEL TEST PROCEDURE

CONTENTS

5.10.A	PURPOSE	67
5.10.B	STARTUP	67
5.10.C	SHUTDOWN	71
Table AA	.....	73
Table AB	.....	74
Table AC	.....	75
Table AD	.....	76
Table AE	.....	77
Table AF	.....	78
Table AG (ANNUNCIATOR TRIP)	.....	79
Table AH (EMERGENCY)	.....	21

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 65 of 108

TTE-TA-001 MODEL TEST PROCEDURE

5.10.A PURPOSE

This procedure contains instructions for performing a model test blowdown following model changeout or facility modification/repair.

5.10.B STARTUP

5.10.B.1 PREREQUISITES

5.10.B.1.1 The following have been verified operational:

5.10.B.1.1.1 Facility/Model amberline setpoints.

5.10.B.1.1.2 Facility/Model redline setpoints.

5.10.B.1.1.3 Facility/Model interlocks.

5.10.B.1.2 Test Systems Master Control Disable/Enable switch on Panel C is in the "Disable" position and key is removed and in place in the Pyrotechnic Disable/Enable switch, JB13, located on the south side of the plenum cart.

5.10.B.1.3 Pyrotechnic Disable/Enable switch is in the "Disable" position.

5.10.B.1.4 Heat Systems Control Disable/Enable switch on Panel E is in the "Disable" position.

5.10.B.1.5 The facility electrical system is aligned per TTE-FP-001, Facility Electrical Power Operations section 5.1.

5.10.B.1.6 Light bulb check has been performed on Annunciator No. 1 Test Systems on Panel A and Annunciator No. 2 Drive Systems on Panel G per Table AD of this procedure.

5.10.B.1.7 Valves are aligned in accordance with Table AA.

5.10.B.1.8 The hydraulic system is operating per TTE-HY-001, Hydraulic System Operation section 5.2.

5.10.B.1.9 Ensure the model data acquisition systems are aligned and calibrated by the Test Engineer.

5.10.B.1.10 Preheating of the model/facility has begun per TTE-MH-001, Model/Facility Pre-heat Operation section 5.3.

5.10.B.1.11 Regeneration of the thermal matrix heater has begun per TTE-RH-001, Regenerative Heat System Operation section 5.6.

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 66 of 108

5.10.B.1.12 T-100 and/or T-101, Test Air Storage Tanks, are adequately charged as indicated on PG-107, Test Air Storage Tanks Pressure located at the missile grade air charging panel.

5.10.B.1.13 Model support systems are aligned and operational per Test Engineer.

5.10.B.1.14 Test speed profile entered into Microstar Speed Controller.

5.10.B.2 PROCEDURE

The Facility Operator shall

NOTE

For operation of the TCS controllers, refer to Table AB of this procedure.

5.10.B.2.1 By using "SP", SET TIC-107, TCV-107A/B Temperature Indicating Controller on Panel D, to the desired temperature (To) required for the current test.

5.10.B.2.2 By using "SP", SET PIC-110, PCV-110 Pressure Indicating Controller on Panel D, to a pressure (Po) of 50 psi.

5.10.B.2.3 By using "SP", SET PRIC-115, Pressure Ratio Indicating Controller on Panel D, to the desired pressure ratio or delta pressure required for the current test. Then perform one of the following:

5.10.B.2.3.1 For delta pressure control, PLACE Loop 2 of PRIC-115 in automatic by pressing the "A" push-button on the controller.

OR

5.10.B.2.3.2 For pressure ratio control, PLACE Loop 1 of PRIC-115 in automatic by pressing the "A" push-button on the controller.

5.10.B.2.4 When the regenerative heater is at the desired temperature and the model/facility has been adequately pre-heated, perform the following:

5.10.B.2.4.1 STOP regenerative heat system per TTE-RH-001, Regenerative Heat System Operation section 5.6.

5.10.B.2.4.2 STOP preheating of the model/facility per TTE-MH-001, Model/Facility Pre-heat Operation section 5.3.

5.10.B.2.4.3 PLACE Heat Systems Control Disable/Enable switch on Panel E in the "Disable" position.

5.10.B.2.5 PLACE Loop 1 of TIC-107 in automatic by pressing the "A" push-button on

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 67 of 108

the controller.

5.10.B.2.6 PLACE Loop 1 of PIC-110 in automatic by pressing the "A" push-button on the controller.

5.10.B.2.7 Reset the enunciator panels by turning the Annunciator Acknowledge/Reset switch on panel C to "Acknowledge" first and then to "Reset".

5.10.B.2.8 VERIFY all annunciator lights on Annunciator No. 1 Test Systems located on Panel A and Annunciator No. 2 Drive Systems located on Panel G are not illuminated. 'Model Speed Lo' will be illuminated.

5.10.B.2.9 PLACE Pyrotechnic Disable/Enable switch, JB13, located on the south side of the plenum cart in the "Enable" position and remove the key.

5.10.B.2.10 ENERGIZE the area alarm and warning system by placing the Bells switch on Panel C to "On".

5.10.B.2.11 Verify Microstar Speed Profile Controller is showing "0" SP and 0% output. If not go to [Appendix Z](#).

5.10.B.2.12 Push Dyno "ON" button located on Panel C. Verify it is illuminated.

5.10.B.2.13 On the Microstar Speed Profile Controller located on panel F, push manual.

5.10.B.2.14 PUSH "Start/Pyro Enabled" button on Panel C. The test article will increase only to 1000 rpm.

5.10.B.2.15 START recording facility data with the facility data acquisition computer.

5.10.B.2.16 PLACE Test Systems Master Control Disable/Enable switch on Panel C in the "Enable" position by using Pyrotechnic key. (Red light in start/pyro should light.)

5.10.B.2.17 START the 'Low Blowdown' by pushing the test "Start/Pyro Enabled" push-button located on Panel C. (ROV 101 A/B will open. Pressure will increase to starting setpoint of 50 psi.)

5.10.B.2.18 PRESS the "Start/Pyro Enabled" push-button until the test article begins to increase to the speed designated by the Test Engineer.

NOTE

Steps 5.10.B.2.19 and 5.10.B.2.20 may be performed/repeated in any order as required by the test engineer.

5.10.B.2.19 As required, using "SP" ADJUST the setpoint on PIC-110 to the pressure designated by the Test Engineer.

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 68 of 108

5.10.B.2.20 As required, ADJUST the setpoint on PRIC-115 to the pressure ratio or delta pressure designated by the Test Engineer.

5.10.B.2.21 When the following required parameters stabilize, tell the Test Engineer:

- Po - Model Inlet Pressure PIC-110
- To - Model Air Inlet Temperature TIC-107
- Pr - Model Pressure Ratio..... PRIC-115
- N - Model Speed..... Torquetronic (Panel D)
- Model Oil Flow VIC-528 ("FLOW-loop 2")
- Model Lube Inlet Temperature..... Panel G
- Model Lube Seal Delta P..... Panel G

5.10.B.2.22 When the data collection process is completed, using "SP", ADJUST the setpoint on PIC-110 to 50 psi.

5.10.B.2.23 PRESS the "Start/Pyro Enabled" push-button until the test article begins to decrease to 1000 rpm.

5.10.B.2.24 FROM the indicators on the Microstar, at 7.9% PRESS the test 'STOP' push-button located on Panel C to stop the 'Low Blowdown'.

5.10.B.2.25 WHEN pressure has bled of to ~atmosphere. PLACE the Test Systems Master Control Disable/Enable switch on Panel C in the "Disable" position and remove key.

5.10.B.2.26 ON Microstar manually bring speed down to 0.0%.

5.10.B.2.27 PUSH Dyno OFF.

5.10.B.2.28 DEENERGIZE the area alarm and warning system by placing the Bells switch on Panel C to "Off".

5.10.B.2.29 STOP the facility computer monitoring facility components.

5.10.B.2.30 Perform ONE of the following:

5.10.B.2.30.1 If testing is to be complete, proceed to Section 5.10.C of this procedure.

OR

5.10.B.2.30.2 If testing is to be continued, proceed to Section 5.11.D of TTE-RT-001, Repetitive Test Procedure.

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 69 of 108

5.10.C SHUTDOWN

5.10.C .1 PREREQUISITES

5.10.C.1.1 The need for the test system no longer exists (i.e., test cancellation, test completion or facility modification/repair).

