NASA/TM−20240008170

Tiltrotor Test Rig Wind-Tunnel Test Data Catalog

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December 2024

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National Aeronautics and
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Available from:

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Nomenclature

BDAS	Basic Data Acquisition System
BVI	Blade-Vortex Interaction
DCMS	Drive Control Monitoring System
DDAS	Dynamic Data Acquisition System
CCW	Counter-Clockwise
CTOS	C_T/σ
CW	Clockwise
NFAC	National Full-Scale Aerodynamics Complex
RDMS	Rotor Database Management System
SDAS	Steady Data Acquisition System
SOF	Safety of Flight
SOFDAS	Safety of Flight Data Acquisition System
TTR	Tiltrotor Test Rig
VS	Vane Set
40x80	NFAC 40- by 80-ft Wind Tunnel
A	Rotor disk area
c	Rotor chord (thrust weighted)
C_T	Thrust coefficient, $T/\rho A\, V_t^2$
D	Drag
M_{tip}	Tip Mach number
N	Number of blades
P	Rotor power
P_i	Rotor induced power
q	Dynamic pressure, ½ ρV^2
R	Rotor radius
T	Rotor thrust
V	Wind tunnel airspeed
V'	Glauert-corrected airspeed
V_t	Rotor tip speed
η	Propulsive efficiency, $TV/P = \mu C_T/C_P$

μ	Advance ratio, V/V_t
Ω	Rotor rotation rate
ρ	Atmospheric density
σ	Rotor solidity, $Nc/\pi R$; standard deviation

Rotor Balance and Shaft Loads

AF	Axial Force
NF	Normal Force
SF	Side Force
PM	Pitching Moment
RM	Rolling Moment
YM	Yaw Moment
B3, B4	Loads from B3 & B4 calibrations
_SH	Shaft Loads
_A, _B	Primary & backup strain gages

Test Point Data Type

CAL	R-cal data point
Cont	Continuously recorded point
REC	Recorded data point
SIM	Simulated rotation
STATIC	Non-rotating reference condition
ZER	Calibration zero point

Summary

The Tiltrotor Test Rig (TTR) is a large-scale proprotor test system for the National Full-Scale Aerodynamics Complex (NFAC). The first wind-tunnel entry was completed in November 2018 with a modern, 26-ft diameter proprotor. The rotor tested was the Bell Model 699, an AW609 rotor modified specifically for wind-tunnel testing. The primary purpose was to complete the development of the TTR, including systems integration with the NFAC. Testing included axial flow up to 273 knots, conversion mode from 30 to 100 deg nacelle angle, and hover/vertical climb conditions. Additional testing included aerodynamic tares, motor tests, thermal tests, modal vibration tests, and other checkout activities. This report lists the test conditions achieved and the types of data acquired and saved in the database.

Introduction

The Tiltrotor Test Rig (TTR) is designed to test large-scale proprotors at high-speed axial flight conditions, tiltrotor conversion mode, and helicopter mode. The TTR was jointly developed by NASA, the U. S. Army and the U. S. Air Force and constructed by Bell Textron. The first entry of the TTR into the NFAC was completed in November 2018. It was considered a checkout test focused on operational safety and efficiency, but the opportunity was used to collect rotor performance, loads, and acoustics data for research. The checkout test used the Bell Model 699 rotor (Figure 1), which was built specifically for NASA by Bell and derived from the right-hand rotor of the Leonardo AW609.

Fig. 1. TTR/699 installed in the NFAC 40- by 80-ft test section, 45-deg yaw.

Dimensions and capabilities of the TTR/699 are summarized in Reference 1, which also includes a description of the NFAC data system. Rotor performance measurements taken during the first entry are given in References 1-3, which have been published as NASA Technical Memoranda

(TMs). NASA TMs generally contain more recent and extensive results than conference papers and are available online. References 1-3 are accordingly recommended as the preferred sources of information on the TTR.

Other useful documents were published as conference papers. Development of the TTR/699 is described in Reference 4, and the test program is described in References 5-6. Acoustics measurements are described in Reference 7. References 8-10 document analytical studies of TTR/699 aeroelastic stability, performance, and airloads. Reference 11 presents a correlation study of performance and loads data and predictions.

Calibration of the TTR rotor balance system is described in Reference 12, and ground vibration testing is described in Reference 13. The NFAC data system is described in Reference 14. Equations for most TTR/699 derived parameters are given in Reference 15.

After acquisition by the NFAC data system, research data are stored in the Rotor Database Management System (RDMS). The present catalog lists all test conditions and data parameters in the database. The section Test Conditions includes summary tables of wind-tunnel runs and NFAC configurations, and tables of data runs organized by category: aerodynamic tares, hover/vertical climb, conversion mode, airplane mode, and dedicated acoustics measurements.

A comprehensive table of all runs and test points is included. The user may profit from examining the summary tables first, followed by the full table, before accessing the database.

The section Instrumentation and Derived Parameters has tables of all types of data stored in the database, organized by data type: operating conditions, rotor balance, rotor coefficients, wall pressures, etc. Note that some data items appear in more than one table.

Test Conditions

For the tables given here, nominal rotor operating conditions are:

Helicopter mode:	569 rpm = 775 ft/sec, M_{tip} = 0.693
Airplane mode:	478 rpm = 651 ft/sec, M_{tip} = 0.580

Table 1 summarizes the TTR wind tunnel runs. The RDMS column indicates whether data for that run are stored in the database: Y = Yes. Y+A indicates that acoustics data are also stored. In a few cases, run numbers were assigned but the run was cancelled or aborted before useful data were acquired. Several runs are included where it was convenient to process calibration and weight-check data through the NFAC data system. Yaw and q values are nominal: not all test conditions were achieved each run.

More detailed tables summarize the runs by operating condition and type of data acquired. Table 2 lists the spinner tare runs (rotor off), including weight tares and background noise measurements. See also Reference 2. Figure 2 graphically shows the test conditions for a subset of the tare data taken at coarse and fine increments of yaw angle and consistent values of dynamic pressure. These data are the most important for determining TTR aerodynamic tares.

Table 1. TTR/699 Summary Run Log

Run	Date	No. Points	RDMS	Description	Notes
				Systems Checks and Aerodynamic Tares: Rotor and Hub Off, Spinner and Fairings Installed	
1	4/28/17	29	Y	Yaw check, 0 airspeed, weight tares	
2	4/28/17	19	Y	Heating run, 0 airspeed	bad rpm data
3	5/1/17	77	Y	Heating run, 0 airspeed	MG set trip
4	5/1/17	34	Y	Spin only run, 0 airspeed, hysteresis check	
5	5/1/17	37	Y	Heating run, 0 airspeed	
6	5/3/17	39	Y	Heating run, 0 airspeed	
7	5/3/17	19	Y	Heating run, 0 airspeed	
8	5/3/17	9	N	*q* sweep, 478 rpm, 0 deg yaw	tunnel trip
9	5/4/17	39	Y	Heating run, 0 airspeed	
10	5/4/17	23	Y+A	*q* sweep, 478 rpm, 0 deg yaw	tunnel trip
11	5/4/17	26	Y	Heating run, 0 airspeed	
12	5/4/17	20	Y+A	*q* sweep, 478 rpm, 0 deg yaw	tunnel trip
13	5/8/17	28	Y	Heating run, 0 airspeed	
14	5/8/17	30	Y+A	*q* sweep, 478 rpm, 0 deg yaw	
15	5/8/17	30	Y	Heating run	
16	5/8/17	24	Y+A	*q* sweep, 478 rpm, 90 deg yaw	
17	5/10/17	39	Y	Heating run	
18	5/10/17	23	Y+A	*q* sweep, 569 rpm, 15 deg yaw	
19	5/11/17	41	Y	Heating run	
20	5/11/17	8	N	30 deg yaw	tunnel trip
21	5/11/17	29	Y	Heating run	
22	5/11/17	176	Y+A	*q* sweeps, 569 rpm, 30 to 100 deg yaw	
23	5/12/17	8	N	90 deg yaw	tunnel trip
24	5/12/17	41	Y	Heating run	
25	5/12/17	15	Y	Yaw sweep, 569 rpm, q = 12 psf	
26	5/12/17	32	Y	Acoustic/heating run, 90 deg yaw	
27	5/12/17	19	Y	*q* sweep, 569 rpm, 90 deg yaw	

Table 1. TTR/699 Summary Run Log (continued)

Run	Date	No. Points	RDMS	Description	Notes
28	5/12/17	30	Y	Yaw sweeps, 569 rpm, q = 12 psf	
29	5/17/17	4	N	Acoustic cal	
30	5/17/17	36	Y	Heating run	
31	5/17/17	43	Y+A	Yaw sweep, 569 rpm, q = 36 psf	
32	5/17/17	28	Y	Heating run	
33	5/17/17	60	Y+A	Yaw sweeps, 569 and 0 rpm, q = 75 psf	
				Rotor Installation, Track and Balance	
34	5/22/17	20	N	Buildup: begin blade installation; -45 deg yaw for blade installation	blades installed 22-23 May
35	5/23/17	—	N	No run	
36	5/23/17	15	Y	Blade installation; -45 deg yaw	
37	5/24/17	4	N	Acoustic cal	
38	6/1/17	15	N	Gage offset coefficient terms 25 deg coll	
39	6/1/17	34	N	Gravity effects 25 deg coll	
40	6/1/17	18	N	Gravity effects 5 deg coll	
41	6/2/17	29	N	Control actuator position calibration	
42	6/2/17	17	N	Control actuator position check	
43	6/5/17	3	N	Discard run	
44	6/6/17	13	N	Control system check	
45	6/6/17	22	N	Control system validation	
46	6/6/17	7	N	Control system check	
47	6/9/17	30	Y	Hover balancing run – nominal blade tip weights	balance heater off (?)
48	8/17/17	5	N	Hover balancing run – new blade tip weights (no rotation), hub flap check	blades reinstalled 27 July
49	8/21/17	38	Y	Hover balancing run – new blade tip weights	limited operations during NFAC shutdown
50	8/22/17	19	Y	Hover balancing run – new blade tip weights	
51	8/22/17	16	Y	Hover balancing run – run 50 tip weights, removed rotating scissor weight	
52	9/6/17	40	N	Blade bending offsets at 15 deg collective	

Table 1. TTR/699 Summary Run Log (continued)

Run	Date	No. Points	RDMS	Description	Notes
				Checkout Runs after NFAC Repairs	
53	—	0	N	No run	
54	3/19/18	0	N	Aborted run	
55	3/19/18	17	Y	Hover Balancing run – no rotating counterweight, swashplate balancing plate installed	
56	3/19/18	27	Y	Hover balancing run – green weight 233.6 g, white weight 177.7 g	
57	3/19/18	25	Y	Hover balancing run – green weight 177.8 g, white weight 177.7 g	
58	3/20/18	27	Y	Hover balancing run – green weight 123.2 g, white weight 177.7 g	
				Wind-Off Thrust Sweeps	
59	3/26/18	41	Y	Thrust checkout: 0 deg yaw, rpm sweep; Vane Set 3 open, VS 4, 6 & 7 closed	high loads
60	3/26/18	26	Y	Thrust checkout: 0 deg yaw, 569 rpm, Vane Set 3 open, VS 4, 6 & 7 closed	hit SOF limits
61	3/27/18	29	Y	Thrust checkout: 0 deg yaw, 569 rpm, Vane Set 3 open, VS 4, 6 & 7 closed	hit SOF limits
62	3/27/18	29	Y	Thrust checkout: 180 deg yaw, 569 rpm, Vane Set 3 open, VS 4, 6 & 7 closed	
63	3/27/18	29	Y	Thrust checkout: 180 deg yaw, 569 rpm, Vane Set 3 closed, VS 4, 6 & 7 open	
				Blades-Off Calibrations and Swashplate Tares	
64	5/14/18	4	N	Acoustic cal	blades removed for NFAC IST
65	5/15/18	5	N	Acoustic cal take 2	
66	5/30/18	10	N	Acoustic cal	
67	6/21/18	6	N	Acoustic cal	
68	7/10/18	13	N	Acoustic cal	
69	7/12/18	27	N	Acoustic cal	
70	7/23/18	4	N	Acoustic cal	
71	7/26/18	31	Y	Swashplate balance tare, spinner fairing and nose cone installed, rpm sweep	
72	7/26/18	79	Y	Swashplate balance tare, spinner fairing and nose cone installed, collective sweep	
73	8/6/18	9	N	Acoustic cal	blades installed 1-2 Aug

Table 1. TTR/699 Summary Run Log (continued)

Run	Date	No. Points	RDMS	Description	Notes
				Blades-On Testing	
74	8/8/18	52	Y+A	Post-IST hover checkout, rpm & collective sweeps, 0 deg yaw, wind off	
75	8/13/18	58	Y+A	Airplane forward flight, 0 deg yaw, 478 RPM, 60, 90 knots	
76	8/13/18	41	Y	Airplane forward flight, 0 deg yaw, 478 RPM, 120, 150 knots; no cooling water	poor data quality?
77	8/14/18	50	Y+A	Airplane forward flight, 0 deg yaw, 478 RPM, 150, 180, 210 knots	tunnel trip
78	8/16/18	27	Y	Motor current checkout, thrust sweep, 0 deg yaw, 478 rpm, wind off	
79	8/16/18	34	Y	Static rotor control rate check	
80	8/16/18	53	Y+A	Airplane forward flight, operator training, 0 deg yaw, 478 RPM, 60, 150, 210 knots	
81	8/17/18	43	Y+A	Airplane forward flight, operator training, 0 deg yaw, 478 RPM, 240-270 knots	hit fan drive BMS limits
82	8/22/18	8	N	Acoustic cal	
83	8/22/18	17	Y	Helicopter forward flight, 90 deg - aborted	
84	8/23/18	2	N	Acoustic cal	
85	8/27/18	42	Y+A	Helicopter forward flight, 90 deg, 57, 80 knots	
86	8/28/18	42	Y+A	Conversion forward flight, thrust sweeps, 90, 75 deg yaw, 57 knots	
87	8/29/18	71	Y+A	Conversion forward flight, thrust sweeps, 75 deg yaw, 57, 70, 81, 92 knots	
88	8/30/18	85	Y+A	Conversion forward flight, thrust sweeps, 75 deg yaw, 104, 115 knots	
89	8/30/18	56	Y+A	Conversion forward flight, thrust sweeps, 60 deg yaw, 70, 81 knots	
90	8/31/18	83	Y+A	Conversion forward flight, thrust sweeps, 60, 45 deg yaw, 91, 103, 115, 126 knots	
91	9/4/18	40	Y+A	Conversion forward flight, thrust sweeps, 45 deg yaw, 57, 103 & 115 knots	
92	9/5/18	14	Y	Conversion forward flight, thrust sweeps, 90 deg yaw - RCC issue	recirculation, aborted
93	9/5/18	81	Y+A	Conversion forward flight, thrust sweeps, 45, 30 deg yaw, 104, 115, 127, 138 knots	
94	9/6/18	65	Y+A	Conversion forward flight, thrust sweeps, 30, 80 deg yaw, 57, 137, 149, 160 knots	
95	9/6/18	26	Y+A	Conversion forward flight, thrust sweeps, 90 deg yaw, 57 knots	
96	9/19/18	7	N	Acoustic cal	
97	10/17/18	4	N	Acoustic cal	
98	11/5/18	5	N	Acoustic cal	
99	11/6/18	23	Y+A	Motor checkout (both fwd motors); NFAC configuration effects	new trunnion etc. in rotating scissors
100	11/6/18	20	Y+A	Motor checkout (port motor disconnected, running motor 5 only); NFAC config. effects	

Table 1. TTR/699 Summary Run Log (concluded)

Run	Date	No. Points	RDMS	Description	Notes
101	11/7/18	33	Y+A	NFAC configuration effects, thrust sweep, 0 deg yaw, 569 rpm	
102	11/7/18	52	Y+A	NFAC configuration effects, thrust sweeps, 0 deg yaw, 569 & 478 rpm	
103	11/7/18	25	Y+A	NFAC configuration effects, thrust sweep, 0 deg yaw, 569 rpm	
104	11/8/18	48	Y+A	Airplane forward flight, thrust sweep, 478 rpm, 120 knots	
105	11/8/18	59	Y+A	Airplane forward flight, thrust sweeps, 569 rpm, 61, 72, 107, 143 knots	
106	11/9/18	36	Y+A	Helicopter forward flight, thrust sweep, 90 deg yaw, 57 knots	
107	11/9/18	46	Y+A	Acoustic BVI helicopter mode testing, yaw sweep & thrust sweep, 57 knots	
108	11/13/18	37	Y+A	Airplane forward flight, 0 yaw, 569 rpm, 176, 212 knots	
109	11/13/18	62	Y+A	Helicopter forward flight, thrust sweeps, 569 rpm, 80, 85, 95, 100 deg yaw, 57 knots	
110	11/14/18	58	Y+A	Motor checkout (both aft motors) & thrust sweeps, 478 & 569 rpm, wind off; NFAC config. effects	
				Blades Off, Hub On (Spindles Exposed)	
111	11/16/18	30	Y+A	Aerotare, yaw sweep, q = 75 psf, blades off, hub taped; both AFT motors	terminated due to loose cowling

Table 2. Aerodynamic Tare Test Points

RPM	Yaw Angle	q, lb/ft^2	Run	Notes
478	0	0-223	10,12,14	Only Run 14 is complete.
569	15	0-75	18	q sweeps at fixed yaw
569	30,45,60,75	0-75	22	
569	90	0-75	16	
553	90	16,21,28	26	acoustics checks
569	90	0-36	27	acoustics
569	0-90	0	25	weight & acoustics checks
	0-90	12	28	repeated yaw sweep
569	80-100	16,22,29,36	22	2-deg yaw increments
569	0-100	36	31	2-deg increments 65-100
569	0-100	75	33	2-deg increments 65-100
0	0-100	75	33	acoustics checks

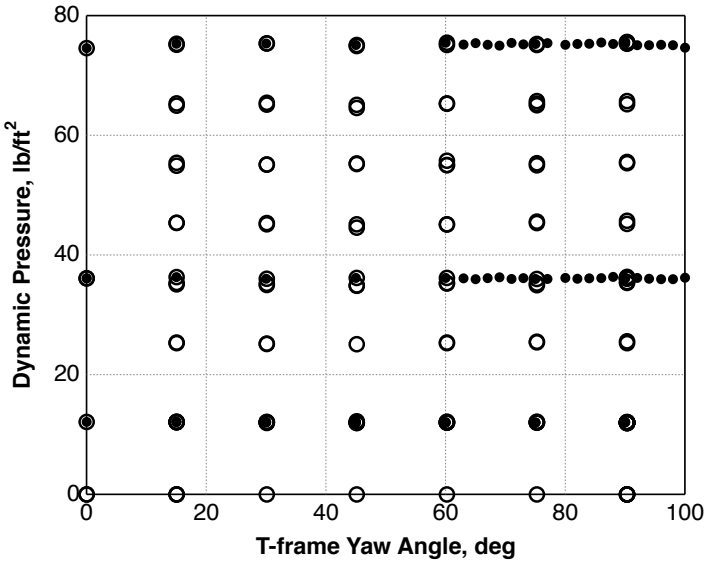

Fig. 2. Aerodynamic Tare Test Points

NFAC tests where only the rotor is powered are frequently referred to as hover tests, simply because the drive fans are not used and airspeed is not controlled. For rotors installed with the shaft axis parallel to the flow direction, the resulting test conditions are actually vertical climb with variable tunnel airspeed (rate of climb) because the rotor's induced velocity causes flow around the closed tunnel circuit.

Table 3 summarizes the hover/vertical climb runs. See also Reference 2. Figures 3 and 4 illustrate the wind tunnel configurations. The rotor is pointing in the upstream direction at 0-deg yaw and in

the reverse direction at 180-deg yaw. Most data were taken at M_{tip} = 0.693 (569 rpm). Runs 102 and 110 included data at both M_{tip} = 0.693 and M_{tip} = 0.583 (479 rpm). Run 78 was a motor test at fixed shaft speed (478 rpm), so M_{tip} does not match perfectly with Runs 102 and 110. For Run 59 only, the personnel access door was open. The Air Exchange was always open. Not all runs include full thrust sweeps.

For completeness, the table includes a few runs that yielded only limited research data. Run 59 was a procedural checkout run (the last track and balance run). Runs 99 and 100 were motor tests with very few data points.

Table 3. Hover/Vertical Climb NFAC Configurations

Run	Yaw angle, deg	VS 3	VS 4	VS 6/7	M_{tip}	Notes
59	0	open	closed	closed	.684	high loads
60	0	open	closed	closed	.684	high loads
61	0	open	closed	closed	.684	
62	180	open	closed	closed	.684	
63	180	closed	open	open	.684	
78	0	open	closed	closed	.583	motor test
99	0	open	closed	open	.684	motor test
100	0	open	closed	open	.684	motor test
101	0	open	open	open	.684	
102	0	4/8 open[a]	open	open	.583, .684	
103	0	2/8 open[a]	open	open	.684	
110	0	open	closed	open	.583, .684	
N/A		4/8 open[a]	closed			not possible

[a]VS 3 has 8 panels, so specified as n/8 open.

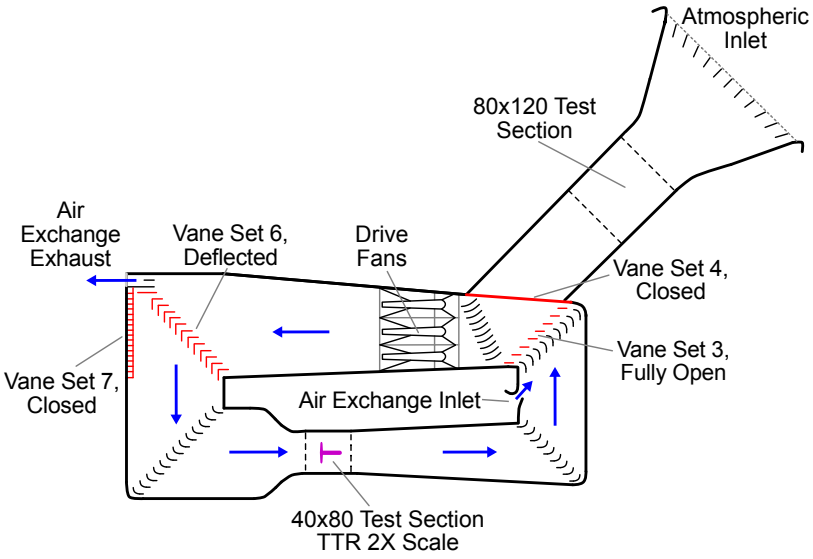

Fig. 3. The NFAC configured for normal 40x80 operations, with the TTR at 0-deg yaw angle.