5.10.C.1.2 Test Systems Master Control Disable/Enable switch on Panel C is in the "Disable" position and key is removed and in place in the Pyrotechnic Disable/Enable switch, JB13, located on the south side of the plenum cart.

5.10.C.1.3 Pyrotechnic Disable/Enable switch is in the "Disable" position.

5.10.C.2 PROCEDURE

The Facility Operator shall

5.10.C.2.1 PLACE TIC-107, TCV-107A/B Temperature Indicating Controller on Panel D, in manual by pressing the "M" push-button on the controller.

5.10.C.2.2 PLACE PIC-110, PCV-110 Pressure Indicating Controller on Panel D, in manual by pressing the "M" push-button on the controller.

5.10.C.2.3 PLACE PRIC-115, Pressure Ratio Indicating Controller on Panel D, in manual by pressing the "M" push-button on the controller.

NOTE

Refer to Table AF of this procedure for operation of the Microstar model speed controller.

5.10.C.2.4 ADJUST the test article speed, as indicated on the Torquetronic speed readout on Panel D, to 0 rpm with the Microstar controller on Panel F.

5.10.C.2.5 SHUTDOWN the hydraulic system per TTE-HY-001, Hydraulic System Operation Section 5.2.C.

5.10.C.2.6 SHUTDOWN the service air system per procedure TTE-SA-001, Service Air Systems Operation Section 5.7.C.

5.10.C.2.7 SHUTDOWN the dynamometer/model per procedure TTE-PT-001, Power Train Components Operation Section 5.5.C.

5.10.C.2.8 SHUTDOWN the facility electrical system per procedure TTE-FP-001, Facility Electrical Power Operations Section 5.1.C.

5.10.C.2.9 Align valves in accordance with Table AC.

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 70 of 108

Table AA - STARTUP

VALVE LINEUP

VALVE NUMBER	VALVE NAME	POSITION REQUIRED
V-101	T-100 ISOLATION VALVE	OPEN
V-102	T-101 ISOLATION VALVE	CLOSED (NOTE 1)

NOTE 1: If this valve is open for the air flow facility to use tank T-100, N/A this valve.

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 71 of 108

Table AB - TCS CONTROLLER AUTOMATIC OPERATION

1.0	SET TIC-107, TCV-107A/B Temperature Indicating Controller on Panel D, to the desired temperature (To) required for the current test as follows:
1.1	SELECT Loop 1 on TIC-107 by pressing the " " push-button.
1.2	PLACE Loop 1 of TIC-107 in manual by pressing the "M" push-button on the controller.
1.3	SELECT Loop 2 on TIC-107 by pressing the " " push-button.
1.4	PLACE Loop 2 of TIC-107 in manual by pressing the "M" push-button on the controller.
1.5	SELECT Loop 1 on TIC-107 by pressing the " " push-button.
1.6	ADJUST TIC-107 to the desired temperature setpoint by pressing the "SP" push-button and the setpoint increase (" ") or decrease (" ") push-button simultaneously.
2.0	SET PIC-110, PCV-110 Pressure Indicating Controller, to the desired pressure as follows:
2.1	PLACE PIC-110 in manual by pressing the "M" push-button on the controller.
2.2	ADJUST PIC-110 to desired pressure setpoint by pressing the "SP" push-button and the setpoint increase (" ") or decrease (" ") push-button simultaneously.
3.0	SET PRIC-115, Pressure Ratio Indicating Controller on Panel D, to the desired pressure ratio or delta pressure required for the current test as follows:
3.1	SELECT Loop 1 on PRIC-115 by pressing the " " push button.
3.2	PLACE Loop 1 of PRIC-115 in manual by pressing the "M" push-button on the controller.
3.3	SELECT Loop 2 on PRIC-115 by pressing the " " push-button.
3.4	PLACE Loop 2 of PRIC-115 in manual by pressing the "M" push-button on the controller.
3.5	For controlling the pressure ratio:
3.5.1	SELECT Loop 1 on PRIC-115 by pressing the " " push-button.
3.5.2	ADJUST PRIC-115 to the desired pressure ratio by pressing the "SP" push-button and the setpoint increase (" ") or decrease (" ") push-button simultaneously.
	<u>OR</u>
3.6	For controlling the delta pressure:
3.6.1	SELECT Loop 2 on PRIC-115 by pressing the " " push-button.
3.6.2	PLACE PRIC-115 in manual by pressing the "M" push-button on the controller.
3.6.3	ADJUST PRIC-115 to the desired delta pressure by pressing the "SP" push-button and the setpoint increase (" ") or decrease (" ") push-button simultaneously.
4.0	SET VIC-528, Vacuum Indicating Controller on Panel F, to the desired model oil flow and model bearing cavity delta pressure required for the current test as follows:
4.1	SELECT Loop 1 on VIC-528 by pressing the " " push-button.

CONTINUES

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 72 of 108

Table AB - TCS CONTROLLER AUTOMATIC OPERATION

4.2	PLACE Loop 1 of VIC-528 in manual by pressing the "M" push-button on the controller.
4.3	SELECT Loop 2 on VIC-528 by pressing the " " push button.
4.4	PLACE Loop 2 of VIC-528 in manual by pressing the "M" push-button on the controller.
4.5	For controlling the model bearing cavity delta pressure:
4.5.1	SELECT Loop 1 on VIC-528 by pressing the " " push-button.
4.5.2	ADJUST VIC-528 to the desired model bearing cavity delta pressure by pressing the "SP" push-button and the setpoint increase (" ") or decrease (" ") push-button simultaneously.
4.6	For controlling the model oil flow:
4.6.1	SELECT Loop 2 on VIC-528 by pressing the " " push-button.
4.6.2	ADJUST VIC-528 to the oil flow rate by pressing the "M" push-button and the setpoint increase (" ") or decrease (" ") push-button simultaneously.

(Refer to **Volume D** for further information on TCS controllers.)

TABLE AB - TCS CONTROLLER MANUAL OPERATION

1.0	Manually ADJUST valve PCV-110 to the desired position by pressing the "M" push-button and the setpoint increase (" ") or decrease (" ") push-button simultaneously on PIC-110, PCV-110 Pressure Indicating Controller.
2.0	Manually ADJUST valve PCV-115 to the desired position by pressing the "M" push-button and the setpoint increase (" ") or decrease (" ") push-button simultaneously on PRIC-115, Pressure Ratio Indicating Controller on Panel D.
3.0	Manually ADJUST valve TCV-107A/B to the desired position by pressing the "M" push-button and the setpoint increase (" ") or decrease (" ") push-button simultaneously on TIC-107, TCV-107A/B Temperature Indicating Controller on Panel D.

(Refer to **Volume D** for further information on TCS controllers.)

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 73 of 108

TABLE AC - SHUTDOWN

VALVE LINEUP

VALVE NUMBER	VALVE NAME	POSITION REQUIRED
V-101	T-100 ISOLATION VALVE	CLOSED
V-102	T-101 ISOLATION VALVE	CLOSED (NOTE 1)
V-132	MODEL PREHEAT SUP ISOLATION	CLOSED

NOTE 1: If this valve is open for the air flow facility to use tank T-100, N/A this valve.

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 74 of 108

TABLE AD - ANNUNCIATOR PANEL LIGHT CHECK

1.0	On Annunciator No. 1 Test Systems, Panel A, PRESS the "Test" push-button.
2.0	VERIFY all annunciator windows are illuminated.
3.0	REPLACE any light bulbs that are not illuminated.
4.0	On Annunciator No. 1 Test Systems, PRESS the "Ack" push-button.
5.0	On Annunciator No. 1 Test Systems, PRESS the "Reset" push-button.
6.0	On Annunciator No. 2 Drive Systems, Panel G, PRESS the "Test" push-button.
7.0	VERIFY all annunciator windows are illuminated.
8.0	REPLACE any light bulbs that are not illuminated.
9.0	On Annunciator No. 2 Drive Systems, PRESS the "Ack" push-button.
10.0	On Annunciator No. 2 Drive Systems, PRESS the "Reset" push-button.

(Refer to **Volume B** for further information on annunciators.)