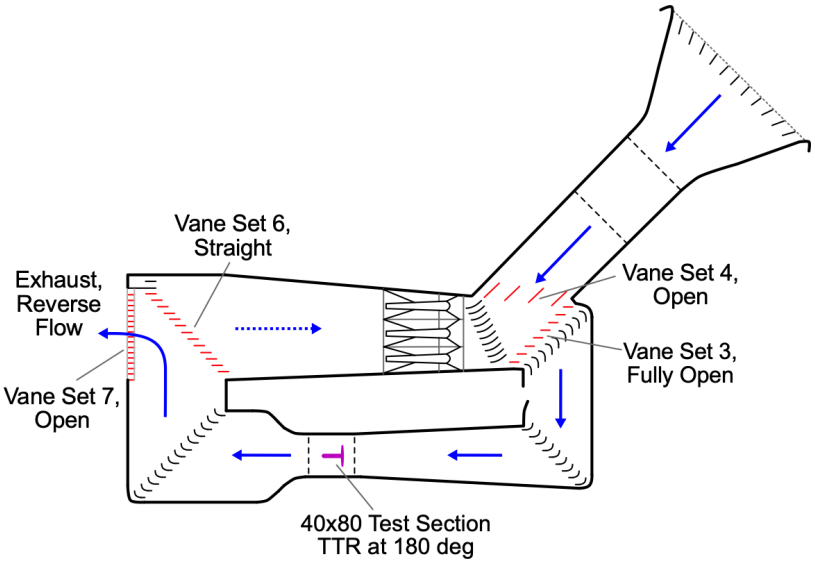

Fig. 4. The NFAC configured for reverse-flow operations, with the TTR at 180-deg yaw angle.

Table 4 summarizes the conversion-mode test points. See also Reference 1. The information in Table 4 is graphically shown in Figure 5.

Table 4. Conversion Mode Thrust Sweeps (M_{tip} = 0.684)

Yaw angle, deg	VKTS	μ	Run
100	57.4	0.125	109
95	57.4	0.125	109
90	57.4	0.125	95
85	57.4	0.125	109
80	57.4	0.125	94
90	56.6	0.125	85
75	56.6	0.125	86
75	69.4	0.151	87
75	80.8	0.176	87
75	92.4	0.201	87
75	104	0.226	88
75	115	0.250	88
60	69	0.150	89
60	81	0.176	89
60	91	0.198	90
60	103	0.224	90
60	114	0.248	90
60	126	0.274	90
45	92	0.200	90
45	103	0.225	91
45	115	0.250	91
45	126	0.275	93
45	138	0.300	93
30	104	0.225	93
30	115	0.250	93
30	127	0.275	93
30	137	0.300	94
30	148	0.325	94
30	160	0.350	94

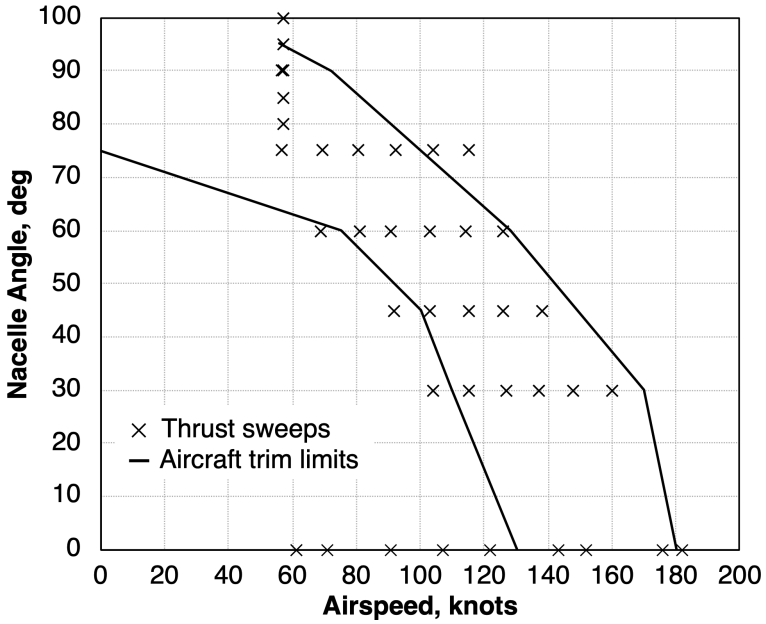

Fig. 5. Nominal conversion-mode envelope and test conditions.

Table 5 summarizes the airplane-mode test points. See also Reference 1.

Table 5. Airplane Mode Thrust Sweeps (Yaw = 0 deg)

M_{tip}	VKTS	μ	Runs
0.583	61	0.156	75, 80
	91	0.233	75
	122	0.312	76, 104
	152	0.391	76, 77, 80
	182	0.468	77
	214	0.544	77, 80
	243	0.622	81
	264	0.674	81
0.684	61	0.133	105
	71	0.156	105
	107	0.233	105
	143	0.311	105
	176	0.391	108
	211	0.468	108

Table 6 summarizes the Blade-Vortex Interaction (BVI) test points for acoustics measurements. See also Reference 7. Background noise measurements were included in the aerodynamic tare runs, and acoustics data were taken at many other non-BVI conditions, as denoted in Table 1.

Table 6. Acoustics BVI Test Points
$C_T/\sigma = 0.075$, $\mu = 0.125$
All Run 107

Yaw range	Increment
80-86 deg	2 deg
88-100 deg	1 deg

Table 7 is a detailed run log, with all data points for runs for which data were acquired and stored in the RDMS database. The table is a heavily redacted version of the NFAC run log. Most of the omitted runs, notably 37-46, were instrumentation checks and calibrations. Initialization points such as instrumentation zeros and R-cals are not normally stored in the database, but all are listed here. “Static” points are non-rotating reference conditions; they are not consistently labeled in the original NFAC run log.

The NFAC data system requires a 1/rev pulse to trigger data acquisition. At zero rotor speed, a dummy trigger is applied which results in a rotor speed reading of 499.095 rpm. Dummy rpm readings are denoted “SIM” in the run log as a reminder that the values are not physical data.

Exactly which parameters are listed depends upon the purpose of the run and point. Airspeed is not always given for wind-off conditions. For hover/vertical climb runs (Table 3), the NFAC fan drives were not used and the airspeed is that generated by the 699 rotor.

Tunnel speed is given as dynamic pressure for rotor-off aerodynamic tare runs, but as airspeed (knots) for rotor-on runs. Nondimensional coefficients—M_{tip}, C_T/σ, and μ—are given where the rotor was trimmed to those values. Standard practice was to set reference points on shaft speed (rpm), tunnel speed (knots), and collective (deg), then switch to coefficients for trim where appropriate.

Motor current is not stored in the RDMS database, but for three runs—99, 100, and 110—the values were recorded by hand in the NFAC run log and are included here.

Table 7. TTR/699 Run Log

Run TR092RN001 4/28/2017 Yaw check, 0 airspeed, weight tares

Aerotares: Blades Off, Spinner Fairing and Fairing Close-Outs Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	VKTS	Notes
ZER	1	0	0	0	ZERO
CAL	2	0	0	0	RCAL/AB
ZER	3	0	0	0	ZERO
CAL	4	0	0	0	RCAL BAD ZERO/RCAL combination
ZER	5	0	0	0	ZERO
CAL	6	0	0	0	RCAL/AB
ZER	7	0	0	0	ZERO
CAL	8	0	0	0	RCAL
REC	9	0	0	0	Static w/ RCAL
REC	10	0	0	0	STATIC
REC	11	0	0	0	
REC	12	15	0	0	
REC	13	30	0	0	
REC	14	45	0	0	
REC	15	60	0	0	
REC	16	75	0	0	
REC	17	90	0	0	
REC	18	100	0	0	
REC	19	90	0	0	
REC	20	75	0	0	
REC	21	60	0	0	
REC	22	45	0	0	
REC	23	30	0	0	
REC	24	15	0	0	
REC	25	0	0	0	Static Point
REC	26	0	0	0	STATIC
REC	27	0	0	0	Static w/ RCAL
ZER	28	0	0	0	ZERO
CAL	29	0	0	0	RCAL

Table 7. TTR/699 Run Log (continued)

Run TR092RN002 4/28/2017 Heating run, 0 airspeed

Aerotares: Blades Off, Spinner Fairing and Fairing Close-Outs Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	VKTS	Notes
ZER	1	0	0	0	ZERO
CAL	2	0	0	0	RCAL/AB
ZER	3	0	0	0	ZERO
CAL	4	0	0	0	RCAL
REC	5	0	0	0	Static w/ RCAL
REC	6	0	0	0	STATIC
REC	7	0	0	0	bad point?
REC	8	0	200	0	Not getting correct RPM from model
REC	9	0	200	0	Not getting correct RPM from model
REC	10	0	200	0	Not getting correct RPM from model
REC	11	0	400	0	No Pulse - repeating point
REC	12	0	400	0	
REC	13	0	569	0	
REC	14	0	200	0	
REC	15	0	0	0	Static Point
REC	16	0	0	0	STATIC
REC	17	0	0	0	Static w/ RCAL
ZER	18	0	0	0	ZERO
CAL	19	0	0	0	RCAL

Table 7. TTR/699 Run Log (continued)

Run TR092RN003 5/1/2017 Heating run, 0 airspeed

Aerotares: Blades Off, Spinner Fairing and Fairing Close-Outs Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	VKTS	Notes
ZER	1	0	0	0	ZERO
CAL	2	0	0	0	RCAL/AB
ZER	3	0	0	0	ZERO
CAL	4	0	0	0	RCAL
REC	5	0	0	0	STATIC
REC	6	0	200	0	no link to acoustics
REC	7	0	200	0	repeating pt/Acoustic issues
REC	8	0	400	0	
REC	9	0	569	0	
Cont	10-21	0	569	0	Hold for 60 min or heat stabilizes, periodic data every min
				0	PT 21 is bad - MG set tripped in middle of point
Cont	22-73	0	569	0	Repeat periodic data - SOFDAS activated
REC	74	0	200	0	
REC	75	0	0	0	STATIC
ZER	76	0	0	0	ZERO
CAL	77	0	0	0	RCAL

Table 7. TTR/699 Run Log (continued)

Run TR092RN004 5/1/2017 Spin only run, 0 airspeed, hysteresis check

Aerotares: Blades Off, Spinner Fairing and Fairing Close-Outs Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	VKTS	Notes
ZER	1	0	0	0	ZERO
CAL	2	0	0	0	RCAL
ZER	3	0	0	0	ZERO
CAL	4	0	0	0	RCAL
REC	5	0	0	0	Static w/ RCAL
REC	6	0	0	0	STATIC
REC	7	0	60	0	RPM sweep, 0 airspeed/Simulated RPM set at 500
REC	8	0	60	0	RPM sweep, 0 airspeed/Repeat pt
REC	9	0	100	0	
REC	10	0	150	0	
REC	11	0	200	0	
REC	12	0	250	0	
REC	13	0	300	0	
REC	14	0	350	0	
REC	15	0	400	0	
REC	16	0	450	0	
REC	17	0	478	0	
REC	18	0	525	0	
REC	19	0	569	0	
REC	20	0	525	0	hysteresis check: reverse RPM sweep
REC	21	0	478	0	
REC	22	0	450	0	
REC	23	0	400	0	
REC	24	0	350	0	
REC	25	0	300	0	
REC	26	0	250	0	
REC	27	0	200	0	TS kept 128 Rot after setting at 32
REC	28	0	150	0	
REC	29	0	100	0	
REC	30	0	60	0	
REC	31	0	0	0	STATIC/ 16 sec sdas point
REC	32	0	0	0	STATIC/ 16 sec sdas point/repeated static
ZER	33	0	0	0	ZERO
CAL	34	0	0	0	RCAL

Table 7. TTR/699 Run Log (continued)

Run TR092RN005 5/1/2017 Heating run, 0 airspeed

Aerotares: Blades Off, Spinner Fairing and Fairing Close-Outs Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	VKTS	Notes
ZER	1	0	0	0	ZERO
CAL	2	0	0	0	RCAL/AB
ZER	3	0	0	0	ZERO
CAL	4	0	0	0	RCAL
REC	5	0	0	0	STATIC
REC	6	0	200	0	
REC	7	0	400	0	
REC	8	0	569	0	Single point
Cont	9-33	0	569	0	Continuous 1 min delay (569 Rots) SDAS pt 33 is bad
REC	34	0	200	0	Post point - causing trip
REC	35	0	0	0	STATIC
ZER	36	0	0	0	ZERO
CAL	37	0	0	0	RCAL

Table 7. TTR/699 Run Log (continued)

Run TR092RN006 5/03/2017 Heating run, 0 airspeed

Aerotares: Blades Off, Spinner Fairing and Fairing Close-Outs Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	VKTS	Notes
ZER	1	0	0	0	ZERO
CAL	2	0	0	0	RCAL/AB
ZER	3	0	0	0	ZERO
CAL	4	0	0	0	RCAL
REC	5	0	0	0	STATIC/started SOF/ Restart 1 per rev issues with rotor
REC	6	0	200	0	
REC	7	0	400	0	Point did not post process
REC	8	0	400	0	
REC	9	0	569	0	
REC	10-20	0	569	0	Hold for 60 min or heat stabilizes, periodic data every min
		0		0	Multiple Points did not post process: error opening BDAS .rstat file
REC	21	0	569	0	Multiple Points did not post process: error opening BDAS .rstat file
REC	22	0	569	0	Multiple Points did not post process: error opening BDAS .rstat file
Cont	23-33	0	569	0	Hold for 60 min or heat stabilizes, periodic data every min
		0		0	Multiple Points did not post process: error opening BDAS .rstat file
REC	34	0	400	0	Multiple Points did not post process: error opening BDAS .rstat file
REC	35	0	400	0	
REC	36	0	200	0	
REC	37	0	0	0	STATIC
ZER	38	0	0	0	ZERO
CAL	39	0	0	0	RCAL

Table 7. TTR/699 Run Log (continued)

Run TR092RN007 5/3/2017 Heating run, 0 airspeed

Aerotares: Blades Off, Spinner Fairing and Fairing Close-Outs Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	VKTS	Notes
ZER	1	0	0	0	ZERO
CAL	2	0	0	0	RCAL
ZER	3	0	0	0	ZERO
CAL	4	0	0	0	RCAL
ZER	5	0	0	0	ZERO
CAL	6	0	0	0	RCAL/proceed per DAN
REC	7	0	0	0	STATIC
REC	8	0	200	0	
Cont	9-15	0	478	0	Continuous data points
REC	16	0	200	0	
REC	17	0	0	0	STATIC
ZER	18	0	0	0	ZERO
CAL	19	0	0	0	RCAL

Table 7. TTR/699 Run Log (continued)

Run TR092RN009 5/4/2017 Heating run, 0 airspeed

Aerotares: Blades Off, Spinner Fairing and Fairing Close-Outs Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	VKTS	Notes
ZER	1	0	0	0	ZERO
CAL	2	0	0	0	RCAL
ZER	3	0	0	0	ZERO (AB)
CAL	4	0	0	0	RCAL
REC	5	0	0	0	STATIC
REC	6	0	200	0	Point was too long in SDAS - captured RPM acceleration to 569
REC	7	0	400	0	
REC	8	0	569	0	
Cont	9-13	0	569	0	Hold for 60 min or heat stabilizes, periodic data every min
Cont	14-34	0	478	0	Hold for 60 min or heat stabilizes, periodic data every min
Cont	32-35	0	478	0	32-35 BDAS was taken as single pt catch-up points
REC	36	0	200	0	
REC	37	0	0	0	Static Point
ZER	38	0	0	0	ZERO
CAL	39	0	0	0	RCAL

Table 7. TTR/699 Run Log (continued)

Run TR092RN010 5/4/2017 *q* sweep, 478 rpm, 0-deg yaw

Aerotares: Blades Off, Spinner Fairing and Fairing Close-Outs Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	*q*, psf	Notes
ZER	1	0	0	0	ZERO
CAL	2	0	0	0	RCAL
ZER	3	0	0	0	ZERO (AB)
CAL	4	0	0	0	RCAL
ZER	5	0	0	0	ZERO
CAL	6	0	0	0	RCAL
ZER	7	0	0	0	ZERO (AB)
CAL	8	0	0	0	RCAL
REC	9	0	0	0	STATIC
REC	10	0	478	0	Reference point
REC	11	0	478	12	did not send pulse to acoustic
REC	12	0	478	12	Repeat pt / VPM_Angle 7.01
REC	13	0	478	30	
REC	14	0	478	30	repeat pt
REC	15	0	478	30	repeat pt
REC	16	0	478	60	
REC	17	0	478	90	
REC	18	0	478	120	
REC	19	0	478	150	
REC	20	0	478	180	SOF 19 Tunnel Estop
REC	21	0	0	0	STATIC
ZER	22	0	0	0	ZERO
CAL	23	0	0	0	RCAL

Table 7. TTR/699 Run Log (continued)

Run TR092RN011 5/4/2017 Heating run, 0 airspeed

Aerotares: Blades Off, Spinner Fairing and Fairing Close-Outs Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	*q*, psf	Notes
ZER	1	0	0	0	ZERO
CAL	2	0	0	0	RCAL
ZER	3	0	0	0	ZERO (AB)
CAL	4	0	0	0	RCAL
REC	5	0	0	0	STATIC
REC	6	0	200	0	
REC	7	0	400	0	
REC	8	0	478	0	
Cont	9-22	0	478	0	Hold for 60 min or heat stabilizes, periodic data every min Taking 2 single BDAS points to catch up
REC	23	0	200	0	
REC	24	0	0	0	Static Point
ZER	25	0	0	0	ZERO
CAL	26	0	0	0	RCAL

Table 7. TTR/699 Run Log (continued)

Run TR092RN012 5/4/2017 *q* sweep, 478 rpm, 0-deg yaw

Aerotares: Blades Off, Spinner Fairing and Fairing Close-Outs Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	*q*, psf	Notes
ZER	1	0	0	0	ZERO
CAL	2	0	0	0	RCAL
ZER	3	0	0	0	ZERO (AB)
CAL	4	0	0	0	RCAL
REC	5	0	0	0	STATIC
REC	6	0	478	0	Reference point
REC	7	0	478	12	
REC	8	0	478	30	
REC	9	0	478	60	
REC	10	0	478	90	No angle entered manually
REC	11	0	478	90	Repeat pt
REC	12	0	478	120	
REC	13	0	478	150	
REC	14	0	478	180	
REC	15	0	478	210	
REC	16	0	478	203	*q* was fluctuating/Tunnel trip
REC	17	0	478	0	Reference point
REC	18	0	0	0	STATIC
ZER	19	0	0	0	ZERO
CAL	20	0	0	0	RCAL

Table 7. TTR/699 Run Log (continued)

Run TR092RN013 5/8/2017 Heating run, 0 airspeed

Aerotares: Blades Off, Spinner Fairing and Fairing Close-Outs Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	*q*, psf	Notes
ZER	1	0	0	0	ZERO
CAL	2	0	0	0	RCAL
ZER	3	0	0	0	ZERO (AB)
CAL	4	0	0	0	RCAL
REC	5	0	0	0	STATIC
REC	6	0	200	0	
REC	7	0	400	0	
REC	8	0	478	0	
Cont	9-24	0	478	0	Hold for 60 min or heat stabilizes, periodic data every min
REC	25	0	200	0	
REC	26	0	0	0	Static Point
ZER	27	0	0	0	ZERO
CAL	28	0	0	0	RCAL

Table 7. TTR/699 Run Log (continued)

Run TR092RN014 5/8/2017 *q* sweep, 478 rpm, 0-deg yaw

Aerotares: Blades Off, Spinner Fairing and Fairing Close-Outs Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	*q*, psf	Notes
ZER	1	0	0	0	ZERO
CAL	2	0	0	0	RCAL
ZER	3	0	0	0	ZERO (AB)
CAL	4	0	478	0	RCAL
REC	5	0	478	0	STATIC
REC	6	0	478	0	Reference point
REC	7	0	478	12	
REC	8	0	478	30	
REC	9	0	478	60	
REC	10	0	478	90	
REC	11	0	478	120	
REC	12	0	478	150	
REC	13	0	478	180	
REC	14	0	478	210	
REC	15	0	478	223	
REC	16	0	478	210	
REC	17	0	478	180	
REC	18	0	478	150	
REC	19	0	478	120	
REC	20	0	478	90	
REC	21	0	478	60	
REC	22	0	478	60	Acoustics did not get signal/repeating pt
REC	23	0	478	30	
REC	24	0	478	12	
REC	25	0	478	12	Acoustics did not get signal/repeating pt
REC	26	0	0	0	Reference point
REC	27	0	0	0	Reference point/Manual inputs still had value/repeat pt
REC	28	0	0	0	STATIC
ZER	29	0	0	0	ZERO
CAL	30	0	0	0	RCAL

Table 7. TTR/699 Run Log (continued)

Run TR092RN015 5/8/2017 Heating run

Aerotares: Blades Off, Spinner Fairing and Fairing Close-Outs Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	*q*, psf	Notes
ZER	1	0	0	0	ZERO
CAL	2	0	0	0	RCAL
ZER	3	0	0	0	ZERO (AB)
CAL	4	0	0	0	RCAL
ZER	5	0	0	0	ZERO (AB)
CAL	6	0	0	0	RCAL
REC	7	0	0	0	STATIC
REC	8	90	200	0	
REC	9	90	400	0	
REC	10	90	569	0	
Cont	11-26	90	569	0	Hold for 60 min or heat stabilizes, periodic data every min
REC	27	90	200	0	
REC	28	0	0	0	Static Point
ZER	29	0	0	0	ZERO
CAL	30	0	0	0	RCAL

Table 7. TTR/699 Run Log (continued)

Run TR092RN016 5/8/2017 *q* sweep, 478 rpm, 90-deg yaw

Aerotares: Blades Off, Spinner Fairing and Fairing Close-Outs Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	*q*, psf	Notes
ZER	1	90	0	0	ZERO
CAL	2	90	0	0	RCAL
REC	3	90	0	0	STATIC
REC	4	90	569	0	Reference point
REC	5	90	569	0	Wind on Ref
REC	6	90	569	0	
REC	7	90	569	12	
REC	8	90	569	25	
REC	9	90	569	35	
REC	10	90	569	45	
REC	11	90	569	55	strut limit is 75 psf
REC	12	90	569	65	hysteresis check: reverse *q* sweep
REC	13	90	569	75	
REC	14	90	569	65	
REC	15	90	569	55	
REC	16	90	569	45	
REC	17	90	569	35	
REC	18	90	569	25	Wind on Ref
REC	19	90	569	15	Reference point; skip if proceed immediately to next azimuth
REC	20	90	0	12	Static Point
REC	21	90	0	0	STATIC
ZER	22	90	0	0	STATIC
ZER	23	90	0	0	ZERO
CAL	24	90	0	0	RCAL

Table 7. TTR/699 Run Log (continued)

Run TR092RN017 5/10/2017 Heating run

Aerotares: Blades Off, Spinner Fairing and Fairing Close-Outs Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	q, psf	Notes
ZER	1	0	0	0	ZERO
CAL	2	0	0	0	RCAL
ZER	3	0	0	0	ZERO (AB)
CAL	4	0	0	0	RCAL
REC	5	0	0	0	STATIC
REC	6	15	200	0	
REC	7	15	400	12	
REC	8	15	569	25	
Cont	9-35	15	569	35	Hold for 60 min or heat stabilizes, periodic data every min
REC	36	15	200	45	
REC	37	0	0	55	Static Point
ZER	38	0	0	65	ZERO
CAL	39	0	0	75	RCAL

Table 7. TTR/699 Run Log (continued)

Run TR092RN018 5/10/2017 *q* sweep, 569 rpm, 15 deg yaw

Aerotares: Blades Off, Spinner Fairing and Fairing Close-Outs Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	*q*, psf	Notes
ZER	1	0	0	0	
CAL	2	0	0	0	AB
ZER	3	0	0	0	
CAL	4	0	0	0	
REC	5	0	0	0	STATIC
REC	6	15	569	0	Reference point
REC	7	15	569	12	Wind on reference point
REC	8	15	569	25	
REC	9	15	569	35	
REC	10	15	569	45	
REC	11	15	569	55	
REC	12	15	569	65	
REC	13	15	569	75	strut limit is 75 psf
REC	14	15	569	65	
REC	15	15	569	55	
REC	16	15	569	45	
REC	17	15	569	35	
REC	18	15	569	25	
REC	19	15	569	12	Wind on reference point
REC	20	15	569	0	Reference point
REC	21	0	0	0	STATIC
ZER	22	0	0	0	ZERO
CAL	23	0	0	0	RCAL

Table 7. TTR/699 Run Log (continued)

Run TR092RN019 5/11/2017 Heating run

Aerotares: Blades Off, Spinner Fairing and Fairing Close-Outs Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	*q*, psf	Notes
ZER	1	0	0	0	
CAL	2	0	0	0	
ZER	3	0	0	0	
CAL	4	0	0	0	
REC	5	0	0	0	STATIC
REC	6	30	200	0	
REC	7	30	400	0	
REC	8	30	569	0	
Cont	9-37	30	569	0	Hold for 60 min or heat stabilizes, periodic data every min
REC	38	30	200	0	
REC	39	0	0	0	Static Point
ZER	40	0	0	0	
CAL	41	0	0	0	

Table 7. TTR/699 Run Log (continued)

Run TR092RN021 5/11/2017 Heating run

Aerotares: Blades Off, Spinner Fairing and Fairing Close-Outs Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	q, psf	Notes
ZER	1	0	0	0	
CAL	2	0	0	0	AB
ZER	3	0	0	0	
CAL	4	0	0	0	
REC	5	0	0	0	STATIC
REC	6	30	200	0	
REC	7	30	400	0	
REC	8	30	569	0	
Cont	9-24	30	569	0	Hold for 60 min or heat stabilizes, periodic data every min
REC	25	30	200	0	
REC	26	0	0	0	Static Point/ SDAS was 16 sec
REC	27	0	0	0	Repeat last pt
ZER	28	0	0	0	
CAL	29	0	0	0	AB

Table 7. TTR/699 Run Log (continued)

Run TR092RN022 5/11/2017 *q* sweeps, 569 rpm, 30 to 100 deg yaw

Aerotares: Blades Off, Spinner Fairing and Fairing Close-Outs Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	*q*, psf	Notes
ZER	1	30	SIM	0	
CAL	2	30	SIM	0	AB
ZER	3	30	SIM	0	
CAL	4	30	SIM	0	
ZER	5	30	SIM	0	
CAL	6	30	SIM	0	
REC	7	30	SIM	0	STATIC
REC	8	30	SIM	0	
REC	9	30	SIM	12	
REC	10	30	569	12	
REC	11	30	569	25	
REC	12	30	569	35	
REC	13	30	569	45	
REC	14	30	569	55	
REC	15	30	569	65	
REC	16	30	569	75	
REC	17	30	569	65	
REC	18	30	569	55	
REC	19	30	569	45	
REC	20	30	569	35	
REC	21	30	569	25	
REC	22	30	569	12	
REC	23	30	SIM	12	RPM was not set to Normal as we came down - bad point
REC	24	30	SIM	12	Repeat wind on reference after coming back to condition
REC	25	30	SIM	12	Repeat wind on reference after coming back to condition
REC	26	45	SIM	12	
REC	27	45	569	12	
REC	28	45	569	25	
REC	29	45	569	35	
REC	30	45	569	45	
REC	31	45	569	55	
REC	32	45	569	65	
REC	33	45	569	75	
REC	34	45	569	65	
REC	35	45	569	55	
REC	36	45	569	45	
REC	37	45	569	35	
REC	38	45	569	25	
REC	39	45	569	12	
REC	40	45	SIM	12	
REC	41	45	SIM	12	Repeat pt per acoustics request
REC	42	60	SIM	12	
REC	43	60	569	12	
REC	44	60	569	12	Repeat pt per acoustics request
REC	45	60	569	25	
REC	46	60	569	35	
REC	47	60	569	45	
REC	48	60	569	55	
REC	49	60	569	65	

Run TR092RN022 continued

Point Type	Data Point	Yaw, deg	Rotor RPM	q, psf	Notes
REC	50	60	569	75	
REC	51	60	569	65	
REC	52	60	569	55	
REC	53	60	569	55	Repeat pt per acoustics request
REC	54	60	569	45	
REC	55	60	569	35	
REC	56	60	569	25	
REC	57	60	569	12	
REC	58	60	SIM	12	
REC	59	75	SIM	12	
REC	60	75	569	12	
REC	61	75	569	25	
REC	62	75	569	35	
REC	63	75	569	45	
REC	64	75	569	55	
REC	65	75	569	65	
REC	66	75	569	65	Repeat, q was too high for previous point
REC	67	75	569	75	
REC	68	75	569	65	
REC	69	75	569	55	
REC	70	75	569	45	
REC	71	75	569	35	
REC	72	75	569	25	
REC	73	75	569	12	
REC	74	75	SIM	12	
REC	75	75	SIM	12	Repeat pt per acoustics request
REC	76	90	SIM	12	
REC	77	90	569	12	
REC	78	90	569	16	
REC	79	92	569	16	
REC	80	94	569	16	
REC	81	96	569	16	
REC	82	98	569	16	
REC	83	100	569	16	
REC	84	98	569	16	
REC	85	96	569	16	
REC	86	94	569	16	
REC	87	92	569	16	
REC	88	90	569	16	
REC	89	88	569	16	
REC	90	86	569	16	
REC	91	84	569	16	
REC	92	82	569	16	
REC	93	80	569	16	
REC	94	82	569	16	
REC	95	84	569	16	
REC	96	86	569	16	
REC	97	88	569	16	
REC	98	90	569	16	
REC	99	90	569	12	
REC	100	90	SIM	12	
REC	101	90	569	12	

Run TR092RN022 continued

Point Type	Data Point	Yaw, deg	Rotor RPM	q, psf	Notes
REC	102	90	569	22	
REC	103	92	569	22	
REC	104	94	569	22	
REC	105	96	569	22	
REC	106	98	569	22	
REC	107	100	569	22	
REC	108	98	569	22	
REC	109	96	569	22	
REC	110	94	569	22	
REC	111	92	569	22	
REC	112	90	569	22	
REC	113	88	569	22	
REC	114	86	569	22	
REC	115	84	569	22	
REC	116	82	569	22	
REC	117	80	569	22	
REC	118	82	569	22	
REC	119	84	569	22	
REC	120	86	569	22	
REC	121	88	569	22	
REC	122	90	569	22	
REC	123	90	569	12	
REC	124	90	SIM	12	
REC	125	90	569	12	
REC	126	90	569	29	
REC	127	92	569	29	
REC	128	94	569	29	
REC	129	96	569	29	
REC	130	98	569	29	
REC	131	100	569	29	
REC	132	98	569	29	
REC	133	96	569	29	
REC	134	94	569	29	
REC	135	92	569	29	
REC	136	90	569	29	
REC	137	88	569	29	
REC	138	86	569	29	
REC	139	84	569	29	
REC	140	82	569	29	
REC	141	80	569	29	
REC	142	82	569	29	
REC	143	84	569	29	
REC	144	86	569	29	
REC	145	88	569	29	
REC	146	90	569	29	
REC	147	90	569	12	
REC	148	90	SIM	12	
REC	149	90	569	12	
REC	150	90	569	36	
REC	151	92	569	36	
REC	152	94	569	36	
REC	153	96	569	36	

Run TR092RN022 continued

Point Type	Data Point	Yaw, deg	Rotor RPM	*q*, psf	Notes
REC	154	98	569	36	
REC	155	100	569	36	
REC	156	98	569	36	
REC	157	96	569	36	
REC	158	94	569	36	
REC	159	92	569	36	
REC	160	90	569	36	
REC	161	88	569	36	
REC	162	86	569	36	
REC	163	84	569	36	
REC	164	82	569	36	
REC	165	80	569	36	
REC	166	82	569	36	
REC	167	84	569	36	
REC	168	86	569	36	
REC	169	88	569	36	
REC	170	90	569	36	
REC	171	90	569	12	
REC	172	90	SIM	12	
REC	173	90	SIM	0	
REC	174	90	SIM	0	
ZER	175	90	SIM	0	
CAL	176	90	SIM	0	

Table 7. TTR/699 Run Log (continued)

Run TR092RN024 5/12/2017 Heating run

Aerotares: Blades Off, Spinner Fairing and Fairing Close-Outs Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	*q*, psf	Notes
ZER	1	0	SIM	0	
CAL	2	0	SIM	0	AB
ZER	3	90	SIM	0	
CAL	4	90	SIM	0	
ZER	5	90	SIM	0	
CAL	6	90	SIM	0	
REC	7	90	SIM	0	STATIC
REC	8	90	SIM	0	
REC	9	90	200	0	
REC	10	90	400	0	
Cont	11-20	90	569	0	
Cont	21-29	90-0	569	0	moving yaw to 0 during data collection
Cont	30-37	0	569	0	
REC	38	90	569	0	
REC	39	90	200	0	STATIC
ZER	40	0	SIM	0	
CAL	41	0	SIM	0	AB

Table 7. TTR/699 Run Log (continued)

Run TR092RN025 5/12/2017 Yaw sweep, 569 rpm, q = 12 psf

Aerotares: Blades Off, Spinner Fairing and Fairing Close-Outs Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	q, psf	Notes
ZER	1	0	SIM	0	
CAL	2	0	SIM	0	AB
ZER	3	0	SIM	0	
CAL	4	0	SIM	0	
REC	5	0	SIM	0	STATIC
REC	6	0	569	0	
REC	7	0	569	0	
REC	8	15	569	0	
REC	9	30	569	0	
REC	10	45	569	0	
REC	11	60	569	0	
REC	12	75	569	0	
REC	13	90	SIM	0	STATIC
ZER	14	90	SIM	0	
CAL	15	90	SIM	0	AB

Table 7. TTR/699 Run Log (continued)

Run TR092RN026 5/12/2017 Acoustic/heating run, 90 deg yaw

Aerotares: Blades Off, Spinner Fairing and Fairing Close-Outs Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	*q*, psf	Notes
ZER	1	90	SIM	0	
CAL	2	90	SIM	0	AB
ZER	3	90	SIM	0	
CAL	4	90	SIM	0	
REC	5	90	SIM	0	STATIC
REC	6	90	201	0	
REC	7	90	401	0	
REC	8	90	570	0	
REC	9	90	553	16	
REC	10	90	552	16	
REC	11	90	552	16	
REC	12	90	552	16	
REC	13	90	553	16	
REC	14	90	554	16	
REC	15	90	553	22	
REC	16	90	553	22	
REC	17	90	553	22	
REC	18	90	553	22	
REC	19	90	553	22	
REC	20	90	553	22	
REC	21	90	553	28	
REC	22	90	553	28	
REC	23	90	553	28	
REC	24	90	553	28	
REC	25	90	554	28	
REC	26	90	554	28	
REC	27	90	569	0	
REC	28	90	401	0	
REC	29	90	200	0	
REC	30	90	SIM	0	rotations set at 64
ZER	31	90	SIM	0	
CAL	32	90	SIM	0	AB

Table 7. TTR/699 Run Log (continued)

Run TR092RN027 5/12/2017 *q* sweep, 569 rpm, 90 deg yaw

Aerotares: Blades Off, Spinner Fairing and Fairing Close-Outs Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	*q*, psf	Notes
ZER	1	90	SIM	0	sdas at 16
ZER	2	90	SIM	0	
CAL	3	90	SIM	0	AB
ZER	4	90	SIM	0	
CAL	5	90	SIM	0	
REC	6	90	SIM	0	STATIC
REC	7	90	569	0	
REC	8	90	569	12	
REC	9	90	569	16	
REC	10	90	569	29	
REC	11	90	569	36	
REC	12	90	569	29	
REC	13	90	569	16	
REC	14	90	569	12	
REC	15	90	569	0	
REC	16	90	SIM	0	Bad point
REC	17	90	SIM	0	STATIC
ZER	18	90	SIM	0	
CAL	19	90	SIM	0	AB

Table 7. TTR/699 Run Log (continued)

Run TR092RN028 5/12/2017 Yaw sweeps, 569 rpm, q = 12 psf

Aerotares: Blades Off, Spinner Fairing and Fairing Close-Outs Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	q, psf	Notes
ZER	1	90	SIM	0	
CAL	2	90	SIM	0	AB
ZER	3	90	SIM	0	
CAL	4	90	SIM	0	
REC	5	90	SIM	0	STATIC
REC	6	90	570	0	
REC	7	90	570	12	
REC	8	75	569	12	
REC	9	60	569	12	
REC	10	45	569	12	
REC	11	30	569	12	
REC	12	15	570	12	
REC	13	0	569	12	
REC	14	15	569	12	
REC	15	30	569	12	
REC	16	45	569	12	
REC	17	60	569	12	
REC	18	75	569	12	
REC	19	90	569	12	
REC	20	75	570	12	
REC	21	60	570	12	
REC	22	45	570	12	
REC	23	30	570	12	
REC	24	15	570	12	
REC	25	0	570	12	
REC	26	90	570	12	
REC	27	90	569	0	
REC	28	90	SIM	0	STATIC
ZER	29	90	SIM	0	
CAL	30	90	SIM	0	AB

Table 7. TTR/699 Run Log (continued)

Run TR092RN030 5/17/2017 Heating run

Aerotares: Blades Off, Spinner Fairing and Fairing Close-Outs Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	q, psf	Notes
ZER	1	0	0	0	ZERO
CAL	2	0	0	0	RCAL
ZER	3	0	0	0	ZERO (AB)
CAL	4	0	0	0	RCAL
ZER	5	0	0	0	ZERO (AB)
REC	6	0	200	0	
REC	7	0	400	0	
REC	8	0	569	0	
Cont	9-32	0	569	0	Hold for 60 min or heat stabilizes, periodic data every min
REC	33	0	200	0	
REC	34	0	0	0	Static Point
ZER	35	0	0	0	ZERO
CAL	36	0	0	0	RCAL

Table 7. TTR/699 Run Log (continued)

Run TR092RN031 5/17/2017 Yaw sweep, 569 rpm, q=36psf

Aerotares: Blades Off, Spinner Fairing and Fairing Close-Outs Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	q, psf	Notes
ZER	1	0	SIM	0	
CAL	2	0	SIM	0	AB
ZER	3	0	SIM	0	
CAL	4	0	SIM	0	
ZER	5	0	SIM	0	
CAL	6	0	SIM	0	
ZER	7	0	SIM	0	
CAL	8	0	SIM	12	
REC	9	0	SIM	36	
REC	10	0	569	36	
REC	11	0	569	36	No tunnel condition data entered
REC	12	0	569	36	No tunnel condition data entered
REC	13	0	569	36	Repeat for tunnel conditions
REC	14	15	569	36	
REC	15	30	569	36	
REC	16	45	569	36	
REC	17	60	569	36	
REC	18	63	569	36	
REC	19	65	569	36	
REC	20	67	569	36	
REC	21	69	569	36	
REC	22	71	569	36	
REC	23	73	569	36	
REC	24	75	569	36	
REC	25	77	569	36	
REC	26	80	569	36	
REC	27	82	569	36	
REC	28	84	569	36	
REC	29	86	569	36	
REC	30	88	569	36	
REC	31	90	569	36	
REC	32	92	569	36	
REC	33	94	569	36	
REC	34	96	569	36	
REC	35	98	569	12	
REC	36	100	569	12	
REC	37	90	569	0	
REC	38	90	569	0	
REC	39	0	569	0	
REC	40	0	569	0	
REC	41	0	SIM	0	
ZER	42	0	SIM	0	
CAL	43	0	SIM	0	

Table 7. TTR/699 Run Log (continued)

Run TR092RN032 5/17/2017 Heating run

Aerotares: Blades Off, Spinner Fairing and Fairing Close-Outs Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	*q*, psf	Notes
ZER	1	0	0	0	
CAL	2	0	0	0	AB
ZER	3	0	0	0	
CAL	4	0	0	0	
REC	5	0	0	0	
REC	6	0	200	0	
REC	7	0	400	0	
REC	8	0	569	0	
Cont	9-24	0	569	0	Hold for 60 min or heat stabilizes, periodic data every min
REC	25	0	200	0	
REC	26	0	0	0	
ZER	27	0	0	0	
CAL	28	0	0	0	AB

Table 7. TTR/699 Run Log (continued)

Run TR092RN033 5/17/2017 Yaw sweeps, 569 and 0 rpm, q=75psf

Aerotares: Blades Off, Spinner Fairing and Fairing Close-Outs Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	q, psf	Notes
ZER	1	0	SIM	0	
CAL	2	0	SIM	0	
ZER	3	0	SIM	0	
CAL	4	0	SIM	0	
REC	5	0	SIM	0	
REC	6	0	570	12	Incorrect inputs
REC	7	0	569	12	Repeat pt
REC	8	0	569	75	
REC	9	15	569	75	
REC	10	30	569	75	
REC	11	45	569	75	
REC	12	60	569	75	
REC	13	63	569	75	
REC	14	65	569	75	
REC	15	67	569	75	
REC	16	69	569	75	
REC	17	71	570	75	
REC	18	73	570	75	
REC	19	75	570	75	
REC	20	77	570	75	
REC	21	80	570	75	
REC	22	82	570	75	
REC	23	84	569	75	
REC	24	86	569	75	
REC	25	88	569	75	
REC	26	90	570	75	
REC	27	92	569	75	
REC	28	94	570	75	
REC	29	96	570	75	
REC	30	98	570	75	
REC	31	100	570	75	
REC	32	90	570	75	
REC	33	90	570	75	
REC	34	90	479	75	
REC	35	90	401	75	
REC	36	90	300	75	
REC	37	90	200	75	
REC	38	90	100	75	
REC	39	90	SIM	75	
REC	40	90	SIM	12	
REC	41	0	SIM	12	
REC	42	0	SIM	75	
REC	43	15	SIM	75	AB
REC	44	30	SIM	75	
REC	45	30	SIM	75	
REC	46	45	SIM	75	
REC	47	60	SIM	75	
REC	48	65	SIM	75	
REC	49	70	SIM	75	

Run TR092RN033 continued

Point Type	Data Point	Yaw, deg	Rotor RPM	q, psf	Notes
REC	50	75	SIM	75	
REC	51	80	SIM	75	
REC	52	85	SIM	75	
REC	53	90	SIM	75	
REC	54	95	SIM	75	
REC	55	100	SIM	75	
REC	56	90	SIM	75	
REC	57	90	SIM	12	
REC	58	0	SIM	0	
ZER	59	0	SIM	0	
CAL	60	0	SIM	0	

Table 7. TTR/699 Run Log (continued)

Run TR092RN036 5/23/2017 Buildup: blade installation, wind off

-45 deg yaw for blade installation

Point Type	Data Point	Yaw, deg	Rotor RPM	*q*, psf	Notes
ZER	1	-45	SIM	0	
CAL	2	-45	SIM	0	AB
ZER	3	-45	SIM	0	
CAL	4	-45	SIM	0	Zero'd AMPs PNL 60
ZER	5	-45	SIM	0	
CAL	6	-45	SIM	0	
ZER	7	-45	SIM	0	
CAL	8	-45	SIM	0	
REC	9	-45	SIM	0	two blades installed
REC	10	-45	SIM	0	repeat point
REC	11	-45	SIM	0	before Red blade install
REC	12	-45	SIM	0	
REC	13	-45	SIM	0	Static
ZER	14	-45	SIM	0	
CAL	15	-45	SIM	0	