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 75 of 108

TABLE AE - FACILITY DATA ACQUISITION COMPUTER OPERATION

<p>The facility data acquisition (DAQ) system consists of three computers and numerous transducers and signal conditioners. The facility operator's computer is located in the TTE control room. It is connected to the other two computers by an Ethernet LAN. The operator's computer has a GPIB connection to a PSI rack and a NI plug-in data acquisition board connected to a signal conditioning chassis.</p>
<p>The second computer is located in the valve room, adjacent to the test chamber. It also has a GPIB connection to a PSI rack and a NI plug-in DAQ board connected to a signal conditioning chassis. During operation, this computer will operate in remote mode, meaning that it will be controlled by the operator's computer from the TTE control room.</p>
<p>The third computer will be for test engineer use and located in the TTE control room. It will receive data from the operator's computer over the LAN, which can be displayed in real-time. This computer will also have an Ethernet connection to the Marshall domain.</p>
<p>1) To operate the DAQ software, the operator must first log into the Windows NT workstation. The DSO (data systems operator) account should be used with the appropriate password (consult the system administrator to receive the password). Once appropriately logged into Windows, there should be an icon on the desktop labeled, "NTF DAQ Software." Double click on this icon to launch the application.</p>
<p>As the software launches, it will automatically look to the template file to determine what data acquisition hardware is connected. The text, "Reading Template File..." will appear on the status bar. If the template is read successfully, the status bar will so indicate. If the file cannot be located or read properly, a popup dialog will alert the operator</p>
<p>After the template file is successfully read, the application on the valve room computer must be launched. The status bar will indicate when this launch is in progress. There is also a circular indicator below the status bar that will blink yellow as the launch is in progress. If the launch is successful, the indicator will turn green and indicate, "Remote Application Running..." If there is any problem, the indicator will turn red. Note that this launch may take about a minute.</p>
<p>2) The next step is to verify the setup. From the "setup" menu select and verify the configurations for each of the following:</p> <ul style="list-style-type: none"> PSI System SCXI → Facility DAQ SCXI → Facility T/C SCXI → Remote DAQ SCXI → Remote T/C <p>If there are any problems with the configuration, an Instrumentation/ DAQ Engineer must be consulted. As the software becomes more sophisticated, all required channels will be blocked out. Operators will then have access to add available channels at will.</p>
<p>3) Once the setup has been verified, measurement can begin. Press the "Record" button (arrow shaped). After initializing the hardware (and communicating with the remote machine), data should be available. Data will be continuously updated from all SCXI sources. PSI data operates in snapshot mode. Once the button is pressed, a single measurement will be conducted and updated to the screen. Note that the PSI must first be calibrated.</p>

CONTINUES

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 76 of 108

TABLE AE (con.'t) - FACILITY DATA ACQUISITION COMPUTER OPERATION

<p>To change settings for SCXI measurements, the DAQ must be stopped and restarted. Do this by clicking the "Record" button to the off state, then clicking it again to restart the DAQ.</p>
<p>4) When the test setpoint is successfully achieved, data may be captured to a file. To capture a snapshot of the data (including PSI), choose the "Capture Data" button. This will capture data to an ASCII file that can be read with a word processor or spreadsheet application.</p>
<p>5) When testing procedure is completed, push the "Quit" button or select "Quit" from the File menu. Confirmation is required. Quitting will stop the application running on the remote computer and close the connection.</p>

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 77 of 108

TABLE AF - MICROSTAR MODEL CONTROLLER OPERATION

AUTOMATIC OPERATION

1.0	If necessary, PRESS the Hold push-button to illuminate the "Hold" light and extinguish the "Run" light.
2.0	PRESS the Recipe Start push-button.
3.0	PRESS the Enter push-button to begin Recipe 1.
4.0	If necessary, PRESS the Manual/Auto push-button to illuminate the "Manual" light.
5.0	PRESS the Scroll arrows to select "% Output".
6.0	PRESS the Enter push-button.
7.0	Using the arrow push-buttons located below the Enter push-button, ADJUST the % output to 0.

MANUAL OPERATION

1.0	PRESS the Scroll arrows to select "% Output".
2.0	PRESS the Manual/Auto push-button to illuminate the "Manual" light.
3.0	PRESS the Enter push-button.
4.0	Using the arrow push-buttons located below the Enter push-button, ADJUST the % output to adjust the test article to the speed desired as indicated on the Torquetronic speed readout on Panel D. 4.0

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 78 of 108

TABLE AG - ANNUNCIATOR TRIP SHUTDOWN PROCEDURE

In the event that an annunciator trip occurs during a blowdown, perform the following:
--

1.0	Set the PIC-110 to a pressure (Po) of 50 psi.
2.0	STOP the "Blowdown" by pushing the test "STOP" push-button located on Panel C.
3.0	Allow pressure to decay to ambient (14.7 psi).
4.0	Place the Test Systems Master Control Disable/Enable switch on Panel C in the "DISABLE" position and remove key.
5.0	As necessary, ADJUST the test article speed, as indicated on the Torquetronic Speed Readout on Panel D, to 0 rpm with the Microstar Controller on Panel F.

<u>NOTE</u>
Refer to Table AF of this procedure for operation of the Microstar model speed controller.

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 79 of 108

TABLE AH - LOSS OF POWER/BROKEN SHAFT SHUTDOWN PROCEDURE

In the event that loss of power or a broken shaft occurs during a blowdown, perform the following:

1.0	Set the PIC-110 to a pressure (Po) of 50 psi.
2.0	STOP the "Blowdown" by pushing the test "STOP" push-button located on Panel C.
3.0	Allow the "PYRO" to detonate and pressure to decay to ambient (14.7 psi).
4.0	Place the Test Systems Master Control Disable/Enable switch on Panel C in the "DISABLE" position and remove key.
5.0	As necessary, ADJUST the test article speed, as indicated on the Torquetronic Speed Readout on Panel D, to 0 rpm with the Microstar Controller on Panel F.

NOTE
Refer to Table AF of this procedure for operation of the Microstar model speed controller.

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 80 of 108

5.11 TTE-RT-001
REPETITIVE TEST PROCEDURE

CONTENTS

5.11.A	PURPOSE	83
5.11.B	SHORT TERM STARTUP	83
5.11.C	REPETITIVE TESTS	89
5.11.D	SHORT TERM SHUTDOWN.....	95
Table AI	.....	97
Table AJ	.....	98
Table AK	.....	99
Table AL	.....	100
Table AM	.....	101
Table AN	.....	102
Table AO	.....	104
Table AP	.....	106
Table AQ (ANNUNCIATOR TRIP)	.....	107
Table AR (EMERGENCY)	.....	108

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 81 of 108

TTE-RT-001 REPETITIVE TEST PROCEDURE

5.11.A PURPOSE

This procedure contains instructions for performing a model test blowdown following a short-term shutdown.

5.11.B SHORT TERM STARTUP

5.11.B.1 PREREQUISITES

5.11.B.1.1 Test Systems Master Control Disable/Enable switch on Panel C is in the "Disable" position and key is removed and in place in the Pyrotechnic Disable/Enable switch, JB13, located on the south side of the plenum cart.

5.11.B.1.2 Pyrotechnic Disable/Enable switch is in the "Disable" position.

5.11.B.1.3 Heat Systems Control Disable/Enable switch on Panel E is in the "Disable" position.

5.11.B.1.4 V-400, T-100 Air Regulator Panel Missile Grade Isol located at the missile grade air charging panel, is open.

5.11.B.1.5 Electrical breakers are aligned in accordance with Table AI.

5.11.B.1.6 Valves are aligned in accordance with Table AK.

5.11.B.1.7 Green "Pressure Supply-OK" light on Heat Systems Control Inlet Preheat System, Panel E, is illuminated.

5.11.B.1.8 Light bulb check has been performed on Annunciator No. 1 Test Systems on Panel A and Annunciator No. 2 Drive Systems on Panel G per Table AM of this procedure.

5.11.B.1.9 The Regenerative Heat System area is clear of personnel and interferences.

5.11.B.1.10 Ensure amber "Power On" light is illuminated on H-125 Heater Panel located south of the plenum.

5.11.B.1.11 Ensure amber "Power On" light is illuminated on H-123 Heater Panel located south of the plenum.

5.11.B.1.12 Verify Model Oil Storage Tank level, located at the model oil skid outside east of the TTE high bay, is greater than 50% as indicated on sight glass SG-521.

5.11.B.1.13 The Dynamometer Control switch, Panel C, is in the "Remote"

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 82 of 108

position.