Table 7. TTR/699 Run Log (continued)

Run TR092RN047 6/9/2017 Hover balancing run, wind off - nominal blade tip weights

Air Exchange Open 100%, Vane Set 3,4, & 6 in 80x Mode; Balance heater off

Point Type	Data Point	Yaw, deg	Rotor RPM	Coll., deg	Notes
ZER	1	0	SIM	25	Not at 25 collective
CAL	2	0	SIM	25	Not at 25 collective
ZER	3	0	SIM	25	Not at 25 collective
CAL	4	0	SIM	25	Not at 25 collective
ZER	5	0	SIM	25	
CAL	6	0	SIM	25	AB
ZER	7	0	SIM	25	
CAL	8	0	SIM	25	
REC	9	0	SIM	5	static
REC	10	0	82	5	
REC	11	0	164	5	
REC	12	0	247	5	
REC	13	0	329	5	
REC	14	0	410	5	
REC	15	0	479	5	
REC	16	0	569	5	
REC	17	0	570	4	
REC	18	0	570	3	
REC	19	0	478	5	
REC	20	0	478	5	cyclic delta from 0-flapping trim
REC	21	0	478	5	cyclic delta
REC	22	0	478	5	cyclic delta
REC	23	0	478	5	cyclic delta
REC	24	0	478	5	cyclic delta
REC	25	0	478	5	cyclic delta
REC	26	0	478	5	cyclic delta
REC	27	0	478	5	
REC	28	0	SIM	5	static
ZER	29	0	SIM	25	
CAL	30	0	SIM	25	

Table 7. TTR/699 Run Log (continued)

Run TR092RN049 8/21/2017 Hover balancing run, wind off - new blade tip weights

Air Exchange Open 100%, Louver 7 Closed, 40x Mode

Point Type	Data Point	Yaw, deg	Rotor RPM	Coll., deg	Notes
ZER	1	0	SIM	25	
CAL	2	0	SIM	25	AB
ZER	3	0	SIM	25	
CAL	4	0	SIM	25	
ZER	5	0	SIM	25	
CAL	6	0	SIM	25	AB
ZER	7	0	SIM	25	
CAL	8	0	SIM	25	
REC	9	0	SIM	5	static
REC	10	0	83	5	
REC	11	0	165	5	
REC	12	0	247	5	
REC	13	0	328	5	
REC	14	0	410	5	
REC	15	0	478	5	
REC	16	0	569	5	
REC	17	0	569	5	
REC	18	0	569	5	
REC	19	0	570	5	
REC	20	0	570	5	
REC	21	0	570	5	
REC	22	0	570	5	
REC	23	0	569	5	
REC	24	0	569	5	
REC	25	0	569	5	
REC	26	0	479	5	
REC	27	0	479	6	
REC	28	0	478	7	
REC	29	0	478	8	
REC	30	0	478	9	
REC	31	0	478	10	
REC	32	0	478	11	
REC	33	0	569	10	
REC	34	0	569	10	
REC	35	0	200	5	
REC	36	0	SIM	5	static
ZER	37	0	SIM	25	
CAL	38	0	SIM	25	

Table 7. TTR/699 Run Log (continued)

Run TR092RN050 8/22/2017 Hover balancing run, wind off - new blade tip weights

Air Exchange Open 100%, Louver 7 Closed, 40x Mode

Point Type	Data Point	Yaw, deg	Rotor RPM	Coll., deg	Notes
ZER	1	0	SIM	25	
CAL	2	0	SIM	25	AB
ZER	3	0	SIM	25	
CAL	4	0	SIM	25	
REC	5	0	SIM	5	static
REC	6	0	82	5	
REC	7	0	164	5	
REC	8	0	200	5	
REC	9	0	246	5	
REC	10	0	328	5	
REC	11	0	410	5	
REC	12	0	478	5	
REC	13	0	570	5	
REC	14	0	570	5	
REC	15	0	570	5	
REC	16	0	201	5	
REC	17	0	SIM	5	static
ZER	18	0	SIM	25	
CAL	19	0	SIM	25	

Table 7. TTR/699 Run Log (continued)

Run TR092RN051 8/22/2017 Hover balancing run – run 50 tip weights, removed rotating scissor weight

Air Exchange Open 100%, Louver 7 Closed, 40x Mode

Point Type	Data Point	Yaw, deg	Rotor RPM	Coll., deg	Notes
ZER	1	0	SIM	25	
CAL	2	0	SIM	25	AB
ZER	3	0	SIM	25	
CAL	4	0	SIM	25	
REC	5	0	SIM	5	static
REC	6	0	82	5	
REC	7	0	165	5	
REC	8	0	201	5	
REC	9	0	247	5	
REC	10	0	328	5	
REC	11	0	411	5	
REC	12	0	478	5	
REC	13	0	201	5	
REC	14	0	SIM	5	static
ZER	15	0	SIM	25	
CAL	16	0	SIM	25	

Table 7. TTR/699 Run Log (continued)

Run TR092RN055 3/19/2018 Hover balancing run – Green weight 233.6 g, White weight 177.7 g
Air Exchange Open 50%, Louver 7 Closed, 40x Mode
Rotating counterweight removed, swashplate balancing plate installed (no weights installed)

Point Type	Data Point	Yaw, deg	Rotor RPM	Coll., deg	Notes
ZER	1	0	SIM	15	
CAL	2	0	SIM	15	AB
ZER	3	0	SIM	15	
CAL	4	0	SIM	15	
REC	5	0	SIM	5	static
REC	6	0	82	5	
REC	7	0	164	5	
REC	8	0	200	5	
REC	9	0	246	5	
REC	10	0	328	5	
REC	11	0	411	5	
REC	12	0	479	5	
REC	13	0	570	5	
REC	14	0	201	5	
REC	15	0	SIM	5	static
ZER	16	0	SIM	15	
CAL	17	0	SIM	15	

Table 7. TTR/699 Run Log (continued)

Run TR092RN056 3/19/2018 Hover balancing run – Green weight 233.6 g, White weight 177.7 g
Air Exchange Open 100%, Louver 7 Closed, 40x Mode
Rotating counterweight removed, swashplate balancing plate installed (all weights installed, 1722 g added)

Point Type	Data Point	Yaw, deg	Rotor RPM	Coll., deg	Notes
ZER	1	0	SIM	15	
CAL	2	0	SIM	15	AB
ZER	3	0	SIM	15	
CAL	4	0	SIM	15	
ZER	5	0	SIM	15	
CAL	6	0	SIM	15	
REC	7	0	SIM	15	static
REC	8	0	SIM	5	static
REC	9	0	82	5	
REC	10	0	164	5	
REC	11	0	200	5	
REC	12	0	246	5	
REC	13	0	328	5	
REC	14	0	410	5	
REC	15	0	478	5	
REC	16	0	569	5	
REC	17	0	479	5	
REC	18	0	411	5	
REC	19	0	328	5	
REC	20	0	247	5	
REC	21	0	201	5	
REC	22	0	165	5	
REC	23	0	83	5	
REC	24	0	SIM	5	static
REC	25	0	SIM	15	static
ZER	26	0	SIM	15	
CAL	27	0	SIM	15	

Table 7. TTR/699 Run Log (continued)

Run TR092RN057 3/19/2018 Hover balancing run – Green weight 177.8 g, White weight 177.7 g
Air Exchange Open 100%, Louver 7 Closed, 40x Mode
Rotating counterweight removed, swashplate balancing plate installed (all weights installed, 1722 g)

Point Type	Data Point	Yaw, deg	Rotor RPM	Coll., deg	Notes
ZER	1	0	SIM	15	
CAL	2	0	SIM	15	AB
ZER	3	0	SIM	15	
CAL	4	0	SIM	15	
REC	5	0	SIM	15	static
REC	6	0	SIM	5	static
REC	7	0	82	5	
REC	8	0	164	5	
REC	9	0	200	5	
REC	10	0	246	5	
REC	11	0	328	5	
REC	12	0	410	5	
REC	13	0	478	5	
REC	14	0	570	5	
REC	15	0	479	5	
REC	16	0	411	5	
REC	17	0	329	5	
REC	18	0	246	5	
REC	19	0	201	5	
REC	20	0	165	5	
REC	21	0	83	5	
REC	22	0	SIM	5	static
REC	23	0	SIM	15	static
ZER	24	0	SIM	15	
CAL	25	0	SIM	15	

Table 7. TTR/699 Run Log (continued)

Run TR092RN058 3/20/2018 Hover balancing run – Green weight 123.2 g, White weight 177.7 g
Air Exchange Open 100%, Louver 7 Closed, 40x Mode
Rotating counterweight removed, swashplate balancing plate installed (all weights installed, 1722 g added)

Point Type	Data Point	Yaw, deg	Rotor RPM	Coll., deg	Notes
ZER	1	0	SIM	15	
CAL	2	0	SIM	15	AB
ZER	3	0	SIM	15	
CAL	4	0	SIM	15	
ZER	5	0	SIM	15	
CAL	6	0	SIM	15	
REC	7	0	SIM	15	static
REC	8	0	SIM	5	static
REC	9	0	82	5	
REC	10	0	164	5	
REC	11	0	201	5	
REC	12	0	246	5	
REC	13	0	328	5	
REC	14	0	411	5	
REC	15	0	479	5	
REC	16	0	569	5	
REC	17	0	479	5	
REC	18	0	411	5	
REC	19	0	328	5	
REC	20	0	247	5	
REC	21	0	201	5	
REC	22	0	165	5	
REC	23	0	83	5	
REC	24	0	SIM	5	static
REC	25	0	SIM	15	static
ZER	26	0	SIM	15	
CAL	27	0	SIM	15	

Table 7. TTR/699 Run Log (continued)

Run TR092RN059 3/26/2018 Thrust checkout, 0 deg yaw, rpm sweep, wind off
Air Exchange Open 100%, Vane Set 3 open, VS 4, 6 & 7 closed
1 Rotating counterweight removed, swashplate balancing plate installed (all weights installed, 1722 g added)

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM	Coll., deg	Thrust, lb	Notes
ZER	1	0		SIM	15		
CAL	2	0		SIM	15		AB
ZER	3	0		SIM	15		
CAL	4	0		SIM	15		
ZER	5	0		SIM	15		
CAL	6	0		SIM	15		
REC	7	0	2	499	15	9	static
REC	8	0	2	499	5	5	static
REC	9	0	2	82	5	32	
REC	10	0	3	164	5	249	
REC	11	0	4	200	5	375	
REC	12	0	5	246	5	598	
REC	13	0	7	328	5	1113	
REC	14	0	10	410	5	1744	
REC	15	0	12	478	5	2396	
REC	16	0	16	569	5	3411	
REC	17	0	17	569	5	3308	cyclic delta from 0-flapping trim
REC	18	0	17	569	5	3349	cyclic delta
REC	19	0	17	569	5	3298	cyclic delta
REC	20	0	17	569	5	3338	cyclic delta
REC	21	0	17	569	5	3327	cyclic delta
REC	22	0	17	569	5	3364	
REC	23	0	16	569	4	2853	
REC	24	0	17	569	5	3375	
REC	25	0	18	569	6	3923	
REC	26	0	17	569	5	3303	
REC	27	0	16	569	4	2844	
REC	28	0	15	569	3	2419	
REC	29	0	15	569	2	2171	hit SOF limit
REC	30	0	17	569	5	3349	
REC	31	0	16	478	5	2235	
REC	32	0	13	410	5	1606	
REC	33	0	11	328	5	995	
REC	34	0	9	246	5	524	
REC	35	0	7	200	5	346	
REC	36	0	6	164	5	225	
REC	37	0	5	82	5	43	
REC	38	0	4	499	5	-4	static
REC	39	0	3	499	15	-8	static
ZER	40	0		SIM	15		
CAL	41	0		SIM	15		

Table 7. TTR/699 Run Log (continued)

Run TR092RN060 3/26/2018 Thrust checkout, 0 deg yaw, 569 rpm, wind off

Air Exchange Open 100%, Vane Set 3 Open, VS 4, 6 & 7 Closed

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM	Coll., deg	Thrust, lb	Notes
ZER	1	0		SIM	15		
CAL	2	0		SIM	15		AB
ZER	3	0		SIM	15		
CAL	4	0		SIM	15		
REC	5	0	3	499	15	-1	static
REC	6	0	3	499	5	-11	static
REC	7	0	4	199	5	410	
REC	8	0	15	569	5	3486	
REC	9	0	19	569	7	4392	
REC	10	0	22	568	9	5569	
REC	11	0	25	569	11	6691	
REC	12	0	27	568	13	7902	
REC	13	0	29	568	14	8446	
REC	14	0	30	569	15	8999	hit SOF limits
REC	15	0	30	569	15	8971	
REC	16	0	29	569	14	8521	
REC	17	0	28	569	13	7883	
REC	18	0	26	569	11	6612	
REC	19	0	23	569	9	5472	
REC	20	0	20	569	7	4379	
REC	21	0	18	569	5	3355	
REC	22	0	10	200	5	287	
REC	23	0	5	499	5	1	static
REC	24	0	4	499	15	3	static
ZER	25	0		499	15		
CAL	26	0		499	15		

Table 7. TTR/699 Run Log (continued)

Run TR092RN061 3/27/2018 Thrust checkout, 0 deg yaw, 569 rpm, wind off

Air Exchange Open 100%, Vane Set 3 Open, VS 4, 6 & 7 Closed

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM	Coll., deg	Thrust, lb	Notes
ZER	1	0		SIM	15		
CAL	2	0		SIM	15		AB
ZER	3	0		SIM	15		
CAL	4	0		SIM	15		
REC	5	0	0	499	15	6	static
REC	6	0	0	499	5	9	static
REC	7	0	0	200	5	393	
REC	8	0	17	569	5	3273	
REC	9	0	19	569	7	4262	
REC	10	0	21	569	9	5423	
REC	11	0	24	569	11	6498	
REC	12	0	27	569	13	7700	
REC	13	0	28	569	14	8260	
REC	14	0	30	569	15	8851	
REC	15	0	31	569	16	9436	
REC	16	0	32	569	17	10069	
REC	17	0	31	570	16	9432	
REC	18	0	30	570	15	8864	
REC	19	0	29	569	14	8226	
REC	20	0	27	569	13	7637	
REC	21	0	25	569	11	6433	
REC	22	0	22	569	9	5348	
REC	23	0	20	569	7	4257	
REC	24	0	17	569	5	3256	
REC	25	0	9	200	5	282	
REC	26	0	4	499	5	8	static
REC	27	0	3	499	15	-4	static
ZER	28	0		SIM	15		
CAL	29	0		SIM	15		

Table 7. TTR/699 Run Log (continued)

Run TR092RN062 3/27/2018 Thrust checkout, 180 deg yaw, 569 rpm, wind off

Air Exchange Open 100%, Vane Set 3 Open, VS 4, 6 & 7 Closed

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM	Coll., deg	Thrust, lb	Notes
ZER	1	180		SIM	15		
CAL	2	180		SIM	15		AB
ZER	3	180		SIM	15		
CAL	4	180		SIM	15		
REC	5	180	3	499	15	-7	static
REC	6	180	3	499	5	-9	static
REC	7	180	5	200	5	393	
REC	8	180	10	569	5	3893	
REC	9	180	10	569	7	5158	
REC	10	180	12	569	9	6330	
REC	11	180	12	569	11	7629	
REC	12	180	14	569	13	9039	
REC	13	180	14	570	14	9708	
REC	14	180	16	569	15	10339	
REC	15	180	16	568	16	10965	
REC	16	180	16	568	17	11471	
REC	17	180	16	568	16	10981	
REC	18	180	14	569	15	10362	
REC	19	180	16	569	14	9804	
REC	20	180	15	569	13	9046	
REC	21	180	12	569	11	7677	
REC	22	180	12	569	9	6353	
REC	23	180	11	569	7	5164	
REC	24	180	7	569	5	3990	
REC	25	180	4	200	5	438	
REC	26	180	3	499	5	10	static
REC	27	180	3	499	15	1	static
ZER	28	180		SIM	15		
CAL	29	180		SIM	15		

Table 7. TTR/699 Run Log (continued)

Run TR092RN063 3/27/2018 Thrust checkout, 180 deg yaw, 569 rpm, wind off

Air Exchange Open 100%, Vane Set 3 Closed, VS 4, 6 & 7 Open

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM	Coll., deg	Thrust, lb	Notes
ZER	1	180		SIM	15		
CAL	2	180		SIM	15		AB
ZER	3	180		SIM	15		
CAL	4	180		SIM	15		
REC	5	180	3	499	15	6	static
REC	6	180	3	499	5	5	static
REC	7	180	6	200	5	416	
REC	8	180	9	569	5	3937	
REC	9	180	9	569	7	5080	
REC	10	180	12	570	9	6474	
REC	11	180	11	570	11	7706	
REC	12	180	14	570	13	9099	
REC	13	180	13	570	14	9745	
REC	14	180	14	569	15	10415	
REC	15	180	15	569	16	11017	
REC	16	180	15	570	17	11419	
REC	17	180	14	570	16	11129	
REC	18	180	17	569	15	10463	
REC	19	180	15	570	14	9756	
REC	20	180	13	569	13	9054	
REC	21	180	10	569	11	7689	
REC	22	180	11	570	9	6497	
REC	23	180	9	569	7	5192	
REC	24	180	11	569	5	3994	
REC	25	180	4	200	5	441	
REC	26	180	4	499	5	14	static
REC	27	180	4	499	15	4	static
ZER	28	180		SIM	15		
CAL	29	180		SIM	15		

Table 7. TTR/699 Run Log (continued)

Run TR092RN071 7/26/2018 Swashplate Balance tare, RPM sweep, 15 deg collective, wind off
Blades Off, Spinner Fairing and Nose Cone Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	Coll., deg	Notes
ZER	1	0	0	15	
CAL	2	0	0	15	
ZER	3	0	0	15	
CAL	4	0	0	15	
REC	5	0	0	15	STATIC
REC	6	0	60	15	
REC	7	0	100	15	
REC	8	0	150	15	
REC	9	0	200	15	
REC	10	0	250	15	
REC	11	0	300	15	
REC	12	0	350	15	
REC	13	0	400	15	
REC	14	0	450	15	
REC	15	0	479	15	
REC	16	0	525	15	
REC	17	0	570	15	
REC	18	0	526	15	
REC	19	0	478	15	
REC	20	0	450	15	
REC	21	0	400	15	
REC	22	0	350	15	
REC	23	0	300	15	
REC	24	0	251	15	
REC	25	0	201	15	
REC	26	0	151	15	
REC	27	0	100	15	
REC	28	0	60	15	
REC	29	0	0	15	STATIC
ZER	30	0	0	15	
CAL	31	0	0	15	

Table 7. TTR/699 Run Log (continued)

Run TR092RN072 7/26/2018 Swashplate balance tare, collective sweep, 569 rpm, wind off

Blades Off, Spinner Fairing and Nose Cone Installed

Point Type	Data Point	Yaw, deg	Rotor RPM	Coll., deg	Notes
ZER	1	0	0	15	
CAL	2	0	0	15	
ZER	3	0	0	15	
CAL	4	0	0	15	
REC	5	0	499	15	STATIC
REC	6	0	569	15	
REC	7	0	568	-5	
REC	8	0	569	0	
REC	9	0	569	5	
REC	10	0	569	10	
REC	11	0	569	15	
REC	12	0	569	20	
REC	13	0	569	25	
REC	14	0	569	30	
REC	15	0	569	35	
REC	16	0	569	40	
REC	17	0	569	45	
REC	18	0	569	50	
REC	19	0	569	45	
REC	20	0	569	40	
REC	21	0	569	35	
REC	22	0	569	30	
REC	23	0	569	25	
REC	24	0	569	20	
REC	25	0	569	15	
REC	26	0	569	10	
REC	27	0	569	5	
REC	28	0	569	0	
REC	29	0	569	-5	
REC	30	0	479	-5	
REC	31	0	478	0	
REC	32	0	479	5	
REC	33	0	479	10	
REC	34	0	478	15	
REC	35	0	478	20	
REC	36	0	478	25	
REC	37	0	478	30	
REC	38	0	479	35	
REC	39	0	479	40	
REC	40	0	479	45	
REC	41	0	479	50	
REC	42	0	479	45	
REC	43	0	479	40	
REC	44	0	479	35	
REC	45	0	479	30	
REC	46	0	479	25	
REC	47	0	479	20	
REC	48	0	479	15	
REC	49	0	479	10	

Run TR092RN072 continued

Point Type	Data Point	Yaw, deg	Rotor RPM	Coll., deg	Notes
REC	50	0	479	5	
REC	51	0	479	0	
REC	52	0	479	-5	
REC	53	0	387	-5	
REC	54	0	387	0	
REC	55	0	387	5	
REC	56	0	387	10	
REC	57	0	388	15	
REC	58	0	388	20	
REC	59	0	388	25	
REC	60	0	388	30	
REC	61	0	388	35	
REC	62	0	387	40	
REC	63	0	387	45	
REC	64	0	388	50	
REC	65	0	388	45	
REC	66	0	387	40	
REC	67	0	387	35	
REC	68	0	388	30	
REC	69	0	387	25	
REC	70	0	388	20	
REC	71	0	387	15	
REC	72	0	388	10	
REC	73	0	387	5	
REC	74	0	388	0	
REC	75	0	388	-5	
REC	76	0	569	15	
REC	77	0	499	15	STATIC
ZER	78	0	0	15	ZERO
CAL	79	0	0	15	RCAL

Table 7. TTR/699 Run Log (continued)

Run TR092RN074 8/8/2018 Post-IST hover checkout, rpm and collective sweeps, 0 deg yaw, wind off
Air Exchange Open 100%, Louver 7 Closed, 40x Mode