5.11.B.1.14 Verify Hydraulic Oil Storage Tank level, located at the north wall of the TTE high bay, is greater than 75% as indicated in the HPU oil reservoir sight glass.

5.11.B.1.15 Verify the blue OIL LEVEL/TEMP light on JB11, located on the north wall of the TTE high bay, is on.

5.11.B.1.16 Model support systems are aligned and operational per Test Engineer.

5.11.B.1.17 Test speed profile entered into Microstar Speed Controller.

5.11.B.2 PROCEDURE

The Facility Operator shall

NOTE For operation of the Chromalox controllers, refer to Table AP of this procedure.

5.11.B.2.1 ADJUST H-123, Chromalox Temp Indicating Controller, located on Panel E, to the temperature desired for regenerative heat.

5.11.B.2.2 PLACE Heat Systems Control Disable/Enable Switch on Panel E in the "Enable" position.

5.11.B.2.3 OPEN the following valves (switches on Panel E) one at a time:

5.11.B.2.3.1 OPEN ROV-119, B-122 Suct Isol Valve, using handswitch located on Panel E.

5.11.B.2.3.2 OPEN ROV-118, B-122 Suct Isol Valve,using handswitch located on Panel E.

5.11.B.2.3.3 OPEN ROV-126, H-123 Disch Isol Valve,using handswitch located on Panel E.

5.11.B.2.3.4 OPEN ROV-124, H-123 Disch Isol Valve,using handswitch located on Panel E.

5.11.B.2.4 START Heat Systems Control Regenerative Heat System blower by pressing the blower "Start" push-button on Panel E.

5.11.B.2.5 START Heat Systems Control Regenerative Heat System heater by pressing the heater "Start" push-button on Panel E.

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 83 of 108

NOTE

For operation of the TCS controllers, refer to Table AL of this procedure.

- 5.11.B.2.6 Set VIC-528, VCV-528 Vacuum Indicating Controller on Panel F, to the desired bearing cavity delta pressure (generally 1.500 on "VACUUM - loop 1") required for the current test.
- 5.11.B.2.7 Set VIC-528 to the desired oil flow rate (generally a valve position of approximately 20% on "FLOW - loop 2") required for the current test.
- 5.11.B.2.8 PLACE Loop 1 of VIC-528 in automatic by pressing the "A" push-button on the controller.
- 5.11.B.2.9 START VP-517, Vacuum Pump, using push-button located at the model oil skid.
- 5.11.B.2.10 START P-512, Scavenge Pump, using push-button located at the model oil skid.
- 5.11.B.2.11 START P-501, Supply Pump, using push-button located at the model oil skid.
- 5.11.B.2.12 ENERGIZE H-524, Tank Heater, using push-button located at the model oil skid.
- 5.11.B.2.13 If necessary, ADJUST TIC-526, Model Oil Temperature Indicating Controller located at southeast door of TTE high bay, as necessary, to maintain desired oil inlet temperature (generally 90 degrees F as indicated on Model Lube Inlet Temp located on Panel G).
- 5.11.B.2.14 If necessary, ADJUST VIC-528 to maintain desired oil inlet flow rate.
- 5.11.B.2.15 START the gearbox lube oil system by pressing the "Start" push-button on MC-900 located on the north side of the gearbox.
- 5.11.B.2.16 START the dynamometer fans and oil pump by turning the Dynamometer Field switch, Panel C, to "FWD".

NOTE

Refer to Table AO of this procedure for operation of the Microstar model speed controller.

- 5.11.B.2.17 ADJUST the Microstar controller, located on Panel F, per Table AO of this procedure.

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 84 of 108

5.11.B.2.18 RESET the dynamometer by pressing the Dynamometer Reset push-button on Panel C.

5.11.B.2.19 Perform one of the following:

5.11.B.2.19.1 If the dynamometer has been shutdown for more than seven (7) days, ensure the dynamometer fans/oil pump runs for at least thirty (30) minutes and START the dynamometer by pressing the Dynamometer "ON" push-button, on Panel C.

OR

5.11.B.2.19.2 If the dynamometer has been shutdown for less than seven (7) days, ensure the dynamometer fans/oil pump runs for at least fifteen (15) minutes and START the "ON" push-button, on Panel C.

5.11.B.2.20 PRESS the Manual/Auto push-button on the Microstar controller to extinguish the "Manual" light.

CAUTION

MONITOR TORQUE READINGS ON THE TORQUETRONIC TORQUE READOUT LOCATED ON PANEL D.

5.11.B.2.21 PRESS the "Start/Pyro Enabled" push-button until the test article begins to increase to 1000 rpm.

NOTE

For operation of the Chromalox controllers, refer to Table AP of this procedure.

5.11.B.2.22 ADJUST H-125, Chromalox Temp Indicating Controller, located on Panel E, to the temperature desired for model/facility preheat.

5.11.B.2.23 On the Heat Systems Control Inlet Preheat System, OPEN valve ROV-127, H-125 Isolation, using handswitch on Panel E.

5.11.B.2.24 When ROV-127 green open light is illuminated on Panel E, START Heat Systems Control Inlet Preheat System Heater, by pressing the heater "Start" push-button on Panel E.

NOTE

For operation of the TCS controllers, refer to Table AD of this procedure.

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 85 of 108

5.11.B.2.25 By using "SP", SET TIC-107, TCV-107A/B Temperature Indicating Controller on Panel D, to the desired temperature (To) required for the current test.

5.11.B.2.26 By using "SP", SET PIC-110, PCV-110 Pressure Indicating Controller on Panel D, to a pressure (Po) of 50 psi.

5.11.B.2.27 By using "SP", SET PRIC-115, Pressure Ratio Indicating Controller on Panel D, to the desired pressure ratio or delta pressure required for the current test. Perform one of the following:

5.11.B.2.27.1 For delta pressure control, PLACE Loop 2 of PRIC-115 in automatic by pressing the "A" push-button on the controller.

OR

5.11.B.2.27.2 For pressure ratio control, PLACE Loop 1 of PRIC-115 in automatic by pressing the "A" push-button on the controller.

5.11.B.2.28 When the regenerative heater is at the desired temperature and the model/facility has been adequately pre-heated, perform the following:

5.11.B.2.28.1 STOP regenerative heat system per TTE-RH-001, Regenerative Heat System Operation Section 5.6.C.

5.11.B.2.28.2 STOP preheating of the model/facility per TTE-MH-001, Model/Facility Pre-heat Operation Section 5.3.C.

5.11.B.2.28.3 PLACE Heat Systems Control Disable/Enable switch on Panel E in the "Disable" position.

5.11.B.2.29 PLACE Loop 1 of TIC-107 in automatic by pressing the "A" push-button on the controller.

5.11.B.2.30 PLACE Loop 1 of PIC-110 in automatic by pressing the "A" push-button on the controller.

5.11.B.2.31 Reset the annunciator panels by turning the Annunciator Acknowledge/Reset switch on panel C to "Acknowledge" first and then to "Reset".

5.11.B.2.32 VERIFY all annunciator lights on Annunciator No. 1 Test Systems located on Panel A and Annunciator No. 2 Drive Systems located on Panel G are not illuminated. 'Model Speed Lo' will be illuminated.

5.11.B.2.33 PLACE Pyrotechnic Disable/Enable switch, JB13, located on the south side of the plenum cart in the "Enable" position and remove the key.

5.11.B.2.34 ENERGIZE the area alarm and warning system by placing the Bells switch

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 86 of 108

on Panel C to "On".

5.11.B.2.35 Verify Microstar Speed Profile Controller is showing “0” SP and 0% output. If not go to [Appendix Z](#).

5.11.B.2.36 Push Dyno “ON” button located on Panel C. Verify it is illuminated.

5.11.B.2.37 On the Microstar Speed Profile Controller located on panel F, push manual.

5.11.B.2.38 PUSH “Start/Pyro Enabled” button on Panel C. The test article will increase only to 1000 rpm.

5.11.B.2.39 START recording facility data with the facility data acquisition computer.

5.11.B.2.40 PLACE Test Systems Master Control Disable/Enable switch on Panel C in the "Enable" position by using Pyrotechnic key. (Red light in start/pyro should light.)

5.11.B.2.41 START the 'Low Blowdown' by pushing the test "Start/Pyro Enabled" push-button located on Panel C. (ROV 101 A/B will open. Pressure will increase to starting setpoint of 50 psi.)