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Coll., deg	Thrust, lb	Notes
ZER	1	0	0	SIM	15		
CAL	2	0	0	SIM	15		
ZER	3	0	0	SIM	15		
CAL	4	0	0	SIM	15		
REC	5	0	0	499	15	6	
REC	6	0	0	499	5	12	
REC	7	0	0	83	5	33	
REC	8	0	0	164	5	258	
REC	9	0	3	200	5	408	
REC	10	0	4	246	5	638	
REC	11	0	6	328	5	1176	
REC	12	0	9	410	5	1900	
REC	13	0	11	478	5	2604	
REC	14	0	14	569	5	3760	
REC	15	0	14	478	5	2501	
REC	16	0	12	411	5	1795	
REC	17	0	9	328	5	1095	
REC	18	0	7	247	5	601	
REC	19	0	5	201	5	392	
REC	20	0	3	165	5	269	
REC	21	0	0	82	5	67	
REC	22	0	13	569	5	3853	
REC	23	0	16	569	5	3640	switched to TTF_ANA
REC	24	0	15	569	5	3666	cyclic delta from 0-flapping trim
REC	25	0	16	570	5	3655	cyclic delta
REC	26	0	15	569	5	3671	cyclic delta
REC	27	0	15	569	5	3706	cyclic delta
REC	28	0	15	569	5	3660	cyclic delta
REC	29	0	15	569	5	3673	
REC	30	0	15	0.684	5	3625	change rotor speed ref. to M_{tip}
REC	31	0	16	0.685	6	4119	
REC	32	0	17	0.684	7	4668	
REC	33	0	20	0.684	9	5783	
REC	34	0	22	0.684	11	6956	
REC	35	0	25	0.684	13	8133	
REC	36	0	26	0.684	14	8718	
REC	37	0	27	0.685	15	9354	
REC	38	0	28	0.684	16	9956	
REC	39	0	28	0.684	17	10,352	expect to hit load limit
REC	40	0	28	0.684	16.5	9980	
REC	41	0	27	0.684	15	9372	
REC	42	0	26	0.685	14	8730	
REC	43	0	25	0.684	13	8133	
REC	44	0	23	0.684	11	6913	
REC	45	0	21	0.685	9	5731	
REC	46	0	18	0.685	7	4658	
REC	47	0	15	0.684	5	3592	
REC	48	0	1	83	5	48	

Run TR092RN074 continued

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Coll., deg	Thrust, lb	Notes
REC	49	0	0	499	5	12	static
REC	50	0	0	499	15	-3	static
ZER	51	0	0	499	15	-4	
CAL	52	0	0	499	15		

Table 7. TTR/699 Run Log (continued)

Run TR092RN075 8/13/2018 Airplane forward flight, thrust sweep, 478 rpm, 60 & 90 knots

Air Exchange Open 100%, Louver 7 Closed, 40x Mode

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
ZER	1	0		SIM				
ZER	2	0		SIM				
CAL	3	0		SIM				
ZER	4	0		SIM				
CAL	5	0		SIM				
REC	6	0		499				
REC	7	0		499				
REC	8	0		200				Rotating ref. point
REC	9	0	7	479	2769	0.018	0.058	Airplane mode rpm ref. point
REC	10	0	61	0.583	508	0.156	0.011	nominal fwd flight ref. point (1)
REC	11	0	61	0.583	552	0.156	0.012	cyclic delta from 0-flapping trim
REC	12	0	61	0.583	489	0.156	0.010	cyclic delta
REC	13	0	61	0.583	456	0.156	0.010	cyclic delta
REC	14	0	61	0.583	488	0.156	0.010	cyclic delta
REC	15	0	61	0.583	552	0.156	0.012	cyclic delta
REC	16	0	61	0.583	491	0.156	0.010	cyclic delta
REC	17	0	61	0.583	467	0.156	0.010	cyclic delta
REC	18	0	61	0.583	500	0.156	0.010	
REC	19	0	61	0.583	1003	0.156	0.021	
REC	20	0	61	0.583	1450	0.157	0.030	
REC	21	0	61	0.583	1935	0.156	0.040	
REC	22	0	61	0.583	2444	0.156	0.051	
REC	23	0	61	0.583	2917	0.157	0.061	
REC	24	0	61	0.583	3371	0.156	0.070	
REC	25	0	61	0.583	3858	0.157	0.081	
REC	26	0	61	0.583	4313	0.157	0.090	
REC	27	0	61	0.583	4809	0.156	0.100	
REC	28	0	61	0.583	5317	0.156	0.111	
REC	29	0	61	0.583	5767	0.157	0.120	
REC	30	0	61	0.583	6249	0.156	0.130	
REC	31	0	61	0.583	6746	0.156	0.141	
REC	32	0	61	0.583	478	0.157	0.010	Return to low thrust; nominal ref. pt
REC	33	0	91	0.583	514	0.233	0.011	
REC	34	0	91	0.583	672	0.233	0.014	cyclic delta
REC	35	0	91	0.583	600	0.233	0.013	cyclic delta
REC	36	0	91	0.584	546	0.233	0.011	cyclic delta
REC	37	0	91	0.583	661	0.233	0.014	cyclic delta
REC	38	0	91	0.583	754	0.233	0.016	cyclic delta
REC	39	0	91	0.583	727	0.233	0.015	cyclic delta
REC	40	0	91	0.583	699	0.234	0.015	cyclic delta
REC	41	0	91	0.583	493	0.233	0.010	cyclic delta
REC	42	0	92	0.583	1010	0.234	0.021	
REC	43	0	91	0.583	1449	0.233	0.030	
REC	44	0	91	0.584	1930	0.233	0.040	
REC	45	0	92	0.583	2376	0.234	0.050	
REC	46	0	91	0.583	2859	0.233	0.060	
REC	47	0	91	0.583	3384	0.233	0.071	

(1) Set rpm, then match M_{tip}

Run TR092RN075 continued

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
REC	48	0	92	0.583	3851	0.234	0.081	
REC	49	0	92	0.584	4298	0.234	0.090	
REC	50	0	91	0.583	4812	0.233	0.101	
REC	51	0	91	0.583	560	0.233	0.012	
REC	52	0	61	0.583	489	0.157	0.010	nominal fwd-flight ref. point
REC	53	0	12	479	2479	0.031	0.053	hover ref. point
REC	54	0		200				
REC	55	0		499				static
REC	56	0		499				static
ZER	57	0		SIM				
CAL	58	0		SIM				

Table 7. TTR/699 Run Log (continued)

Run TR092RN076 8/13/2018 Airplane forward flight, thrust sweep, 478 rpm, 120 & 150 knots
Air Exchange Open 100%, Louver 7 Closed, 40x Mode

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes (1)
ZER	1	0		SIM				
CAL	2	0		SIM				
ZER	3	0		SIM				
CAL	4	0		SIM				
REC	5	0		SIM				
REC	6	0		SIM				
REC	7	0	0	200	418	0.000	0.0510	Rotating ref. point
REC	8	0	9	478	2611	0.022	0.0559	Airplane mode rpm ref. point
REC	9	0	61	0.584	472	0.156	0.0098	nominal fwd flight ref. point
REC	10	0	122	0.583	543	0.311	0.0115	
REC	11	0	122	0.583	537	0.311	0.0114	cyclic delta from 0-flapping trim
REC	12	0	122	0.583	538	0.311	0.0114	cyclic delta
REC	13	0	122	0.584	504	0.311	0.0107	cyclic delta
REC	14	0	122	0.583	512	0.311	0.0108	cyclic delta
REC	15	0	122	0.583	536	0.311	0.0114	cyclic delta
REC	16	0	122	0.584	494	0.311	0.0105	cyclic delta
REC	17	0	122	0.584	508	0.311	0.0107	cyclic delta
REC	18	0	122	0.583	513	0.311	0.0109	
REC	19	0	122	0.583	949	0.312	0.0201	
REC	20	0	122	0.583	1455	0.312	0.0308	
REC	21	0	122	0.583	1939	0.312	0.0411	
REC	22	0	122	0.583	2338	0.312	0.0497	
REC	23	0	122	0.583	2891	0.311	0.0614	
REC	24	0	123	0.583	3284	0.313	0.0697	
REC	25	0	123	0.583	3846	0.313	0.0816	
REC	26	0	122	0.583	428	0.311	0.0091	
REC	27	0	152	0.583	472	0.389	0.0101	
REC	28	0	152	0.583	451	0.389	0.0097	cyclic delta
REC	29	0	152	0.584	545	0.389	0.0117	cyclic delta
REC	30	0	152	0.584	372	0.388	0.0080	cyclic delta
REC	31	0	152	0.584	467	0.388	0.0100	cyclic delta
REC	32	0	152	0.583	537	0.388	0.0115	cyclic delta
REC	33	0	152	0.584	382	0.388	0.0082	cyclic delta
REC	34	0	152	0.584	343	0.388	0.0074	cyclic delta
REC	35	0	62	0.583	415	0.157	0.0086	nominal fwd-flight ref. point
REC	36	0	13	478	2561	0.033	0.0531	hover ref. point
REC	37	0	2	200	384	0.012	0.0471	
REC	38	0		SIM				static
REC	39	0		SIM				static
ZER	40	0		SIM				
CAL	41	0		SIM				

(1) No cooling water

Table 7. TTR/699 Run Log (continued)

Run TR092RN077 8/14/2018 Airplane forward flight, thrust sweep, 478 rpm, 150, 180, 210 knots
Air Exchange Open 100%, Louver 7 Closed, 40x Mode

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
ZER	1	0		SIM				
CAL	2	0		SIM				
ZER	3	0		SIM				
CAL	4	0		SIM				
REC	5	0		SIM				
REC	6	0		SIM				
REC	7	0	3	200	431	0.020	0.0515	Rotating ref. point
REC	8	0	12	478	2624	0.031	0.0545	Airplane mode rpm ref. point
REC	9	0	61	0.583	489	0.156	0.0102	Set cyclic for zero flapping; nominal fwd flight ref. point
REC	10	0	151	0.582	502	0.390	0.0108	
REC	11	0	151	0.582	745	0.390	0.0161	cyclic delta from 0-flapping trim
REC	12	0	151	0.583	1027	0.390	0.0221	cyclic delta
REC	13	0	152	0.582	1186	0.391	0.0256	cyclic delta
REC	14	0	151	0.582	1507	0.390	0.0324	cyclic delta
REC	15	0	152	0.582	1685	0.391	0.0363	cyclic delta
REC	16	0	151	0.582	1991	0.390	0.0429	cyclic delta
REC	17	0	152	0.583	2162	0.390	0.0464	cyclic delta
REC	18	0	152	0.583	2457	0.391	0.0528	
REC	19	0	152	0.582	2602	0.391	0.0560	
REC	20	0	152	0.583	2917	0.391	0.0628	
REC	21	0	153	0.582	3172	0.392	0.0683	
REC	22	0	152	0.583	517	0.389	0.0111	
REC	23	0	182	0.583	502	0.468	0.0109	Record initial cyclic before input
REC	24	0	182	0.582	499	0.467	0.0109	cyclic delta
REC	25	0	182	0.582	607	0.468	0.0133	cyclic delta
REC	26	0	182	0.583	509	0.467	0.0111	cyclic delta
REC	27	0	182	0.582	516	0.467	0.0113	cyclic delta
REC	28	0	182	0.582	589	0.466	0.0129	cyclic delta
REC	29	0	182	0.582	622	0.468	0.0136	cyclic delta
REC	30	0	182	0.582	543	0.468	0.0119	cyclic delta
REC	31	0	182	0.582	576	0.467	0.0126	
REC	32	0	182	0.583	798	0.467	0.0174	
REC	33	0	182	0.584	982	0.467	0.0214	
REC	34	0	182	0.583	1227	0.467	0.0268	
REC	35	0	183	0.583	1532	0.469	0.0334	
REC	36	0	183	0.584	1750	0.468	0.0380	
REC	37	0	183	0.583	1928	0.468	0.0420	
REC	38	0	183	0.583	2165	0.469	0.0472	
REC	39	0	183	0.583	2357	0.470	0.0515	
REC	40	0	183	0.582	2592	0.469	0.0567	
REC	41	0	183	0.583	606	0.468	0.0132	
REC	42	0	212	0.583	609	0.544	0.0135	Record initial cyclic before input
REC	43	0	213	0.583	536	0.545	0.0119	cyclic delta
REC	44	0	212	0.583	454	0.544	0.0101	cyclic delta
REC	45	0	212	0.583	637	0.544	0.0141	cyclic delta; tunnel auto stopped after point
REC	46	0		SIM				static
REC	47	0		SIM				static

Run TR092RN077 continued

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
REC	48	0		SIM			static	
ZER	49	0		SIM				
CAL	50	0		SIM				

Table 7. TTR/699 Run Log (continued)

Run TR092RN078 8/16/2018 Motor current checkout, thrust sweep, 0 deg yaw, 478 rpm, wind off
Air Exchange Open 100%, Louver 7 Closed, 40x Mode

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM	Coll., deg	Thrust, lb	Notes
ZER	1	0		SIM	15		
CAL	2	0		SIM	15		
ZER	3	0		SIM	15		
CAL	4	0		SIM	15		
REC	5	0		SIM	15		
REC	6	0		SIM	5		
REC	7	0	5	200	5	466	
REC	8	0	13	478	5	2601	
REC	9	0	14	478	6	2944	
REC	10	0	15	479	7	3326	
REC	11	0	17	479	9	4119	
REC	12	0	19	479	11	4967	
REC	13	0	20	479	13	5824	
REC	14	0	21	479	14	6250	
REC	15	0	22	479	15	6654	
REC	16	0	23	478	16	7063	
REC	17	0	24	479	17	7488	expect to hit load limit
REC	18	0	24	479	18	7899	expect to hit load limit
REC	19	0	25	479	19	8268	expect to hit load limit
REC	20	0	26	478	20	8601	expect to hit load limit
REC	21	0	26	478	21	8827	expect to hit load limit
REC	22	0	14	478	5	2534	
REC	23	0	7	200	5	394	
REC	24	0		SIM	5		static
REC	25	0		SIM	15		static
ZER	26	0		SIM	15		
CAL	27	0		SIM	15		

Table 7. TTR/699 Run Log (continued)

Run TR092RN079 8/16/2018 Static rotor control rate check, wind off

Air Exchange Open 100%, Louver 7 Closed, 40x Mode

Point Type	Data Point	Yaw, deg	Rotor RPM	Coll., deg	Long. Cyclic, deg	Lateral Cyclic, deg	Notes
ZER	1	0	SIM	15	0	0	
CAL	2	0	SIM	15	0	0	
ZER	3	0	SIM	15	0	0	
CAL	4	0	SIM	15	0	0	
REC	5	0	SIM	15	0	0	
REC	6	0	SIM	15+	0	0	Rate 4/Emergency: 0.5 deg/sec
REC	7	0	SIM	15-	0	0	
REC	8	0	SIM	15	+	0	
REC	9	0	SIM	15	-	0	
REC	10	0	SIM	15	0	+	
REC	11	0	SIM	15	0	-	
REC	12	0	SIM	15+	0	0	Rate 3: 0.25 deg/sec
REC	13	0	SIM	15-	0	0	
REC	14	0	SIM	15	+	0	
REC	15	0	SIM	15	-	0	
REC	16	0	SIM	15	0	+	
REC	17	0	SIM	15	0	-	
REC	18	0	SIM	15+	0	0	Rate 2: 0.10 deg/sec
REC	19	0	SIM	15-	0	0	
REC	20	0	SIM	15	+	0	
REC	21	0	SIM	15	-	0	
REC	22	0	SIM	15	0	+	
REC	23	0	SIM	15	0	-	
REC	24	0	SIM	15+	0	0	Rate 1: 0.06 deg/sec
REC	25	0	SIM	15-	0	0	
REC	26	0	SIM	15	+	0	
REC	27	0	SIM	15	-	0	
REC	28	0	SIM	15	0	+	
REC	29	0	SIM	15	0	-	
REC	30	0	SIM	35+	0	0	Rate 3: 0.25 deg/sec - High Collective
REC	31	0	SIM	35-	0	0	
REC	32	0	SIM	15	0	0	
ZER	33	0	SIM	15	0	0	
CAL	34	0	SIM	15	0	0	

Table 7. TTR/699 Run Log (continued)

Run TR092RN080 8/16/2018 Airplane forward flight, operator training, 0 deg yaw, 60, 150, 210 knots
Air Exchange Open 100%, Louver 7 Closed, 40x Mode

Point Type	Data Point	Rotor RPM/ M_{tip}	VKTS	Coll., deg	Thrust, lb	μ	C_T/σ	Notes
ZER	1	SIM		15				
CAL	2	SIM		15				
ZER	3	SIM		15				
CAL	4	SIM		15				
REC	5	SIM		15				
REC	6	SIM		15				
REC	7	SIM		5				
REC	8	200	0	5	413	0.000	0.0501	Rotating ref. point
REC	9	0.583	10	5	2623	0.026	0.0542	Airplane mode rpm ref. point
REC	10	0.583	61	11	975	0.157	0.0203	Operating Training – Loaded Rate Check
					1094	0.157	0.0229	*Control deltas*, *Blue console:*
REC	11	0.582	61	+	867	0.157	0.0180	collective delta
REC	12	0.583	61	-	993	0.157	0.0207	collective delta
REC	13	0.582	61		982	0.157	0.0204	cyclic delta from 0-flapping trim (1)
REC	14	0.583	61		1025	0.157	0.0214	cyclic delta
REC	15	0.583	61		992	0.157	0.0206	cyclic delta
REC	16	0.583	62		1052	0.156	0.0220	cyclic delta
					821	0.156	0.0171	*Control deltas*, *White console:*
REC	17	0.582	61	+	1012	0.157	0.0211	collective delta
REC	18	0.583	61	-	986	0.157	0.0205	collective delta
REC	19	0.583	61		1015	0.156	0.0212	cyclic delta from 0-flapping trim (1)
REC	20	0.583	61		1002	0.157	0.0209	cyclic delta
REC	21	0.583	61		1013	0.390	0.0217	cyclic delta
REC	22	0.583	61		1108	0.392	0.0240	cyclic delta
REC	23	0.583	153	28	892	0.389	0.0191	Operating Training – Loaded Rate Check
					992	0.391	0.0214	*Control deltas*, *Blue console:*
REC	24	0.580	153	+	999	0.390	0.0215	collective delta
REC	25	0.584	153	-	1041	0.391	0.0224	collective delta
REC	26	0.582	153		928	0.390	0.0199	cyclic delta from 0-flapping trim (1)
REC	27	0.582	153		578	0.544	0.0128	cyclic delta
REC	28	0.582	153		550	0.542	0.0121	cyclic delta
REC	29	0.582	153		558	0.544	0.0123	cyclic delta
REC	30	0.583	213	36	685	0.544	0.0152	Record initial cyclic settings before input
REC	31	0.584	213	36	584	0.544	0.0129	cyclic delta
REC	32	0.583	214	36	546	0.543	0.0121	cyclic delta
REC	33	0.582	213	36	506	0.544	0.0112	cyclic delta
REC	34	0.583	214	36	550	0.544	0.0122	cyclic delta
REC	35	0.583	213	36	559	0.543	0.0124	cyclic delta
REC	36	0.583	213	36	839	0.544	0.0186	cyclic delta
REC	37	0.583	213	36	1093	0.543	0.0242	cyclic delta
REC	38	0.583	213	36	1221	0.544	0.0271	
REC	39	0.582	213	36	1481	0.544	0.0327	
REC	40	0.582	213	36	1629	0.544	0.0360	
REC	41	0.583	214	37	1896	0.546	0.0422	
REC	42	0.583	214	37	2049	0.545	0.0455	
REC	43	0.583	214	37	545	0.545	0.0120	

(1) Set cyclic for zero flapping then apply delta control; nominal fwd flt ref point

Run TR092RN080 continued

Point Type	Data Point	Rotor RPM/ M_{tip}	VKTS	Coll., deg	Thrust, lb	μ	C_T/σ	Notes
REC	44	0.581	214	38	512	0.156	0.0106	
REC	45	0.581	214	38	2618	0.031	0.0542	
REC	46	0.584	214	36	354	0.038	0.0437	
REC	47	0.583	62	10	413	0.000	0.0501	nominal fwd-flight ref. point
REC	48	0.583	12	5	2623	0.026	0.0542	hover ref. point
REC	49	201	6	5	975	0.157	0.0203	
REC	50	SIM	0	5				static
REC	51	SIM		15				static
ZER	52	SIM		15				
CAL	53	SIM		15				

Table 7. TTR/699 Run Log (continued)

Run TR092RN081 8/17/2018 Airplane forward flight, operator training, 0 deg yaw, 240-270 knots

Air Exchange Open 100%, Louver 7 Closed, 40x Mode

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
ZER	1	0		SIM				
CAL	2	0		SIM				
ZER	3	0		SIM				
CAL	4	0		SIM				
ZER	5	0		SIM				
CAL	6	0		SIM				
REC	7	0		SIM				
REC	8	0		SIM				
REC	9	0	4	200	416	0.024	0.0496	Rotating ref. point
REC	10	0	13	0.583	2596	0.032	0.0537	Airplane mode rpm ref. point
REC	11	0	61	0.583	493	0.156	0.0103	Operating Training Points - Loaded Rate Check
REC	12	0	61	0.582	516	0.156	0.0107	cyclic delta (Rate 2)
REC	13	0	61	0.582	509	0.156	0.0106	cyclic delta (Rate 2)
REC	14	0	241	0.582	607	0.621	0.0137	Record initial cyclic settings before input
REC	15	0	241	0.582	575	0.621	0.0130	cyclic delta from 0-flapping trim
REC	16	0	241	0.582	628	0.619	0.0142	cyclic delta
REC	17	0	240	0.581	575	0.618	0.0130	cyclic delta
REC	18	0	241	0.582	676	0.619	0.0153	cyclic delta
REC	19	0	241	0.583	598	0.618	0.0135	cyclic delta
REC	20	0	240	0.582	642	0.617	0.0145	cyclic delta
REC	21	0	241	0.581	570	0.618	0.0129	cyclic delta
REC	22	0	242	0.582	607	0.619	0.0137	cyclic delta
REC	23	0	242	0.582	779	0.620	0.0176	
REC	24	0	242	0.581	1146	0.621	0.0260	
REC	25	0	243	0.582	1228	0.624	0.0278	
REC	26	0	243	0.583	1517	0.621	0.0341	
REC	27	0	243	0.582	1728	0.623	0.0390	
REC	28	0	245	0.584	528	0.624	0.0119	
REC	29	0	273	0.583	700	0.698	0.0161	
REC	30	0	268	0.583	635	0.685	0.0146	
REC	31	0	269	0.583	561	0.686	0.0129	cyclic delta
REC	32	0	268	0.583	587	0.685	0.0135	cyclic delta
REC	33	0	269	0.583	516	0.685	0.0118	cyclic delta
REC	34	0	268	0.581	669	0.685	0.0154	cyclic delta
REC	35	0	263	0.583	661	0.671	0.0151	Tunnel speed lowered for fan drive BMS limits
REC	36	0	264	0.583	867	0.673	0.0198	
REC	37	0	265	0.583	1151	0.676	0.0264	
REC	38	0	265	0.583	1223	0.676	0.0279	
REC	39	0	265	0.582	1533	0.675	0.0351	
REC	40	0		SIM				static
REC	41	0		SIM				static
ZER	42	0		SIM				
CAL	43	0		SIM				