5.11.B.2.42 PRESS the "Start/Pyro Enabled" push-button until the test article begins to increase to the speed designated by the Test Engineer.

NOTE

Steps 5.11.B.2.2.43 and 5.11.B.2.2.44 may be performed/repeated in any order as required by the test engineer.

5.11.B.2.43 As required, using “SP” ADJUST the setpoint on PIC-110 to the pressure designated by the Test Engineer.

5.11.B.2.44 As required, ADJUST the setpoint on PRIC-115 to the pressure ratio or delta pressure designated by the Test Engineer.

5.11.B.2.45 When the following required parameters stabilize, tell the Test Engineer:

- Po - Model Inlet PressurePIC-110
- To - Model Air Inlet TemperatureTIC-107
- Pr - Model Pressure RatioPRIC-115
- N - Model SpeedTorquetronic (Panel D)
- Model Oil FlowVIC-528 ("FLOW-loop 2")
- Model Lube Inlet TemperaturePanel G
- Model Lube Seal Delta PPanel G

5.11.B.2.46 When the data collection process is completed, using “SP”, ADJUST the setpoint on PIC-110 to 50 psi.

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 87 of 108

5.11.B.2.47 PRESS the "Start/Pyro Enabled" push-button until the test article begins to decrease to 1000 rpm.

5.11.B.2.48 FROM the indicators on the Microstar, at 7.9% PRESS the test 'STOP' push-button located on Panel C to stop the 'Low Blowdown'.

5.11.B.2.49 WHEN pressure has bled of to ~atmosphere. PLACE the Test Systems Master Control Disable/Enable switch on Panel C in the "Disable" position and remove key.

5.11.B.2.50 ON Microstar manually bring speed down to 0.0%.

5.11.B.2.51 PUSH Dyno OFF.

5.11.B.2.52 DEENERGIZE the area alarm and warning system by placing the Bells switch on Panel C to "Off".

5.11.B.2.53 STOP the facility computer monitoring facility components.

5.11.B.2.54 Perform ONE of the following:

5.11.B.2.54.1 If testing is complete, perform one of the following:

5.11.B.2.54.1.A Proceed to Section 5.10.D of procedure TTE-TA-001, Model Test Procedure, if long term shutdown is necessary.

OR

5.11.B.2.54.1.B Proceed to **Section 5.11.D** of this procedure if short term shutdown is necessary.

OR

5.11.B.2.54.1.C If testing is to be continued, proceed to 5.11.C of this procedure.

5.11.C REPETITIVE TESTS

5.11.C.1 PREREQUISITES

5.11.C.1.1 Test Systems Master Control Disable/Enable switch on Panel C is in the "Disable" position and key is removed.

5.11.C.1.2 Heat Systems Control Disable/Enable switch on Panel E is in the "Disable" position.

5.11.C.1.3 Green "Pressure Supply-OK" light on Heat Systems Control Inlet Preheat System, Panel E, is illuminated.

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 88 of 108

5.11.C.1.4 Model support systems are aligned and operational per Test Engineer.

5.11.C.1.5 Test speed profile entered into Microstar Speed Controller.

5.11.C.2 PROCEDURE

The Facility Operator shall

5.11.C.2.1 PLACE TIC-107, TCV-107A/B Temperature Indicating Controller on Panel D, in manual by pressing the "M" push-button on the controller.

5.11.C.2.2 PLACE PIC-110, PCV-110 Pressure Indicating Controller on Panel D, in manual by pressing the "M" push-button on the controller.

5.11.C.2.3 PLACE PRIC-115, Pressure Ratio Indicating Controller on Panel D, in manual by pressing the "M" push-button on the controller.

NOTE

Steps 5.11.C.2.4 through 5.11.C.2.13 may be omitted (N/A'd) if model/facility pre-heating and/or heater regeneration is not required.

5.11.C.2.4 With the key from the Test Systems Master Control Disable/Enable switch on Panel C, PLACE the Pyrotechnic Disable/Enable switch, JB13, located on the south side of the plenum cart, in the "Disable" position.

5.11.C.2.5 Valves are aligned in accordance with Table AK.

NOTE

For operation of the Chromalox controllers, refer to Table AP of this procedure.

5.11.C.2.6 ADJUST H-123, Chromalox Temp Indicating Controller, located on Panel E, to the temperature desired for regenerative heat.

5.11.C.2.7 ADJUST H-125, Chromalox Temp Indicating Controller, located on Panel E, to the temperature desired for model/facility preheat.

5.11.C.2.8 PLACE Heat Systems Control Disable/Enable Switch on Panel E in the "Enable" position.

5.11.C.2.9 On the Heat Systems Control Inlet Preheat System, OPEN valve ROV-127, H-125 Isolation, using handswitch on Panel E.

5.11.C.2.10 When ROV-127 green open light is illuminated on Panel E, START Heat Systems Control Inlet Preheat System Heater, by pressing the heater "Start" push-button on

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 89 of 108

Panel E.

5.11.C.2.11 OPEN the following valves (switches on Panel E) one at a time:

5.11.C.2.11.1 OPEN ROV-119, B-122 Suct Isol Valve,using handswitch located on Panel E.

5.11.C.2.11.2 OPEN ROV-118, B-122 Suct Isol Valve,using handswitch located on Panel E.

5.11.C.2.11.3 OPEN ROV-126, H-123 Disch Isol Valve,using handswitch located on Panel E.

5.11.C.2.11.4 OPEN ROV-124, H-123 Disch Isol Valve,using handswitch located on Panel E.

5.11.C.2.12 START Heat Systems Control Regenerative Heat System blower by pressing the blower "Start" push-button on Panel E.

5.11.C.2.13 START Heat Systems Control Regenerative Heat System heater by pressing the heater "Start" push-button on Panel E.

NOTE

For operation of the TCS controllers, refer to Table AL of this procedure.

5.11.C.2.14 SET TIC-107 to the desired temperature (To) required for the current test.

5.11.C.2.15 SET PIC-110 to a pressure (Po) of 50 psi.

5.11.C.2.16 SET PRIC-115, Pressure Ratio Indicating Controller on Panel D, to the desired pressure ratio or delta pressure required for the current test.

NOTE

Step 5.11.C.2.17 may be omitted (N/A'd) if model/facility pre-heating and/or heater regeneration is not required.

5.11.C.2.17 When the regenerative heater is at the desired temperature and the model/facility has been adequately pre-heated, perform the following, if necessary:

5.11.C.2.17.1 STOP Heat Systems Control Regenerative Heat System heater by pressing the heater "Stop" push-button on Panel E.

5.11.C.2.17.2 STOP Heat Systems Control Regenerative Heat System blower by pressing the blower "Stop" push-button on Panel E.

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 90 of 108

5.11.C.2.17.3 CLOSE the following valves (switches on Panel E):

5.11.C.2.17.3.1 CLOSE ROV-119, B-122 Suct Isol Valve, using handswitch located on Panel E.

5.11.C.2.17.3.2 CLOSE ROV-118, B-122 Suct Isol Valve, using handswitch located on Panel E.

5.11.C.2.17.3.3 CLOSE ROV-126, H-123 Disch Isol Valve, using handswitch located on Panel E.

5.11.C.2.17.3.4 CLOSE ROV-124, H-123 Disch Isol Valve, using handswitch located on Panel E.

5.11.C.2.17.4 STOP Heat Systems Control Inlet Preheat System Heater, by pressing the heater "Stop" push-button on Panel E.

5.11.C.2.17.5 On the Heat Systems Control Inlet Preheat System, CLOSE valve ROV-127, H-125 Isolation, using handswitch on Panel E.

5.11.C.2.17.6 PLACE Heat Systems Control Disable/Enable switch on Panel E in the "Disable" position.

5.11.C.2.18 PLACE Loop 1 of TIC-107 in automatic by pressing the "A" push-button on the controller.

5.11.C.2.19 PLACE Loop 1 of PIC-110 in automatic by pressing the "A" push-button on the controller.

5.11.C.2.20 Perform one of the following:

5.11.C.2.20.1 For delta pressure control, PLACE Loop 2 of PRIC-115 in automatic by pressing the "A" push-button on the controller.

OR

5.11.C.2.20.2 For pressure ratio control, PLACE Loop 1 of PRIC-115 in automatic by pressing the "A" push-button on the controller.