Table 7. TTR/699 Run Log (continued)

Run TR092RN083 8/22/2018 Helicopter forward flight, 90 deg yaw

Air Exchange Open 100%, Louver 7 Closed, 40x Mode

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
ZER	1	90		SIM				
CAL	2	90		SIM				
ZER	3	90		SIM				
CAL	4	90		SIM				
ZER	5	90		SIM				
CAL	6	90		SIM				
REC	7	90		SIM				
REC	8	90		SIM				
REC	9	90		SIM				
REC	10	90		200	448		0.0542	Rotating ref. point
REC	11	90	3	0.684	2284	0.007	0.0343	Helicopter mode rpm; min thrust, watch blade loads - recirculation
REC	12	90	5	0.684	2350	0.010	0.0354	X is established at start of run
REC	13	90		200	532		0.0650	
REC	14	90		SIM				static
REC	15	90		SIM				static
ZER	16	90		SIM				
CAL	17	90		SIM				

Table 7. TTR/699 Run Log (continued)

Run TR092RN085 8/27/2018 Helicopter forward flight, 90 deg yaw, 57 & 80 knots

Air Exchange Open 100%, Louver 7 Closed, 40x Mode

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
ZER	1	90		SIM				(1)
CAL	2	90		SIM				
ZER	3	90		SIM				
CAL	4	90		SIM				
ZER	5	90		SIM				
CAL	6	90		SIM				
ZER	7	90		SIM				
CAL	8	90		SIM				
REC	9	90		SIM				
REC	10	90		SIM				
REC	11	90	4	200	411	0.024	0.0492	Rotating ref. point
REC	12	90	8	0.684	2252	0.017	0.0340	Helicopter mode rpm; min thrust, watch blade loads - recirculation
REC	13	90	57	0.684	1012	0.125	0.0153	Set rpm, then match M_{tip}; nominal fwd flight ref point
REC	14	90	57	0.684	1253	0.125	0.0190	
REC	15	90	57	0.684	1948	0.125	0.0296	
REC	16	90	57	0.684	2575	0.125	0.0390	
REC	17	90	57	0.684	3229	0.125	0.0490	
REC	18	90	57	0.683	3191	0.125	0.0484	
REC	19	90	57	0.684	3289	0.125	0.0499	cyclic delta from 0-flapping trim
REC	20	90	57	0.684	3268	0.125	0.0495	cyclic delta
REC	21	90	57	0.684	3253	0.125	0.0493	cyclic delta
REC	22	90	57	0.684	3268	0.125	0.0495	cyclic delta
REC	23	90	57	0.684	3217	0.125	0.0488	cyclic delta
REC	24	90	57	0.684	3264	0.125	0.0495	cyclic delta
REC	25	90	57	0.684	3218	0.125	0.0488	cyclic delta
REC	26	90	57	0.683	3254	0.125	0.0494	trim to zero flapping
REC	27	90	57	0.684	3839	0.125	0.0582	
REC	28	90	57	0.684	4620	0.125	0.0701	
REC	29	90	57	0.684	5233	0.125	0.0794	
REC	30	90	57	0.683	5880	0.125	0.0892	
REC	31	90	57	0.683	6589	0.125	0.1000	
REC	32	90	57	0.683	3202	0.125	0.0486	
REC	33	90	78	0.684	3899	0.170	0.0593	
REC	34	90	80	0.684	3871	0.175	0.0589	trim to zero flapping; establish ref point
REC	35	90	80	0.684	3228	0.175	0.0492	trim to zero flapping; establish ref point
REC	36	90	57	0.684	1228	0.124	0.0186	
REC	37	90	8	0.683	2434	0.016	0.0368	X is established at start of run
REC	38	90	0	200	523	0.000	0.0634	
REC	39	90		SIM				static
REC	40	90		SIM				static
REC	41	90		SIM				
ZER	42	90		SIM				

(1) True setting on MSS is 90.3 to get TTR at 90 deg relative to tunnel

Table 7. TTR/699 Run Log (continued)

Run TR092RN086 8/28/2018 Conversion forward flight, thrust sweeps, 90 & 75 deg yaw, 57 knots
Air Exchange Open 100%, Louver 7 Closed, 40x Mode

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
ZER	1	90		SIM				(1)
CAL	2	90		SIM				
ZER	3	90		SIM				
CAL	4	90		SIM				AB
ZER	5	90		SIM				
CAL	6	90		SIM				Manual AB on select channels
ZER	7	90		SIM				
CAL	8	90		SIM				
ZER	9	90		SIM				
CAL	10	90		SIM				
REC	11	90		SIM				Forgot to hit take data switch
REC	12	90		SIM				
REC	13	90		SIM				
REC	14	90	3.6	200	434	0.022	0.0518	Rotating ref. point
REC	15	90	8.2	569	2251	0.018	0.0339	Helicopter mode rpm; min thrust, high blade loads - recirculation
REC	16	90	56.7	0.684	3214	0.124	0.0487	Set rpm, then match M_{tip}; nominal fwd flight ref point
REC	17	90	56.8	0.663	3064	0.128	0.0493	RPM sweep, hub acceleration - do not change collective, retrim flap
REC	18	90	57.4	0.684	3230	0.125	0.0489	
REC	19	85	57.6	0.684	3244	0.126	0.0491	
REC	20	80	57.6	0.684	3224	0.126	0.0488	
REC	21	75	57.8	0.684	3210	0.126	0.0486	
REC	22	70	57.8	0.684	3190	0.126	0.0483	
REC	23	75	56.9	0.684	659	0.124	0.0100	
REC	24	75	57.1	0.684	1274	0.124	0.0193	
REC	25	75	57.2	0.684	1938	0.125	0.0293	
REC	26	75	57.3	0.683	2593	0.125	0.0393	
REC	27	75	57.6	0.683	3212	0.126	0.0487	
REC	28	75	57.7	0.684	3881	0.126	0.0588	
REC	29	75	57.9	0.684	4583	0.126	0.0694	
REC	30	75	58.2	0.684	5204	0.127	0.0788	
REC	31	75	58.3	0.684	5900	0.127	0.0894	
REC	32	75	57.6	0.684	6551	0.125	0.0992	Max thrust
REC	33	75	57.7	0.684	7195	0.126	0.1090	
REC	34	75	57.9	0.684	7867	0.126	0.1191	lost gages around here
REC	35	75	56.8	0.683	3242	0.124	0.0491	return to ref condition
REC	36	90	57.7	0.684	3224	0.126	0.0488	
REC	37	90	6.8	0.684	2389	0.015	0.0360	
REC	38	90	0.9	201	512	0.005	0.0623	sofdas stopped at 12:08
REC	39	90	0	SIM				static
REC	40	90	0	SIM				static
ZER	41	90	0	SIM				
CAL	42	90	0	SIM				

(1) True setting on MSS is 90.3 to get TTR at 90 deg relative to tunnel

Table 7. TTR/699 Run Log (continued)

Run TR092RN087 8/29/2018 Conversion forward flight, thrust sweeps, 75 deg yaw, 57, 70, 81, 92 knots
Air Exchange Open 100%, Louver 7 Closed, 40x Mode

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
ZER	1	90.3		SIM				
CAL	2	90.3		SIM				
ZER	3	90.3		SIM				
CAL	4	90.3		SIM				AB
ZER	5	90.3		SIM				
CAL	6	90.3		SIM				
ZER	7	90.3		SIM				
CAL	8	90.3		SIM				
REC	9	90.3	0	SIM	0	0	0	
REC	10	90.3	0	SIM	0	0	0	
REC	11	90	0	200	455		0.0556	Rotating ref. point
REC	12	90	2	0.684	2400	0.005	0.0362	Helicopter mode rpm; min thrust, watch blade loads - recirculation
REC	13	90	58	0.684	3222	0.125	0.0488	Set rpm, then match M_{tip}; nominal fwd flight ref point
REC	14	75	58	0.683	3226	0.126	0.0489	
REC	15	75	70	0.684	3193	0.151	0.0485	
REC	16	75	69	0.683	541	0.149	0.0082	Min CTOS - trim to zero flapping
REC	17	75	69	0.684	1259	0.150	0.0191	
REC	18	75	69	0.684	1922	0.150	0.0292	
REC	19	75	69	0.683	2505	0.150	0.0381	
REC	20	75	69	0.684	3239	0.150	0.0492	
REC	21	75	70	0.684	3893	0.151	0.0591	
REC	22	75	70	0.684	4521	0.151	0.0687	
REC	23	75	70	0.684	5239	0.151	0.0795	
REC	24	75	70	0.684	5916	0.151	0.0898	
REC	25	75	70	0.684	6490	0.151	0.0986	
REC	26	75	70	0.684	7117	0.151	0.1081	
REC	27	75	70	0.684	7775	0.152	0.1180	Max CTOS
REC	28	75	70	0.684	3223	0.150	0.0489	return to ref condition
REC	29	75	81	0.684	3145	0.175	0.0478	
REC	30	75	81	0.684	3176	0.175	0.0483	cyclic delta from 0-flapping trim
REC	31	75	81	0.684	3199	0.175	0.0487	cyclic delta
REC	32	75	81	0.684	3139	0.175	0.0478	cyclic delta
REC	33	75	81	0.684	3086	0.175	0.0470	cyclic delta
REC	34	75	81	0.684	3173	0.175	0.0483	cyclic delta
REC	35	75	81	0.684	3144	0.175	0.0478	cyclic delta
REC	36	75	81	0.684	3155	0.175	0.0480	
REC	37	75	81	0.684	3140	0.175	0.0478	
REC	38	75	81	0.684	551	0.175	0.0084	Min CTOS - trim to zero flapping
REC	39	75	81	0.684	1211	0.175	0.0184	
REC	40	75	81	0.684	1917	0.175	0.0292	
REC	41	75	81	0.684	2519	0.175	0.0383	
REC	42	75	81	0.684	3135	0.175	0.0478	
REC	43	75	81	0.684	3763	0.175	0.0573	
REC	44	75	81	0.684	4435	0.175	0.0675	
REC	45	75	81	0.684	5159	0.175	0.0785	
REC	46	75	81	0.684	5754	0.175	0.0876	

Run TR092RN087 continued

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
REC	47	75	81	0.684	6409	0.175	0.0976	
REC	48	75	81	0.684	7084	0.176	0.1077	
REC	49	75	81	0.684	7727	0.176	0.1177	Max CTOS
REC	50	75	81	0.684	3203	0.176	0.0488	return to ref condition
REC	51	75	93	0.684	3135	0.200	0.0479	
REC	52	75	92	0.684	396	0.199	0.0060	Min CTOS - trim to zero flapping
REC	53	75	92	0.684	1152	0.199	0.0176	
REC	54	75	92	0.684	1834	0.200	0.0280	
REC	55	75	93	0.684	2530	0.200	0.0387	
REC	56	75	92	0.683	3098	0.200	0.0474	
REC	57	75	93	0.684	3638	0.201	0.0555	
REC	58	75	93	0.684	4451	0.201	0.0679	
REC	59	75	93	0.684	5013	0.201	0.0765	
REC	60	75	92	0.684	5702	0.200	0.0871	
REC	61	75	92	0.684	6384	0.200	0.0975	
REC	62	75	93	0.684	7026	0.200	0.1072	Max CTOS
REC	63	75	92	0.684	3150	0.200	0.0481	
REC	64	75	58	0.684	3235	0.125	0.0491	
REC	65	90	58	0.684	3176	0.126	0.0481	
REC	66	90	6	0.684	2296	0.012	0.0346	
REC	67	90	1	200	468	0.003	0.0580	
REC	68	90.3	0	SIM				static
REC	69	90.3		SIM				static
ZER	70	90.3		SIM				
CAL	71	90.3		SIM				

Table 7. TTR/699 Run Log (continued)

Run TR092RN088 8/30/2018 Conversion forward flight, thrust sweeps, 75 deg yaw, 104 & 115 knots
Air Exchange Open 100%, Louver 7 Closed, 40x Mode

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
ZER	1	90		SIM				
CAL	2	90		SIM				AB
ZER	3	90		SIM				
CAL	4	90		SIM				
ZER	5	90		SIM				
CAL	6	90		SIM				
REC	7	90		SIM				
REC	8	90		SIM				
REC	9	90	4	201	474	0.028	0.0566	Rotating ref. point
REC	10	90	8	0.684	2424	0.017	0.0364	Helicopter mode rpm; min thrust, watch blade loads - recirculation
REC	11	90	57	0.684	3212	0.125	0.0485	Set rpm, then match M_{tip}; nominal fwd flight ref point
REC	12	75	57	0.684	3234	0.126	0.0488	
REC	13	75	103	0.684	3034	0.225	0.0463	
REC	14	75	102	0.684	457	0.224	0.0070	Min CTOS - trim to zero flapping
REC	15	75	103	0.684	1214	0.225	0.0185	
REC	16	75	103	0.684	1724	0.225	0.0263	
REC	17	75	103	0.684	2466	0.225	0.0376	
REC	18	75	103	0.684	3196	0.225	0.0487	
REC	19	75	103	0.684	3776	0.226	0.0576	
REC	20	75	104	0.684	4330	0.226	0.0660	
REC	21	75	103	0.684	5033	0.226	0.0768	
REC	22	75	104	0.684	5663	0.226	0.0864	
REC	23	75	104	0.684	6393	0.226	0.0976	
REC	24	75	103	0.684	6969	0.225	0.1063	Max CTOS
REC	25	75	103	0.684	3034	0.225	0.0462	return to ref condition
REC	26	75	115	0.684	4237	0.250	0.0648	
REC	27	75	115	0.684	4992	0.250	0.0764	
REC	28	75	115	0.684	5594	0.251	0.0855	
REC	29	75	115	0.684	6335	0.251	0.0969	Max CTOS
REC	30	75	115	0.684	4264	0.250	0.0653	return to ref condition
REC	31	75	57	0.684	3135	0.125	0.0473	
REC	32	90	58	0.684	3188	0.125	0.0480	
REC	33	90	7	0.684	2371	0.015	0.0356	
REC	34	90	4	200	497	0.024	0.0603	
REC	35	90		SIM	135			static
REC	36	90		SIM				static
ZER	37	90		SIM				
CAL	38	90		SIM				

Table 7. TTR/699 Run Log (continued)

Run TR092RN089 8/30/2018 Conversion forward flight, thrust sweeps, 60 deg yaw, 70 & 81 knots

Air Exchange Open 100%, Louver 7 Closed, 40x Mode

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
ZER	1	90		SIM				
CAL	2	90		SIM				AB
ZER	3	90		SIM				
CAL	4	90		SIM				Manual AB
ZER	5	90		SIM				
CAL	6	90		SIM				
REC	7	90		SIM				
REC	8	90		SIM				
REC	9	90	0	200	458	0.000	0.0560	Rotating ref. point
REC	10	90	7	0.684	2530	0.015	0.0381	Helicopter mode rpm; min thrust, watch blade loads - recirculation
REC	11	90	58	0.684	3212	0.125	0.0485	Set rpm, then match M_{tip}; nominal fwd flight ref point
REC	12	60	58	0.684	3309	0.125	0.0500	
REC	13	60	58	0.684	3332	0.125	0.0504	Added Ref Point Turntable at 60.2 deg
REC	14	60	70	0.684	3220	0.151	0.0487	Cyclic ref
REC	15	60	69	0.684	3239	0.151	0.0490	cyclic delta from 0-flapping trim
REC	16	60	69	0.684	3211	0.151	0.0486	cyclic delta
REC	17	60	69	0.684	3272	0.151	0.0495	cyclic delta
REC	18	60	69	0.684	3204	0.151	0.0485	cyclic delta
REC	19	60	69	0.684	3157	0.151	0.0478	cyclic delta
REC	20	60	69	0.684	3215	0.150	0.0487	cyclic delta
REC	21	60	69	0.684	3178	0.151	0.0481	cyclic delta
REC	22	60	69	0.684	3266	0.151	0.0495	
REC	23	60	69	0.684	549	0.150	0.0083	Min CTOS - trim to zero flapping
REC	24	60	69	0.684	1281	0.150	0.0194	
REC	25	60	70	0.684	1906	0.151	0.0289	
REC	26	60	69	0.684	2624	0.150	0.0398	
REC	27	60	69	0.683	3166	0.151	0.0480	
REC	28	60	69	0.684	3878	0.151	0.0588	
REC	29	60	69	0.684	4616	0.150	0.0699	
REC	30	60	69	0.684	5216	0.150	0.0790	
REC	31	60	70	0.684	5881	0.151	0.0891	
REC	32	60	70	0.684	6513	0.151	0.0986	
REC	33	60	69	0.684	7195	0.151	0.1089	
REC	34	60	70	0.684	7803	0.151	0.1181	Max CTOS
REC	35	60	69	0.684	3243	0.150	0.0491	return to ref condition
REC	36	60	81	0.684	3218	0.175	0.0488	
REC	37	60	81	0.684	511	0.176	0.0078	Min CTOS - trim to zero flapping
REC	38	60	80	0.684	1186	0.174	0.0180	
REC	39	60	81	0.684	1901	0.175	0.0289	
REC	40	60	81	0.684	2620	0.176	0.0398	
REC	41	60	81	0.684	3182	0.176	0.0483	
REC	42	60	81	0.684	3766	0.175	0.0571	
REC	43	60	81	0.684	4483	0.176	0.0681	
REC	44	60	81	0.684	5172	0.175	0.0785	
REC	45	60	81	0.684	5827	0.175	0.0885	
REC	46	60	81	0.684	6463	0.175	0.0981	

Run TR092RN087 continued

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
REC	47	60	81	0.684	7059	0.176	0.1072	Max CTOS
REC	48	60	81	0.684	3161	0.176	0.0480	return to ref condition
REC	49	60	57	0.684	3235	0.124	0.0489	
REC	50	90	58	0.684	3187	0.125	0.0482	
REC	51	90	6	0.684	2310	0.013	0.0348	
REC	52	90	2	201	506	0.011	0.0620	
REC	53	90		SIM				static
REC	54	90		SIM				static
ZER	55	90		SIM				
CAL	56	90		SIM				

Table 7. TTR/699 Run Log (continued)

Run TR092RN090 8/31/2018 Conversion forward flight, thrust sweeps, 60 & 45 deg yaw, 91-126 knots
Air Exchange Open 100%, Louver 7 Closed, 40x Mode

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
	1	90		SIM				
CAL	2	90		SIM				AB
ZER	3	90		SIM				
CAL	4	90		SIM				
ZER	5	90		SIM				
CAL	6	90		SIM				
REC	7	90		SIM				
REC	8	90		SIM				
REC	9	90	2	200	501	0.011	0.0593	Rotating ref. point
REC	10	90	7	0.684	2276	0.014	0.0342	Helicopter mode rpm; min thrust, watch blade loads - recirculation
REC	11	90	57	0.684	3312	0.126	0.0500	Set rpm, then match M_{tip}; nominal fwd flight ref point
REC	12	60	57	0.684	3273	0.125	0.0494	
REC	13	60	91	0.684	3252	0.200	0.0495	
REC	14	60	92	0.684	515	0.201	0.0078	Min CTOS - trim to zero flapping
REC	15	60	92	0.684	1215	0.201	0.0185	
REC	16	60	92	0.684	1846	0.202	0.0281	
REC	17	60	91	0.684	2614	0.200	0.0397	
REC	18	60	91	0.684	3149	0.200	0.0479	
REC	19	60	91	0.684	3915	0.200	0.0596	
REC	20	60	92	0.684	4474	0.201	0.0680	
REC	21	60	92	0.684	5151	0.201	0.0783	
REC	22	60	91	0.684	5910	0.200	0.0900	
REC	23	60	91	0.684	6475	0.200	0.0984	Max CTOS
REC	24	60	91	0.684	3276	0.200	0.0498	return to ref condition
REC	25	60	103	0.684	3147	0.226	0.0480	
REC	26	60	103	0.684	1800	0.225	0.0275	cyclic delta from 0-flapping trim
REC	27	60	103	0.684	1879	0.225	0.0287	cyclic delta
REC	28	60	103	0.684	1876	0.225	0.0287	cyclic delta
REC	29	60	103	0.684	1829	0.225	0.0279	cyclic delta
REC	30	60	103	0.684	1856	0.225	0.0284	cyclic delta
REC	31	60	103	0.684	1854	0.225	0.0283	cyclic delta
REC	32	60	103	0.684	1832	0.225	0.0280	cyclic delta
REC	33	60	103	0.684	1926	0.225	0.0294	cyclic delta
REC	34	60	103	0.684	1903	0.225	0.0291	
REC	35	60	103	0.684	489	0.225	0.0075	Min CTOS - trim to zero flapping
REC	36	60	103	0.684	1200	0.225	0.0183	
REC	37	60	103	0.684	1795	0.226	0.0274	
REC	38	60	103	0.683	2563	0.226	0.0392	
REC	39	60	103	0.684	3242	0.225	0.0495	
REC	40	60	103	0.684	3752	0.225	0.0573	
REC	41	60	103	0.684	4191	0.225	0.0640	Max CTOS
REC	42	60	103	0.684	1909	0.225	0.0291	return to ref condition
REC	43	60	115	0.684	1732	0.251	0.0265	
REC	44	60	114	0.684	570	0.250	0.0087	Min CTOS - trim to zero flapping
REC	45	60	114	0.684	1185	0.250	0.0181	
REC	46	60	115	0.684	1760	0.250	0.0269	

Run TR092RN090 continued

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
REC	47	60	115	0.684	2472	0.251	0.0379	
REC	48	60	115	0.683	3182	0.251	0.0489	Max CTOS
REC	49	60	114	0.684	1843	0.250	0.0282	return to ref condition
REC	50	60	126	0.684	1767	0.275	0.0272	
REC	51	60	126	0.684	518	0.275	0.0080	Min CTOS - trim to zero flapping
REC	52	60	126	0.684	1142	0.275	0.0176	
REC	53	60	126	0.683	1677	0.275	0.0259	
REC	54	60	126	0.684	2443	0.276	0.0376	Max CTOS, missed CTOS of 0.05 look at SOF PN36->37
REC	55	60	126	0.684	1711	0.275	0.0263	return to ref condition
REC	56	60	58	0.684	3232	0.125	0.0488	
REC	57	45	57	0.684	3284	0.125	0.0496	
REC	58	45	92	0.684	3194	0.200	0.0486	
REC	59	45	92	0.684	3208	0.200	0.0488	cyclic delta from 0-flapping trim
REC	60	45	92	0.684	3203	0.200	0.0488	cyclic delta
REC	61	45	91	0.684	3192	0.199	0.0486	cyclic delta
REC	62	45	92	0.684	3208	0.200	0.0489	cyclic delta
REC	63	45	92	0.683	3213	0.200	0.0490	cyclic delta
REC	64	45	92	0.684	3187	0.200	0.0486	cyclic delta
REC	65	45	92	0.684	3177	0.200	0.0483	cyclic delta
REC	66	45	92	0.684	3172	0.200	0.0483	
REC	67	45	92	0.684	531	0.200	0.0081	Min CTOS - trim to zero flapping
REC	68	45	92	0.685	1250	0.200	0.0190	
REC	69	45	92	0.684	1823	0.201	0.0277	
REC	70	45	92	0.684	2523	0.200	0.0384	
REC	71	45	92	0.684	3214	0.201	0.0490	
REC	72	45	92	0.684	3845	0.201	0.0586	
REC	73	45	92	0.684	4520	0.202	0.0689	
REC	74	45	92	0.683	5174	0.200	0.0789	
REC	75	45	92	0.684	5819	0.200	0.0887	
REC	76	45	92	0.683	6535	0.201	0.0997	Max CTOS
REC	77	45	92	0.684	3136	0.200	0.0477	return to ref condition
REC	78	45	58	0.684	3187	0.125	0.0481	
REC	79	90	57	0.684	3293	0.125	0.0498	
REC	80	90	5	0.684	2313	0.011	0.0348	
REC	81	90	0	201	510	0.000	0.0620	
REC	82	90		SIM				static
REC	83	90		SIM				static
ZER	84	90		SIM				
CAL	85	90		SIM				

Table 7. TTR/699 Run Log (continued)

Run TR092RN091 9/4/2018 Conversion forward flight, thrust sweeps, 45 deg yaw, 57, 103, 115 knots
Air Exchange Open 100%, Louver 7 Closed, 40x Mode

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
ZER	1	90		SIM				
CAL	2	90		SIM				AB
ZER	3	90		SIM				
CAL	4	90		SIM				
ZER	5	90		SIM				
CAL	6	90		SIM				
REC	7	90		SIM				
REC	8	90		SIM				
REC	9	90	4	201	456	0.022	0.0543	Rotating ref. point
REC	10	90	7	0.685	2303	0.016	0.0347	Helicopter mode rpm; min thrust, watch blade loads - recirculation
REC	11	90	57	0.684	3266	0.125	0.0496	Set rpm, then match M_{tip}; nominal fwd flight ref point
REC	12	45	57	0.684	3313	0.125	0.0503	
REC	13	45	57	0.683	3262	0.125	0.0496	cyclic delta from 0-flapping trim
REC	14	45	57	0.684	3300	0.125	0.0501	cyclic delta
REC	15	45	103	0.684	3143	0.225	0.0482	
REC	16	45	103	0.684	675	0.225	0.0104	Min CTOS - trim to zero flapping
REC	17	45	103	0.684	1240	0.225	0.0190	
REC	18	45	103	0.684	1975	0.225	0.0303	
REC	19	45	103	0.683	2527	0.225	0.0389	
REC	20	45	103	0.684	3229	0.225	0.0496	
REC	21	45	103	0.683	3927	0.225	0.0604	
REC	22	45	103	0.684	4458	0.225	0.0684	
REC	23	45	103	0.684	5124	0.226	0.0788	Max CTOS
REC	24	45	103	0.684	3192	0.225	0.0490	return to ref condition
REC	25	45	114	0.684	3194	0.250	0.0492	
REC	26	45	115	0.684	593	0.250	0.0091	Min CTOS - trim to zero flapping
REC	27	45	114	0.684	1295	0.250	0.0199	
REC	28	45	115	0.684	1811	0.251	0.0279	
REC	29	45	115	0.684	2665	0.252	0.0411	
REC	30	45	115	0.684	3117	0.252	0.0481	
REC	31	45	115	0.684	3886	0.250	0.0599	Max CTOS
REC	32	45	115	0.684	3166	0.250	0.0487	return to ref condition
REC	33	45	57	0.684	3272	0.125	0.0497	
REC	34	90	57	0.684	3230	0.125	0.0490	
REC	35	90	3	0.685	2355	0.007	0.0355	
REC	36	90	0	201	499	0.000	0.0606	
REC	37	90		SIM				static
REC	38	90		SIM				static
ZER	39	90		SIM				
CAL	40	90		SIM				

Table 7. TTR/699 Run Log (continued)

Run TR092RN092 9/5/2018 Conversion forward flight, thrust sweeps, 90 deg yaw

Air Exchange Open 100%, Louver 7 Closed, 40x Mode

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
ZER	1	90		SIM				
CAL	2	90		SIM				AB
ZER	3	90		SIM				
CAL	4	90		SIM				
REC	5	90		SIM				
REC	6	90		SIM				
REC	7	90	5	201	453	0.028	0.0539	Rotating ref. point
REC	8	90	7	0.684	2425	0.016	0.0365	Helicopter mode rpm; min thrust, watch blade loads - recirculation
REC	9	90	6	0.684	2311	0.013	0.0348	
REC	10	90	4	201	471	0.024	0.0562	
REC	11	90		SIM				static
REC	12	90		SIM				static
ZER	13	90		SIM				
CAL	14	90		SIM				

Table 7. TTR/699 Run Log (continued)

Run TR092RN093 9/5/2018 Conversion forward flight, thrust sweeps, 30 & 45 deg yaw, 57-138 knots
Air Exchange Open 100%, Louver 7 Closed, 40x Mode

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
ZER	1	90		SIM				
CAL	2	90		SIM				AB
ZER	3	90		SIM				
CAL	4	90		SIM				
ZER	5	90		SIM				
CAL	6	90		SIM				
REC	7	90		SIM				
REC	8	90		SIM				
REC	9	90	0	201	445	0.000	0.0537	Rotating ref. point
REC	10	90	4	0.684	2231	0.009	0.0336	Helicopter mode rpm; min thrust, watch blade loads - recirculation
REC	11	90	57	0.684	3212	0.125	0.0486	Set rpm, then match M_{tip}; nominal fwd flight ref point
REC	12	45	58	0.684	3284	0.125	0.0498	
REC	13	45	127	0.684	1952	0.276	0.0301	
REC	14	45	127	0.683	1788	0.276	0.0276	cyclic delta from 0-flapping trim
REC	15	45	127	0.683	1896	0.276	0.0293	cyclic delta
REC	16	45	127	0.684	1883	0.275	0.0291	cyclic delta
REC	17	45	127	0.684	1863	0.275	0.0287	cyclic delta
REC	18	45	127	0.684	1879	0.276	0.0290	cyclic delta
REC	19	45	127	0.685	1841	0.275	0.0283	cyclic delta
REC	20	45	127	0.685	1855	0.275	0.0285	cyclic delta
REC	21	45	127	0.685	1873	0.275	0.0288	
REC	22	45	126	0.684	591	0.274	0.0091	Min CTOS - trim to zero flapping
REC	23	45	126	0.684	1245	0.275	0.0192	
REC	24	45	127	0.683	1866	0.275	0.0289	
REC	25	45	127	0.683	2595	0.277	0.0402	
REC	26	45	127	0.683	3096	0.277	0.0479	Max CTOS
REC	27	45	127	0.683	1884	0.276	0.0291	return to ref condition
REC	28	45	137	0.684	601	0.298	0.0093	Min CTOS - trim to zero flapping
REC	29	45	138	0.684	1261	0.299	0.0196	
REC	30	45	138	0.683	1821	0.300	0.0283	Max CTOS
REC	31	45	137	0.684	533	0.299	0.0083	return to ref condition
REC	32	45	57	0.684	3283	0.124	0.0497	
REC	33	30	58	0.684	3312	0.125	0.0502	
REC	34	30	104	0.684	1925	0.225	0.0295	
REC	35	30	104	0.684	1942	0.225	0.0298	cyclic delta
REC	36	30	104	0.684	1963	0.225	0.0301	cyclic delta
REC	37	30	104	0.684	1985	0.226	0.0304	cyclic delta
REC	38	30	104	0.683	1933	0.226	0.0297	cyclic delta
REC	39	30	104	0.684	1883	0.226	0.0289	cyclic delta
REC	40	30	104	0.684	1941	0.226	0.0298	cyclic delta
REC	41	30	104	0.684	1894	0.226	0.0290	cyclic delta
REC	42	30	104	0.684	1982	0.226	0.0304	
REC	43	30	104	0.684	746	0.226	0.0114	Min CTOS - trim to zero flapping
REC	44	30	104	0.684	1329	0.225	0.0204	
REC	45	30	104	0.684	1968	0.225	0.0302	
REC	46	30	103	0.684	2586	0.225	0.0396	

Run TR092RN093 continued

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
REC	47	30	104	0.684	3277	0.226	0.0502	
REC	48	30	104	0.684	3860	0.226	0.0592	
REC	49	30	104	0.684	4658	0.225	0.0714	
REC	50	30	104	0.683	5213	0.226	0.0800	
REC	51	30	104	0.683	5654	0.226	0.0869	Max CTOS
REC	52	30	104	0.684	1926	0.225	0.0295	return to ref condition
REC	53	30	115	0.684	1927	0.251	0.0297	
REC	54	30	115	0.684	1275	0.250	0.0196	
REC	55	30	115	0.684	617	0.249	0.0095	Min CTOS - trim to zero flapping
REC	56	30	115	0.684	1321	0.250	0.0203	
REC	57	30	115	0.684	1889	0.250	0.0290	
REC	58	30	116	0.684	2550	0.251	0.0393	
REC	59	30	115	0.684	3292	0.249	0.0506	
REC	60	30	115	0.684	3874	0.250	0.0596	
REC	61	30	115	0.684	4632	0.251	0.0713	
REC	62	30	116	0.684	5189	0.251	0.0799	Max CTOS
REC	63	30	115	0.685	2009	0.250	0.0308	return to ref condition
REC	64	30	127	0.685	1976	0.275	0.0305	
REC	65	30	127	0.685	694	0.275	0.0107	Min CTOS - trim to zero flapping
REC	66	30	127	0.684	1360	0.275	0.0210	
REC	67	30	126	0.684	1967	0.275	0.0304	
REC	68	30	127	0.684	2643	0.275	0.0409	
REC	69	30	127	0.684	3192	0.276	0.0493	
REC	70	30	127	0.684	3811	0.275	0.0589	
REC	71	30	127	0.683	4535	0.276	0.0702	
REC	72	30	127	0.683	4812	0.275	0.0745	Max CTOS
REC	73	30	127	0.685	1808	0.275	0.0279	return to ref condition
REC	74	30	58	0.684	3309	0.125	0.0502	
REC	75	90	58	0.684	3225	0.125	0.0489	
REC	76	90	7	0.684	2281	0.015	0.0344	
REC	77	90	0	201	529	0.002	0.0648	
REC	78	90		SIM				static
REC	79	90		SIM				static
ZER	80	90		SIM				
CAL	81	90		SIM				

Table 7. TTR/699 Run Log (continued)

Run TR092RN094 9/6/2018 Conversion forward flight, thrust sweeps, 30 & 80 deg yaw, 57-160 knots
Air Exchange Open 100%, Louver 7 Closed, 40x Mode

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
ZER	1	90		SIM				
CAL	2	90		SIM				AB
ZER	3	90		SIM				
CAL	4	90		SIM				
REC	5	90		SIM				
REC	6	90		SIM				
REC	7	90	4	201	478	0.026	0.0566	Rotating ref. point
REC	8	90	8	0.684	2450	0.017	0.0368	Helicopter mode rpm; min thrust, watch blade loads - recirculation
REC	9	90	57	0.683	3198	0.126	0.0483	Set rpm, then match M_{tip}; nominal fwd flight ref point
REC	10	30	57	0.684	3285	0.125	0.0496	
REC	11	30	137	0.684	1927	0.300	0.0297	
REC	12	30	137	0.683	1961	0.301	0.0303	cyclic delta from 0-flapping trim
REC	13	30	137	0.683	1860	0.301	0.0288	cyclic delta
REC	14	30	137	0.683	1818	0.301	0.0281	cyclic delta
REC	15	30	137	0.683	1935	0.301	0.0299	cyclic delta
REC	16	30	137	0.683	1858	0.301	0.0288	cyclic delta
REC	17	30	137	0.684	1856	0.301	0.0287	cyclic delta
REC	18	30	137	0.683	1867	0.300	0.0289	cyclic delta
REC	19	30	137	0.683	1919	0.300	0.0297	
REC	20	30	137	0.684	590	0.300	0.0091	Min CTOS - trim to zero flapping
REC	21	30	137	0.684	1349	0.300	0.0208	
REC	22	30	137	0.684	1943	0.300	0.0300	
REC	23	30	137	0.684	2622	0.300	0.0404	
REC	24	30	137	0.684	3195	0.301	0.0493	
REC	25	30	138	0.684	3852	0.302	0.0595	
REC	26	30	137	0.683	4302	0.300	0.0665	Max CTOS
REC	27	30	138	0.684	2018	0.301	0.0311	return to ref condition
REC	28	30	149	0.685	1890	0.325	0.0292	
REC	29	30	148	0.684	516	0.325	0.0080	Min CTOS - trim to zero flapping
REC	30	30	149	0.684	1315	0.325	0.0204	
REC	31	30	149	0.684	1951	0.325	0.0303	
REC	32	30	149	0.684	2590	0.326	0.0402	
REC	33	30	149	0.684	3008	0.326	0.0467	Max CTOS
REC	34	30	149	0.684	2015	0.325	0.0313	return to ref condition
REC	35	30	160	0.684	603	0.350	0.0094	Min CTOS - trim to zero flapping
REC	36	30	160	0.684	1326	0.350	0.0207	
REC	37	30	160	0.684	1647	0.351	0.0257	Max CTOS
REC	38	30	160	0.684	1299	0.350	0.0203	
REC	39	30	57	0.684	3301	0.125	0.0498	
REC	40	80	58	0.684	3191	0.125	0.0481	
REC	41	80	58	0.684	3252	0.125	0.0490	cyclic delta
REC	42	80	58	0.685	3279	0.125	0.0494	cyclic delta
REC	43	80	58	0.685	3273	0.125	0.0493	cyclic delta
REC	44	80	57	0.684	3189	0.125	0.0480	cyclic delta
REC	45	80	57	0.684	3184	0.125	0.0480	cyclic delta
REC	46	80	57	0.684	3217	0.125	0.0485	cyclic delta

Run TR092RN094 continued

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
REC	47	80	57	0.685	3127	0.125	0.0471	cyclic delta
REC	48	80	57	0.684	3156	0.125	0.0475	
REC	49	80	57	0.684	672	0.125	0.0101	Min CTOS - trim to zero flapping
REC	50	80	57	0.684	1240	0.125	0.0187	
REC	51	80	58	0.684	1840	0.125	0.0278	
REC	52	80	57	0.684	2498	0.125	0.0377	
REC	53	80	57	0.684	3206	0.125	0.0483	
REC	54	80	58	0.684	3833	0.125	0.0577	
REC	55	80	57	0.684	4580	0.125	0.0690	
REC	56	80	57	0.685	5254	0.125	0.0791	
REC	57	80	57	0.684	5514	0.125	0.0831	Max CTOS
REC	58	80	58	0.685	3196	0.125	0.0481	return to ref condition
REC	59	90	57	0.684	3183	0.125	0.0480	
REC	60	90	5	0.683	2414	0.011	0.0363	
REC	61	90	0	201	515	0.000	0.0623	
REC	62	90		SIM				static
REC	63	90		SIM				static
ZER	64	90		SIM				
CAL	65	90		SIM				

Table 7. TTR/699 Run Log (continued)

Run TR092RN095 9/6/2018 Conversion forward flight, thrust sweep, 90 deg yaw, 57 knots

Air Exchange Open 100%, Louver 7 Closed, 40x Mode

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
ZER	1	90		SIM				
CAL	2	90		SIM				AB
ZER	3	90		SIM				
CAL	4	90		SIM				
ZER	5	90		SIM				
CAL	6	90		SIM				
REC	7	90		SIM				
REC	8	90		SIM				
REC	9	90	0	201	457	0.000	0.0551	Rotating ref. point
REC	10	90	5	0.684	2406	0.012	0.0362	Helicopter mode rpm; min thrust, watch blade loads - recirculation
REC	11	90	58	0.684	3211	0.126	0.0484	Set rpm, then match M_{tip}; nominal fwd flight ref point
REC	12	90	58	0.684	1533	0.125	0.0232	Min CTOS - trim to zero flapping
REC	13	90	57	0.684	1905	0.125	0.0288	
REC	14	90	57	0.684	2574	0.125	0.0389	
REC	15	90	57	0.684	3226	0.125	0.0487	
REC	16	90	57	0.684	3828	0.125	0.0578	
REC	17	90	57	0.684	4548	0.125	0.0686	
REC	18	90	57	0.684	5248	0.125	0.0792	
REC	19	90	57	0.684	5546	0.125	0.0837	Max CTOS; high loads on swashplate driver
REC	20	90	57	0.684	3232	0.125	0.0488	return to ref condition
REC	21	90	5	0.683	2398	0.011	0.0361	
REC	22	90	0	201	549	0.000	0.0664	
REC	23	90		SIM				static
REC	24	90		SIM				static
ZER	25	90		SIM				
CAL	26	90		SIM				

Table 7. TTR/699 Run Log (continued)

Run R092RN099 11/6/2018 Motor checkout (both fwd motors), wind off

Air Exchange Open 100%, Louver 7 Open, VS 6 in 80x Mode, VS 4 Closed, VS 3 Open

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM	Coll., deg	Thrust, lb	C_T/σ	Motor Current	Notes (1)
ZER	1	0		SIM					
CAL	2	0		SIM					AB
ZER	3	0		SIM					
CAL	4	0		SIM					
ZER	5	0		SIM					
CAL	6	0		SIM					
ZER	7	0		SIM					
CAL	8	0		SIM					
REC	9	0		SIM					
REC	10	0		SIM					
REC	11	0	0	200	5.0	403	0.0495		
REC	12	0	15	571	5.0	3562	0.0537	200	
REC	13	0	21	571	10.0	6254	0.0945	300	
REC	14	0	24	570	13.1	8124	0.1229	400	
REC	15	0	27	570	15.6	9527	0.1445	500	
REC	16	0	27	569	16.6	10191	0.1549	550	
REC	17	0	16	572	5.0	3505	0.0528		
REC	18	0	8	200	5.0	265	0.0325	200	
REC	19	0							static; bad point
REC	20	0		SIM					
REC	21	0		SIM					static
ZER	22	0		SIM					
CAL	23	0		SIM					

(1) New trunnion etc. in rotating scissor

Table 7. TTR/699 Run Log (continued)

Run R092RN100 11/6/2018 Motor checkout (port motor disconnected, running motor 5 only)

Air Exchange Open 100%, Louver 7 Open, VS 6 in 80x Mode, VS 4 Closed, VS 3 Open

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM	Coll., deg	Thrust, lb	C_T/σ	Motor Current	Notes
ZER	1	0		SIM	15				
CAL	2	0		SIM	15				AB
ZER	3	0		SIM	15				
CAL	4	0		SIM	15				
ZER	5	0		SIM	15				
CAL	6	0		SIM	15				
ZER	7	0		SIM	15				
CAL	8	0		SIM	15				
REC	9	0		SIM	15				
REC	10	0		SIM	5				
REC	11	0	0	200	5.0	447	0.0551		
REC	12	0	9	573	-0.7	1306	0.0194	200	
REC	13	0	14	572	4.6	3447	0.0514	300	
REC	14	0	17	572	7.2	4746	0.0709	400	
REC	15	0	20	570	9.1	5798	0.0873	500	
REC	16	0	21	569	9.9	6270	0.0946	550	
REC	17	0		SIM	5				
REC	18	0		SIM	15				static
ZER	19	0		SIM	15				
CAL	20	0		SIM	15				

Table 7. TTR/699 Run Log (continued)

Run TR092RN101 11/7/2018 NFAC configuration effects, thrust sweep, 0 deg yaw, 569 rpm, wind off
Air Exchange Open 100%, Louver 7 Open, VS 6 in 80x Mode, VS 4 Closed, VS 3 Open