5.11.C.2.21 RESET the annunciator panels by turning the Annunciator Acknowledge/Reset switch on panel C to "Acknowledge" first and then to "Reset".

5.11.C.2.22 VERIFY all annunciator lights on Annunciator No. 1 Test Systems located on Panel A and Annunciator No. 2 Drive Systems located on Panel G are not illuminated.

5.11.C.2.23 ENSURE T-100 and/or T-101, Test Air Storage Tanks, are adequately

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 91 of 108

charged as indicated on PG-107, Test Air Storage Tanks Pressure located at the missile grade air charging panel.

5.11.C.2.24 PLACE Pyrotechnic Disable/Enable switch, JB13, located on the south side of the plenum cart in the "Enable" position and remove the key.

5.11.C.2.25 ENERGIZE the area alarm and warning system by placing the Bells switch on Panel C to "On".

5.11.C.2.26 Verify Microstar Speed Profile Controller is showing "0" SP and 0% output. If not go to [Appendix Z](#).

5.11.C.2.27 Push Dyno "ON" button located on Panel C. Verify it is illuminated.

5.11.C.2.28 On the Microstar Speed Profile Controller located on panel F, push manual.

5.11.C.2.29 PUSH "Start/Pyro Enabled" button on Panel C. The test article will increase only to 1000 rpm.

5.11.C.2.30 START recording facility data with the facility data acquisition computer.

5.11.C.2.31 PLACE Test Systems Master Control Disable/Enable switch on Panel C in the "Enable" position by using Pyrotechnic key. (Red light in start/pyro should light.)

5.11.C.2.32 START the 'Low Blowdown' by pushing the test "Start/Pyro Enabled" push-button located on Panel C. (ROV 101 A/B will open. Pressure will increase to starting setpoint of 50 psi.)

5.11.C.2.33 PRESS the "Start/Pyro Enabled" push-button until the test article begins to increase to the speed designated by the Test Engineer.

NOTE
Steps 5.11.C.2.34 and 5.11.C.2.35 may be performed/repeated in any order as required by the test engineer.

5.11.C.2.34 As required, using "SP" ADJUST the setpoint on PIC-110 to the pressure designated by the Test Engineer.

5.11.C.2.35 As required, ADJUST the setpoint on PRIC-115 to the pressure ratio or delta pressure designated by the Test Engineer.

5.11.C.2.36 When the following required parameters stabilize, tell the Test Engineer:

Po - Model Inlet Pressure	PIC-110
To - Model Air Inlet Temperature	TIC-107
Pr - Model Pressure Ratio	PRIC-115
	CONTINUES

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 92 of 108

N - Model Speed	Torquetronic (Panel D)
Model Oil Flow	VIC-528 ("FLOW-loop 2")
Model Lube Inlet Temperature	Panel G
Model Lube Seal Delta P	Panel G

5.11.C.2.37 When the data collection process is completed, using "SP", ADJUST the setpoint on PIC-110 to 50 psi.

5.11.C.2.38 PRESS the "Start/Pyro Enabled" push-button until the test article begins to decrease to 1000 rpm.

5.11.C.2.39 FROM the indicators on the Microstar, at 7.9% PRESS the test 'STOP' push-button located on Panel C to stop the 'Low Blowdown'.

5.11.C.2.40 WHEN pressure has bled of to ~atmosphere. PLACE the Test Systems Master Control Disable/Enable switch on Panel C in the "Disable" position and remove key.

5.11.C.2.41 ON Microstar manually bring speed down to 0.0%.

5.11.C.2.42 PUSH Dyno OFF.

5.11.C.2.43 DEENERGIZE the area alarm and warning system by placing the Bells switch on Panel C to "Off".

5.11.C.2.44 STOP the facility computer monitoring facility components.

5.11.C.2.45 Perform ONE of the following:

5.11.C.2.45.1 If testing is complete, perform one of the following:

5.11.C.2.45.1.1 Proceed to [Section 5.10.C of procedure TTE-TA-001](#), Model Test Procedure, if long term shutdown is necessary.

OR

5.11.C.2.45.1.2 Proceed to Section 5.11.D of this procedure if short term shutdown is necessary.

OR

5.11.C.2.45.1.3 If testing is to be continued, repeat this section 5.11.C of this procedure.

5.11.D SHORT TERM SHUTDOWN

5.11.D.1 PREREQUISITES

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 93 of 108

5.11.D.1.1 Test Systems Master Control Disable/Enable switch on Panel C is in the "Disable" position and key is removed and in place in the Pyrotechnic Disable/Enable switch, JB13, located on the south side of the plenum cart.

5.11.D.1.2 Pyrotechnic Disable/Enable switch is in the "Disable" position.

5.11.D.2 PROCEDURE

The Facility Operator shall

5.11.D.2.1 PLACE TIC-107, TCV-107A/B Temperature Indicating Controller on Panel D, in manual by pressing the "M" push-button on the controller.

5.11.D.2.2 PLACE PRIC-115, Pressure Ratio Indicating Controller on Panel D, in manual by pressing the "M" push-button on the controller.

5.11.D.2.3 PLACE PIC-110, PCV-110 Pressure Indicating Controller on Panel D, in manual by pressing the "M" push-button on the controller.

NOTE

Refer to Table AO of this procedure for operation of the Microstar model speed controller.

5.11.D.2.4 ADJUST the test article speed, as indicated on the Torquetronic speed readout on Panel D, to 0 rpm with the Microstar controller on Panel F.

5.11.D.2.5 STOP the dynamometer by pressing the Dynamometer "OFF" push-button, on Panel C.

5.11.D.2.6 ALIGN valves per Table AL.

5.11.D.2.7 STOP HPU-700, Hydraulic Power Unit, by pressing the stop push-button on JB11 located on the north wall of the TTE high bay.

5.11.D.2.8 Slowly OPEN V-205, PCV-115 Oil Supply Equalization Valve, located on Hydraulic Rack #1.

5.11.D.2.9 When PG-213 on Hydraulic Rack #1 indicates 0 psi, CLOSE V-205.

5.11.D.2.10 STOP the dynamometer fans and oil pump by turning the Dynamometer Field switch, Panel C, to "OFF".

5.11.D.2.11 STOP the gearbox oil system by pressing the "Stop" push-button on MC-900.

5.11.D.2.12 STOP P-501, Supply Pump, using push-button located at the model

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 94 of 108

oil skid outside east of the TTE high bay.

5.11.D.2.13 STOP P-512, Scavenge Pump, using push-button located at the model oil skid.

5.11.D.2.14 STOP VP-517, Vacuum Pump, using push-button located at the model oil skid.

5.11.D.2.15 DE-ENERGIZE H-524, Tank Heater, using push-button located at the model oil skid.

NOTE

If tank T-100 is needed by the Air Flow facility for blowdowns, N/A step 5.11.D.2.16.

5.11.D.2.16 CLOSE V-400, T-100 Air Regulator Panel Missile Grade Isol located at the missile grade air charging panel.

5.11.D.2.17 PERFORM electrical breaker alignment per Table AJ of this procedure.

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 95 of 108

Table AI - START-UP

ELECTRICAL LINEUP

PANEL PDP2

BREAKER NUMBER	BREAKER NAME	POSITION REQUIRED	INITIALS
	MAIN	ON	
01	CONTROL ROOM PANEL G	ON	
02	CONTROL ROOM PANEL B	ON	
03	CONTROL ROOM PANEL C	ON	
04	CONTROL ROOM PANEL D	ON	
05	CONTROL ROOM PANEL E	ON	
06	CONTROL ROOM PANEL F	ON	
07	CONTROL ROOM PANEL A	ON	
08	CONTROL ROOM PANEL H	ON	
09	CONTROL ROOM PANEL I	ON	
10	CONTROL ROOM PRINTER STAND	ON	
12	CONTROL ROOM UPS POWER SUP	ON	
POWER STRIP	UPS POWER SUPPLY--IN PRINTER STAND IN CONTROL ROOM	ON	

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 96 of 108

Table AJ - SHUTDOWN

ELECTRICAL LINEUP

PANEL PDP2

BREAKER NUMBER	BREAKER NAME	POSITION REQUIRED	INITIALS
	MAIN	ON	
01	CONTROL ROOM PANEL G	OFF	
02	CONTROL ROOM PANEL B	OFF	
03	CONTROL ROOM PANEL C	OFF	
04	CONTROL ROOM PANEL D	OFF	
05	CONTROL ROOM PANEL E	OFF	
06	CONTROL ROOM PANEL F	OFF	
07	CONTROL ROOM PANEL A	OFF	
08	CONTROL ROOM PANEL H	OFF	
09	CONTROL ROOM PANEL I	OFF	
10	CONTROL ROOM PRINTER STAND	OFF	
12	CONTROL ROOM UPS POWER SUP	ON	
POWER STRIP	UPS POWER SUPPLY (IN PRINTER STAND IN CONTROL ROOM)	ON	

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 97 of 108

Table AK - SHUTDOWN

VALVE LINEUP

VALVE NUMBER	VALVE NAME	POSITION REQUIRED	INITIALS
ROV-101A/B	TEST AIR SUPPLY ISOLATION	CLOSED	
PCV-110	MODEL INLET (Po) PRESSURE CONTROL VALVE	CLOSED (NOTE 1)	
PCV-115	MODEL BACKPRESSURE VALVE	OPEN (NOTE 1)	
TCV-107A	TEST AIR TEMPERATURE CONTROL VALVE - HOT	OPEN (NOTE 1)	
TCV-107B	TEST AIR TEMPERATURE CONTROL VALVE - COLD	CLOSED (NOTE 1)	

NOTE 1: If PCV-110, TCV-107A, TCV-107B or PCV-115 are not in their correct position, the hydraulic system may have to be started per TTE-HY-001, Hydraulic System Operation, to correctly position these valves.

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 98 of 108

Table AL - TCS CONTROLLER AUTOMATIC OPERATION

1.0	SET TIC-107, TCV-107A/B Temperature Indicating Controller on Panel D, to the desired temperature (To) required for the current test as follows:
1.1	SELECT Loop 1 on TIC-107 by pressing the " " push-button.
1.2	PLACE Loop 1 of TIC-107 in manual by pressing the "M" push-button on the controller.
1.3	SELECT Loop 2 on TIC-107 by pressing the " " push-button.
1.4	PLACE Loop 2 of TIC-107 in manual by pressing the "M" push-button on the controller.
1.5	SELECT Loop 1 on TIC-107 by pressing the " " push-button.
1.6	ADJUST TIC-107 to the desired temperature setpoint by pressing the "SP" push-button and the setpoint increase (" ") or decrease (" ") push-button simultaneously.
2.0	SET PIC-110, PCV-110 Pressure Indicating Controller, to the desired pressure as follows:
2.1	PLACE PIC-110 in manual by pressing the "M" push-button on the controller.
2.2	ADJUST PIC-110 to desired pressure setpoint by pressing the "SP" push-button and the setpoint increase (" ") or decrease (" ") push-button simultaneously.
3.0	SET PRIC-115, Pressure Ratio Indicating Controller on Panel D, to the desired pressure ratio or delta pressure required for the current test as follows:
3.1	SELECT Loop 1 on PRIC-115 by pressing the " " push-button.
3.2	PLACE Loop 1 of PRIC-115 in manual by pressing the "M" push-button on the controller.
3.3	SELECT Loop 2 on PRIC-115 by pressing the " " push-button.
3.4	PLACE Loop 2 of PRIC-115 in manual by pressing the "M" push-button on the controller.
3.5	For controlling the pressure ratio:
3.5.1	SELECT Loop 1 on PRIC-115 by pressing the " " push-button.
3.5.2	ADJUST PRIC-115 to the desired pressure ratio by pressing the "SP" push-button and the setpoint increase (" ") or decrease (" ") push-button simultaneously.
	<u>OR</u>
3.6	For controlling the delta pressure:
3.6.1	SELECT Loop 2 on PRIC-115 by pressing the " " push-button.
3.6.2	PLACE PRIC-115 in manual by pressing the "M" push-button on the controller.
3.6.3	ADJUST PRIC-115 to the desired delta pressure by pressing the "SP" push-button and the setpoint increase (" ") or decrease (" ") push-button simultaneously.
4.0	SET VIC-528, Vacuum Indicating Controller on Panel F, to the desired model oil flow and model bearing cavity delta pressure required for the current test as follows:
4.1	SELECT Loop 1 on VIC-528 by pressing the " " push-button.

CONTINUES

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 99 of 108

Table AL (CON.'T) - TCS CONTROLLER AUTOMATIC OPERATION

4.2	PLACE Loop 1 of VIC-528 in manual by pressing the "M" push-button on the controller.
4.3	SELECT Loop 2 on VIC-528 by pressing the " " push-button.
4.4	PLACE Loop 2 of VIC-528 in manual by pressing the "M" push-button on the controller.
4.5	For controlling the model bearing cavity delta pressure:
4.5.1	SELECT Loop 1 on VIC-528 by pressing the " " push-button.
4.5.2	ADJUST VIC-528 to the desired model bearing cavity delta pressure by pressing the "SP" push-button and the setpoint increase (" ") or decrease (" ") push-button simultaneously.
4.6	For controlling the model oil flow:
4.6.1	SELECT Loop 2 on VIC-528 by pressing the " " push-button.
4.6.2	ADJUST VIC-528 to the oil flow rate by pressing the "M" push-button and the setpoint increase (" ") or decrease (" ") push-button simultaneously. (Refer to Volume D for further information on TCS controllers.)

TCS CONTROLLER MANUAL OPERATION

1.0	Manually ADJUST valve PCV-110 to the desired position by pressing the "M" push-button and the setpoint increase (" ") or decrease (" ") push-button simultaneously on PIC-110, PCV-110 Pressure Indicating Controller.
2.0	Manually ADJUST valve PCV-115 to the desired position by pressing the "M" push-button and the setpoint increase (" ") or decrease (" ") push-button simultaneously on PRIC-115, Pressure Ratio Indicating Controller on Panel D.
3.0	Manually ADJUST valve TCV-107A/B to the desired position by pressing the "M" push-button and the setpoint increase (" ") or decrease (" ") push-button simultaneously on TIC-107, TCV-107A/B Temperature Indicating Controller on Panel D.

(Refer to Volume D for further information on TCS controllers.)

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 100 of 108

Table AM - ANNUNCIATOR PANEL LIGHT CHECK

1.0	On Annunciator No. 1 Test Systems, Panel A, PRESS the "Test" push-button.
2.0	VERIFY all annunciator windows are illuminated.
3.0	REPLACE any light bulbs that are not illuminated.
4.0	On Annunciator No. 1 Test Systems, PRESS the "Ack" push-button.
5.0	On Annunciator No. 1 Test Systems, PRESS the "Reset" push-button.
6.0	On Annunciator No. 2 Drive Systems, Panel G, PRESS the "Test" push-button.
7.0	VERIFY all annunciator windows are illuminated.
8.0	REPLACE any light bulbs that are not illuminated.
9.0	On Annunciator No. 2 Drive Systems, PRESS the "Ack" push-button.
10.0	On Annunciator No. 2 Drive Systems, PRESS the "Reset" push-button.

(Refer to **Volume B** for further information on annunciators.)

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 101 of 108

TABLE AN - FACILITY DATA ACQUISITION COMPUTER OPERATION

<p>The facility data acquisition (DAQ) system consists of three computers and numerous transducers and signal conditioners. The facility operator's computer is located in the TTE control room. It is connected to the other two computers by an Ethernet LAN. The operator's computer has a GPIB connection to a PSI rack and a NI plug-in data acquisition board connected to a signal conditioning chassis.</p>
<p>The second computer is located in the valve room, adjacent to the test chamber. It also has a GPIB connection to a PSI rack and a NI plug-in DAQ board connected to a signal conditioning chassis. During operation, this computer will operate in remote mode, meaning that it will be controlled by the operator's computer from the TTE control room.</p>
<p>The third computer will be for test engineer use and located in the TTE control room. It will receive data from the operator's computer over the LAN, which can be displayed in real-time. This computer will also have an Ethernet connection to the Marshall domain.</p>
<p>1) To operate the DAQ software, the operator must first log into the Windows NT workstation. The DSO (data systems operator) account should be used with the appropriate password (consult the system administrator to receive the password). Once appropriately logged into Windows, there should be an icon on the desktop labeled, "NTF DAQ Software." Double click on this icon to launch the application.</p>
<p>As the software launches, it will automatically look to the template file to determine what data acquisition hardware is connected. The text, "Reading Template File..." will appear on the status bar. If the template is read successfully, the status bar will so indicate. If the file cannot be located or read properly, a popup dialog will alert the operator</p>
<p>After the template file is successfully read, the application on the valve room computer must be launched. The status bar will indicate when this launch is in progress. There is also a circular indicator below the status bar that will blink yellow as the launch is in progress. If the launch is successful, the indicator will turn green and indicate, "Remote Application Running..." If there is any problem, the indicator will turn red. Note that this launch may take about a minute.</p>
<p>2) The next step is to verify the setup. From the "setup" menu select and verify the configurations for each of the following:</p> <ul style="list-style-type: none"> PSI System SCXI → Facility DAQ SCXI → Facility T/C SCXI → Remote DAQ SCXI → Remote T/C <p>If there are any problems with the configuration, an Instrumentation/ DAQ Engineer must be consulted. As the software becomes more sophisticated, all required channels will be blocked out. Operators will then have access to add available channels at will.</p>
<p>3) Once the setup has been verified, measurement can begin. Press the "Record" button (arrow shaped). After initializing the hardware (and communicating with the remote machine), data should be available. Data will be continuously updated from all SCXI sources. PSI data operates in snapshot mode. Once the button is pressed, a single measurement will be conducted and updated to the screen. Note that the PSI must first be calibrated.</p>

CONTINUES

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 102 of 108

TABLE AN (con.'t) - FACILITY DATA ACQUISITION COMPUTER OPERATION

To change settings for SCXI measurements, the DAQ must be stopped and restarted. Do this by clicking the "Record" button to the off state, then clicking it again to restart the DAQ.
4) When the test setpoint is successfully achieved, data may be captured to a file. To capture a snapshot of the data (including PSI), choose the "Capture Data" button. This will capture data to an ASCII file that can be read with a word processor or spreadsheet application.
5) When testing procedure is completed, push the "Quit" button or select "Quit" from the File menu. Confirmation is required. Quitting will stop the application running on the remote computer and close the connection.

Space Transportation Directorate		
TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 103 of 108

TABLE AO MICROSTAR MODEL CONTROLLER OPERATION

AUTOMATIC OPERATION

1.0	If necessary, PRESS the Hold push-button to illuminate the "Hold" light and extinguish the "Run" light.
2.0	PRESS the Recipe Start push-button.
3.0	PRESS the Enter push-button to begin Recipe 1.
4.0	If necessary, PRESS the Manual/Auto push-button to illuminate the "Manual" light.
5.0	PRESS the Scroll arrows to select "% Output".
6.0	PRESS the Enter push-button.
7.0	Using the arrow push-buttons located below the Enter push-button, ADJUST the % output to 0.

MANUAL OPERATION

1.0	PRESS the Scroll arrows to select "% Output".
2.0	PRESS the Manual/Auto push-button to illuminate the "Manual" light.
3.0	PRESS the Enter push-button.
4.0	Using the arrow push-buttons located below the Enter push-button, ADJUST the % output to adjust the test article to the speed desired as indicated on the Torquetronic speed readout on Panel D.

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 104 of 108

TABLE AP - CHROMALOX HEATER CONTROLLER OPERATION

1.0	PRESS the Menu/Val push-button to select "MENU" as indicated by the green light being illuminated above MENU on the "MENU/VAL" indicator.
2.0	SELECT Menu #1, as indicated by "1" in the lower window, by pressing the arrow push-buttons.
3.0	PRESS the Menu/Val push-button to select "VAL" as indicated by the green light being illuminated below VAL on the "MENU/VAL" indicator.
4.0	ADJUST the heater setpoint, as indicated in the lower window, with the arrow push-buttons.

(Refer to **Volume E** for further information on Chromalox.)

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 105 of 108

TABLE AQ - ANNUNCIATOR TRIP SHUTDOWN PROCEDURE

In the event that an annunciator trip occurs during a blowdown, perform the following:

1.0	Set the PIC-110 to a pressure (Po) of 50 psi.
2.0	STOP the "Blowdown" by pushing the test "STOP" push-button located on Panel C.
3.0	Allow pressure to decay to ambient (14.7 psi).
4.0	Place the Test Systems Master Control Disable/ Enable switch on Panel C in the "DISABLE" position and remove key.
5.0	As necessary, ADJUST the test article speed, as indicated on the Torquetronic Speed Readout on Panel D, to 0 rpm with the Microstar Controller on Panel F.

NOTE
Refer to Table AO of this procedure for operation of the Microstar model speed controller.

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 106 of 108

TABLE AR - LOSS OF POWER/BROKEN SHAFT SHUTDOWN PROCEDURE

In the event that loss of power or a broken shaft occurs during a blowdown, perform the following:
--

1.0	Set the PIC-110 to a pressure (Po) of 50 psi.
2.0	STOP the "Blowdown" by pushing the test "STOP" push-button located on Panel C.
3.0	Allow the "PYRO" to detonate and pressure to decay to ambient (14.7 psi).
4.0	Place the Test Systems Master Control Disable/ Enable switch on Panel C in the "DISABLE" position and remove key.
5.0	As necessary, ADJUST the test article speed, as indicated on the Torquetric Speed Readout on Panel D, to 0 rpm with the Microstar Controller on Panel F.

<p><u>NOTE</u> Refer to Table AO of this procedure for operation of the Microstar model speed controller.</p>

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 107 of 108

6.0 NOTES

Refer to appropriate or specific operating procedure.

7.0 SAFETY PRECAUTIONS AND WARNING NOTES

7.1 Exercise caution in the vicinity of electrical equipment.

7.2 Any conflicts encountered during the performance of this procedure should be resolved prior to completion of the procedure.

7.3 Steps in this procedure are to be performed in the order listed unless deviation is permitted by the facility engineer.

7.4 ALL prerequisites shall be completed prior to commencing a section of a procedure.

7.5 Exercise caution in the vicinity of rotating equipment and high temperature systems.

7.6 **EMERGENCY** telephone numbers are as follows:

Ambulance	119
Medical Center	4-2390
Fire	119
Security	4-4357
Utilities	4-3919
Communication Repair	4-1771

8.0 APPENDICES, DATA, REPORTS, AND FORMS

Post-test Or Test Completion Report: Post-test reports shall be generated as a memorandum for each Group test activity. The content and format of the Test Completion Report is the same for all facilities and therefore is defined in OI TD74-100.

9.0 RECORDS

The Test Facility or Facility Systems Engineer is responsible to produce and archive the following, typical records as defined in and superseded by OI TD74-100:

Space Transportation Directorate TD74		
Turbine Test Equipment Facility Operating Procedure	Document #: TD74-FOP-TTE	REVISION: C
	Effective Date: November ,2 2004	Page 108 of 108

- 9.1 “As Built” Drawings for test facility subsystem configurations
- 9.2 Facility Checkout data files
- 9.3 Facility Run Logs
- 9.4 Test data files

9.5 A Run Log is kept to document each test performance (run) in lieu of an “as-run” test procedure. For each run, entries including the time/date, unique run number, test-specific facility parameter set points, anomalous events and facility operator initials are required as a minimum. These logs also serve as an historical record on the use/run time of TD74 Facilities and aid in the analysis of data after the tests have been completed. Each facility’s operation Run Log shall be maintained and retained by the assigned Test Facility System Engineer for a period of 10 (ten) years.

10.0 TOOLS, EQUIPMENT, AND MATERIALS

What ever is needed or required per the testing procedure. For each individual procedure see section 5.

11.0 PERSONNEL TRAINING AND CERTIFICATION

11.1 Personnel who operate the TTE must undergo training by authorized TTE personnel and be recognized as a “Certified Operator” via TD74 memorandum issued by the Group Lead. Training is to be administered at the discretion of the TTE Facility Engineer and the TD74 Group Leader and, as a minimum, consist of the following:

- a. Read and comprehend TTE-specific documentation including operating procedures, hazard analysis and drawings.
- b. Perform 3 months of on-the-job training supervised by the TTE Facility Engineer and/or the certified TTE Facility Technician.

11.2 In addition to TTE operator training, test area personnel may be required to complete safety critical training and be certified for crane/forklift operation, confined space entry, respirator use, etc. This necessity will be determined on an “as needed” basis and will be governed by the requirements in MWI 3410.1, “Personnel Certification Program”.

12.0 FLOWCHARTS

None