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM	Coll., deg	Thrust, lb	C_T/σ	Notes
ZER	1	0		SIM	15			
CAL	2	0		SIM	15			AB
ZER	3	0		SIM	15			
CAL	4	0		SIM	15			
ZER	5	0		SIM	15			
CAL	6	0		SIM	15			
ZER	7	0		SIM	15			
CAL	8	0		SIM	15			
ZER	9	0		SIM	15			
CAL	10	0		SIM	15			
REC	11	0		SIM	15			static
REC	12	0		200	5			static
REC	13	0	0	200	5	436	0.0508	
REC	14	0	15	558	5	3488	0.0523	
REC	15	0	20	558	7	4385	0.0658	
REC	16	0	22	557	9	5360	0.0805	
REC	17	0	25	558	11	6563	0.0986	
REC	18	0	27	557	13	7726	0.1163	
REC	19	0	28	557	14	8344	0.1257	
REC	20	0	30	559	15	8987	0.1347	
REC	21	0	30	558	16	9699	0.1457	
REC	22	0	29	559	15	8977	0.1345	
REC	23	0	29	559	14	8414	0.1261	
REC	24	0	28	559	13	7749	0.1162	
REC	25	0	26	559	11	6538	0.0981	
REC	26	0	23	559	9	5401	0.0809	
REC	27	0	20	559	7	4360	0.0654	
REC	28	0	18	559	5	3356	0.0503	
REC	29	0	8	200	5	297	0.0346	
REC	30	0		SIM	5			static
REC	31	0		SIM	15			static
ZER	32	0		SIM	15			
CAL	33	0		SIM	15			

Table 7. TTR/699 Run Log (continued)

Run TR092RN102 11/7/2018 NFAC configuration effects, thrust sweep, 0 deg yaw, 569 & 478 rpm
Air Exchange Open 100%, Louver 7 Open, VS 6 in 80x Mode, VS 4 Open, VS 3 Outboard Half Closed

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM	Coll., deg	Thrust, lb	C_T/σ	Notes
ZER	1	0		SIM	15			
CAL	2	0		SIM	15			AB
ZER	3	0		SIM	15			
CAL	4	0		SIM	15			
REC	5	0		SIM	15			static
REC	6	0		SIM	5			static
REC	7	0	0	200	5	475	0.0561	
REC	8	0	10	562	5	3795	0.0569	
REC	9	0	13	563	7	4865	0.0729	
REC	10	0	15	563	9	5901	0.0885	
REC	11	0	18	562	11	7114	0.1069	
REC	12	0	21	563	13	8418	0.1264	
REC	13	0	21	563	14	9035	0.1357	
REC	14	0	22	563	15	9620	0.1443	
REC	15	0	24	563	16	10114	0.1519	
REC	16	0	21	564	15	9756	0.1461	
REC	17	0	20	563	14	9103	0.1366	
REC	18	0	20	564	13	8480	0.1271	
REC	19	0	17	564	11	7245	0.1087	
REC	20	0	16	564	9	5991	0.0898	
REC	21	0	13	564	7	4934	0.0740	
REC	22	0	11	564	5	3773	0.0566	
REC	23	0	8	481	5	2709	0.0559	
REC	24	0	9	481	7	3491	0.0720	
REC	25	0	12	481	9	4307	0.0888	
REC	26	0	14	481	11	5169	0.1066	
REC	27	0	15	481	13	6068	0.1253	
REC	28	0	16	481	14	6456	0.1334	
REC	29	0	17	481	15	6880	0.1420	
REC	30	0	18	481	16	7375	0.1522	
REC	31	0	19	481	17	7767	0.1604	
REC	32	0	19	481	18	8247	0.1703	
REC	33	0	20	481	19	8701	0.1798	
REC	34	0	20	481	20	8904	0.1842	
REC	35	0	21	481	19	8589	0.1776	
REC	36	0	21	481	18	8128	0.1679	
REC	37	0	19	482	17	7720	0.1593	
REC	38	0	18	482	16	7410	0.1530	
REC	39	0	16	482	15	6989	0.1440	
REC	40	0	15	481	14	6585	0.1361	
REC	41	0	14	482	13	6121	0.1263	
REC	42	0	14	482	11	5174	0.1066	
REC	43	0	12	482	9	4299	0.0886	
REC	44	0	10	482	7	3499	0.0721	
REC	45	0	6	483	5	2806	0.0577	
REC	46	0	0	200	5	466	0.0558	
REC	47	0		SIM	5			static
REC	48	0		SIM	15			static, disregard Acoustic Point, Zero Point taken while they were taking data

Run TR092R102 continued

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM	Coll., deg	Thrust, lb	C_T/σ	Notes
ZER	49	0		SIM	15			
REC	50	0		SIM	15			Retake of Point 48 for acoustics
ZER	51	0		SIM	15			
CAL	52	0		SIM	15			

Table 7. TTR/699 Run Log (continued)

Run TR092RN103 11/7/2018 NFAC configuration effects, thrust sweep, 0 deg yaw, 569 rpm, wind off
Air Exchange Open 100%, Louver 7 Open, VS 6 in 80x Mode, VS 4 Open, VS 3 Outboard ¾ Closed,
Doors G, H, I, J, K, L Closed

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM	Coll., deg	Thrust, lb	C_T/σ	Notes
ZER	1	0		SIM	15			
CAL	2	0		SIM	15			AB
ZER	3	0		SIM	15			
CAL	4	0		SIM	15			
REC	5	0		SIM	5			
REC	6	0		SIM	5			
REC	7	0	0	200	5	475	0.0561	static
REC	8	0	10	562	7	3795	0.0569	static
REC	9	0	0	201	5	483	0.0580	
REC	10	0	6	567	5	4017	0.0604	
REC	11	0	7	568	7	5215	0.0783	
REC	12	0	9	568	9	6393	0.0962	
REC	13	0	8	568	11	7714	0.1159	
REC	14	0	12	568	13	8780	0.1321	
REC	15	0	13	568	14	9419	0.1417	
REC	16	0	11	568	13	8885	0.1336	
REC	17	0	10	568	11	7621	0.1145	
REC	18	0	9	569	9	6333	0.0950	
REC	19	0	7	569	7	5179	0.0776	
REC	20	0	5	568	5	4064	0.0611	
REC	21	0	0	200	5	489	0.0592	
REC	22	0		SIM	15			static
REC	23	0		SIM	15			static
REC	24	0		SIM	15			
REC	25	0		SIM	15			

Table 7. TTR/699 Run Log (continued)

Run TR092RN104 11/8/2018 Airplane forward flight, thrust sweep, 478 rpm, 120 knots

Air Exchange Open 100%, Louver 7 Closed, 40x Mode

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
ZER	1	0		SIM				
CAL	2	0		SIM				
ZER	3	0		SIM				
CAL	4	0		SIM				
ZER	5	0		SIM				
CAL	6	0		SIM				
ZER	7	0		SIM				
CAL	8	0		SIM				
ZER	9	0		SIM				
CAL	10	0		SIM				
REC	11	0	0	SIM	7	0.000	0.0001	
REC	12	0	0	SIM	-11	0.000		
REC	13	0	0	200	438	0.000	0.0515	Rotating ref. point
REC	14	0	9	0.583	2678	0.024	0.0552	Airplane mode rpm ref. point (FAILED TUNNEL START)
REC	15	0	0	0.608	-14	0.000		
REC	16	0	0	0.244	439	0.000	0.0517	Rotating ref. point
REC	17	0	7	0.583	2691	0.019	0.0554	Airplane mode rpm ref. point
REC	18	0	61	0.583	466	0.157	0.0096	Set cyclic for zero flapping; nominal fwd flight ref point
REC	19	0	120	0.583	507	0.310	0.0107	
REC	20	0	120	0.582	506	0.311	0.0107	cyclic input checks
REC	21	0	120	0.582	469	0.311	0.0099	
REC	22	0	120	0.582	465	0.311	0.0098	
REC	23	0	120	0.582	463	0.311	0.0098	
REC	24	0	120	0.583	512	0.310	0.0108	
REC	25	0	120	0.584	497	0.310	0.0104	
REC	26	0	120	0.583	492	0.310	0.0103	
REC	27	0	120	0.583	467	0.310	0.0098	
REC	28	0	121	0.582	964	0.311	0.0203	
REC	29	0	121	0.583	1426	0.311	0.0300	
REC	30	0	121	0.583	1945	0.312	0.0409	
REC	31	0	121	0.582	2391	0.312	0.0504	
REC	32	0	121	0.583	2908	0.311	0.0611	
REC	33	0	121	0.583	3332	0.312	0.0701	
REC	34	0	122	0.583	3718	0.313	0.0783	Max CTOS, Torque limited
REC	35	0	121	0.583	3317	0.312	0.0698	
REC	36	0	121	0.584	2872	0.311	0.0603	
REC	37	0	121	0.583	2396	0.312	0.0504	
REC	38	0	122	0.583	1911	0.312	0.0401	
REC	39	0	121	0.584	1392	0.311	0.0292	
REC	40	0	121	0.583	924	0.312	0.0194	
REC	41	0	121	0.583	511	0.310	0.0108	
REC	42	0	61	0.583	477	0.156	0.0099	nominal fwd-flight ref. point
REC	43	0	10	0.583	2643	0.024	0.0543	hover ref. point
REC	44	0	5	200	321	0.029	0.0385	
REC	45	0	0	SIM	12	0.000	0.0002	static
REC	46	0	0	SIM	-7	0.000		static

Run TR092RN022 continued

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
ZER	47	0		SIM				
CAL	48	0		SIM				

Table 7. TTR/699 Run Log (continued)

Run TR092RN105 11/8/2018 Airplane forward flight, thrust sweeps, 569 rpm, 60, 70, 107, 142 knots
Air Exchange Open 100%, Louver 7 Closed, 40x Mode

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
ZER	1	0		SIM				
CAL	2	0		SIM				
ZER	3	0		SIM				
CAL	4	0		SIM				
ZER	5	0		SIM				
CAL	6	0		SIM				
ZER	7	0		SIM				
CAL	8	0		SIM				
REC	9	0		SIM				
REC	10	0		SIM				
REC	11	0	0	200	431	0.000	0.0517	Rotating ref. point
REC	12	0	13	0.684	3603	0.029	0.0539	Airplane mode rpm ref. point
REC	13	0	61	0.684	661	0.134	0.0099	Set cyclic for zero flapping; nominal fwd flight ref point
REC	14	0	61	0.684	1320	0.133	0.0199	
REC	15	0	62	0.683	1995	0.134	0.0300	
REC	16	0	61	0.684	2674	0.133	0.0402	
REC	17	0	61	0.684	3347	0.134	0.0504	
REC	18	0	61	0.684	4017	0.133	0.0605	
REC	19	0	61	0.684	4670	0.134	0.0703	
REC	20	0	61	0.684	5359	0.134	0.0807	
REC	21	0	62	0.684	5978	0.134	0.0900	
REC	22	0	61	0.684	6738	0.133	0.1014	
REC	23	0	62	0.684	7309	0.134	0.1099	
REC	24	0	62	0.684	7505	0.134	0.1129	Max CTOS, Torque limited
REC	25	0	62	0.684	684	0.134	0.0103	
REC	26	0	72	0.684	658	0.157	0.0099	Set cyclic for zero flapping; nominal fwd flight ref point
REC	27	0	72	0.684	1320	0.156	0.0199	
REC	28	0	72	0.684	2019	0.157	0.0304	
REC	29	0	72	0.684	2651	0.156	0.0400	
REC	30	0	72	0.684	3314	0.156	0.0500	
REC	31	0	72	0.684	4009	0.157	0.0604	
REC	32	0	72	0.684	4682	0.156	0.0706	
REC	33	0	72	0.684	5321	0.157	0.0802	
REC	34	0	72	0.684	5984	0.157	0.0902	
REC	35	0	72	0.684	6707	0.156	0.1011	Max CTOS, Torque limited
REC	36	0	72	0.684	657	0.157	0.0099	
REC	37	0	107	0.684	683	0.233	0.0104	Set cyclic for zero flapping; nominal fwd flight ref point
REC	38	0	107	0.684	1329	0.234	0.0202	
REC	39	0	107	0.684	2004	0.233	0.0305	
REC	40	0	107	0.684	2601	0.234	0.0396	
REC	41	0	107	0.684	3363	0.233	0.0512	
REC	42	0	107	0.684	3907	0.233	0.0595	
REC	43	0	107	0.684	4620	0.234	0.0703	
REC	44	0	107	0.684	5083	0.234	0.0773	Max CTOS, Torque limited
REC	45	0	107	0.684	628	0.233	0.0095	

Run TR092RN105 continued

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
REC	46	0	143	0.683	719	0.311	0.0111	Set cyclic for zero flapping; nominal fwd flight ref point
REC	47	0	143	0.683	1325	0.312	0.0205	
REC	48	0	143	0.683	2027	0.311	0.0313	
REC	49	0	143	0.683	2615	0.312	0.0404	
REC	50	0	144	0.684	3312	0.312	0.0510	
REC	51	0	144	0.684	3700	0.313	0.0570	Max CTOS, Torque limited
REC	52	0	143	0.684	724	0.311	0.0112	
REC	53	0	62	0.684	686	0.134	0.0103	nominal fwd-flight ref. point
REC	54	0	15	0.684	3637	0.033	0.0544	hover ref. point
REC	55	0	7	201	338	0.044	0.0411	
REC	56	0		SIM				static
REC	57	0		SIM				static
ZER	58	0		SIM				
CAL	59	0		SIM				

Table 7. TTR/699 Run Log (continued)

Run TR092RN106 11/9/2018 Helicopter forward flight, thrust sweeps, 90 deg yaw, 57 knots

Air Exchange Open 100%, Louver 7 Closed, 40x Mode

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
ZER	1	90		SIM				
CAL	2	90		SIM				AB
ZER	3	90		SIM				
CAL	4	90		SIM				
ZER	5	90		SIM				
CAL	6	90		SIM				
REC	7	90		SIM				
REC	8	90		SIM				
REC	9	90	0	200	442	0.000	0.0515	Rotating ref. point
REC	10	90	0	0.684	761	0.000	0.0113	Helicopter mode rpm; min thrust, watch blade loads - recirculation
REC	11	90	0	0.684	694	0.000	0.0103	Helicopter mode rpm; min thrust, watch blade loads - recirculation
REC	12	90	57	0.684	1270	0.125	0.0190	Min CTOS - trim to zero flapping
REC	13	90	57	0.684	1938	0.126	0.0290	
REC	14	90	57	0.683	2642	0.126	0.0396	
REC	15	90	57	0.684	3245	0.126	0.0486	
REC	16	90	57	0.683	3600	0.126	0.0540	
REC	17	90	57	0.684	3937	0.126	0.0590	
REC	18	90	57	0.684	4227	0.126	0.0633	
REC	19	90	57	0.683	4686	0.126	0.0703	
REC	20	90	57	0.684	4951	0.126	0.0741	
REC	21	90	57	0.684	5314	0.126	0.0796	Max CTOS
REC	22	90	57	0.684	4919	0.126	0.0737	
REC	23	90	57	0.683	4544	0.126	0.0682	
REC	24	90	57	0.684	4239	0.126	0.0634	
REC	25	90	57	0.684	3943	0.125	0.0591	
REC	26	90	57	0.684	3570	0.125	0.0534	
REC	27	90	57	0.684	3272	0.125	0.0490	
REC	28	90	57	0.684	2573	0.125	0.0386	
REC	29	90	57	0.684	1914	0.125	0.0287	
REC	30	90	57	0.684	1213	0.125	0.0182	
REC	31	90	0	0.684	625	0.000	0.0093	
REC	32	90	0	201	527	0.000	0.0625	
REC	33	90		SIM				static
REC	34	90		SIM				static
ZER	35	90		SIM				
CAL	36	90		SIM				

Table 7. TTR/699 Run Log (continued)

Run TR092RN107 11/9/2018 Acoustic BVI helicopter mode testing, yaw and thrust sweeps, 57 knots
Air Exchange Open 100%, Louver 7 Closed, 40x Mode

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
ZER	1	90		SIM				
CAL	2	90		SIM				AB
ZER	3	90		SIM				
CAL	4	90		SIM				
ZER	5	90		SIM				
CAL	6	90		SIM				
REC	7	90		SIM				
REC	8	90		SIM				
REC	9	90	0	201	448	0.000	0.0535	Rotating ref. point
REC	10	90	0	0.684	705	0.000	0.0105	Helicopter mode rpm; min thrust, watch blade loads - recirculation
REC	11	90	57	0.684	3258	0.126	0.0489	Min CTOS - trim to zero flapping
REC	12	80	58	0.684	3263	0.126	0.0490	
REC	13	80	57	0.684	4942	0.125	0.0741	
REC	14	82	57	0.684	4985	0.125	0.0748	
REC	15	84	57	0.684	4924	0.125	0.0740	
REC	16	86	57	0.684	4895	0.125	0.0735	
REC	17	88	58	0.684	4926	0.126	0.0740	
REC	18	89	58	0.684	4968	0.126	0.0746	
REC	19	90	58	0.684	4974	0.125	0.0746	
REC	20	91	57	0.684	4907	0.125	0.0737	
REC	21	92	57	0.684	4918	0.125	0.0737	
REC	22	93	57	0.684	4927	0.125	0.0740	
REC	23	94	57	0.684	4889	0.125	0.0734	
REC	24	95	58	0.684	4950	0.126	0.0743	
REC	25	96	58	0.684	4895	0.126	0.0735	
REC	26	97	58	0.684	4951	0.125	0.0742	
REC	27	98	57	0.684	4943	0.125	0.0741	
REC	28	99	58	0.684	4926	0.126	0.0740	
REC	29	100	58	0.684	4930	0.126	0.0740	
REC	30	90	58	0.684	1238	0.125	0.0186	
REC	31	90	58	0.684	2000	0.125	0.0300	
REC	32	90	58	0.684	2594	0.125	0.0389	
REC	33	90	58	0.684	3265	0.126	0.0490	
REC	34	90	58	0.684	3568	0.126	0.0536	
REC	35	90	58	0.684	3824	0.126	0.0574	
REC	36	90	58	0.684	4227	0.126	0.0634	
REC	37	90	58	0.684	4590	0.126	0.0689	
REC	38	90	58	0.684	4959	0.126	0.0745	Max CTOS
REC	39	90	58	0.684	1186	0.126	0.0178	
REC	40	90	58	0.684	3234	0.126	0.0486	
REC	41	90	0	0.684	527	0.000	0.0079	
REC	42	90	0	201	522	0.001	0.0630	
REC	43	90		SIM				static
REC	44	90		SIM				static
ZER	45	90		SIM				
CAL	46	90		SIM				

Table 7. TTR/699 Run Log (continued)

Run TR092RN108 11/13/2018 Airplane forward flight, 0 yaw, 569 rpm, 176, 212 knots

Air Exchange Open 100%, Louver 7 Closed, 40x Mode

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
ZER	1	0		SIM				
CAL	2	0		SIM				
ZER	3	0		SIM				
CAL	4	0		SIM				
ZER	5	0		SIM				
CAL	6	0		SIM				
REC	7	0		SIM				
REC	8	0		SIM				
REC	9	0	0	200	425	0.001	0.0484	Rotating ref. point
REC	10	0	7	0.684	705	0.016	0.0104	hover ref. point
REC	11	0	60	0.684	677	0.133	0.0101	Airplane mode rpm ref. point
REC	12	0	176	0.684	696	0.391	0.0108	Set cyclic for zero flapping; nominal fwd flight ref point
REC	13	0	176	0.683	986	0.391	0.0153	
REC	14	0	176	0.684	1323	0.391	0.0205	
REC	15	0	176	0.683	1638	0.390	0.0255	
REC	16	0	176	0.684	2091	0.391	0.0325	
REC	17	0	176	0.684	2341	0.390	0.0363	
REC	18	0	176	0.684	2744	0.391	0.0426	
REC	19	0	176	0.683	2896	0.391	0.0450	Max CTOS, Torque limited
REC	20	0	176	0.684	757	0.391	0.0117	
REC	21	0	212	0.685	780	0.468	0.0123	Set cyclic for zero flapping; nominal fwd flight ref point
REC	22	0	212	0.683	1032	0.469	0.0164	
REC	23	0	212	0.683	1511	0.469	0.0240	
REC	24	0	212	0.683	1807	0.470	0.0287	
REC	25	0	213	0.684	2100	0.470	0.0333	
REC	26	0	212	0.684	2173	0.469	0.0344	
REC	27	0	213	0.683	2438	0.471	0.0388	Max CTOS, Torque limited
REC	28	0	212	0.685	798	0.468	0.0126	
REC	29	0	61	0.684	695	0.133	0.0103	nominal fwd-flight ref. point
REC	30	0	210	0.685	968	0.463	0.0153	Set cyclic for zero flapping; nominal fwd flight ref point
REC	31	0	61	0.684	698	0.133	0.0104	nominal fwd flight ref. point
REC	32	0	15	0.684	3650	0.034	0.0541	hover ref. point
REC	33	0	8	200	349	0.047	0.0410	
REC	34	0		SIM				static
REC	35	0		SIM				static
ZER	36	0		SIM				
CAL	37	0		SIM				

Table 7. TTR/699 Run Log (continued)

Run TR092RN109 11/13/2018 Helicopter fwd flight, thrust sweeps, 569 rpm, 80-100 deg yaw, 57 knots
Air Exchange Open 100%, Louver 7 Closed, 40x Mode

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
ZER	1	90		SIM				
CAL	2	90		SIM				AB
ZER	3	90		SIM				
CAL	4	90		SIM				
ZER	5	90		SIM				
CAL	6	90		SIM				
REC	7	90		SIM				
REC	8	90		SIM				
REC	9	90	3	200	464	0.016	0.0546	Rotating ref. point
REC	10	90	3	0.684	669	0.007	0.0099	Helicopter mode rpm; min thrust, watch blade loads - recirculation
REC	11	90	57	0.684	3296	0.126	0.0490	Min CTOS - trim to zero flapping
REC	12	80	57	0.683	1336	0.125	0.0199	
REC	13	80	57	0.684	2017	0.126	0.0300	
REC	14	80	57	0.684	2579	0.126	0.0384	
REC	15	80	57	0.684	3311	0.126	0.0493	
REC	16	80	57	0.684	3641	0.125	0.0543	
REC	17	80	57	0.684	3916	0.125	0.0584	
REC	18	80	57	0.684	4294	0.126	0.0640	
REC	19	80	57	0.684	4610	0.126	0.0687	
REC	20	80	57	0.684	4938	0.126	0.0736	
REC	21	80	57	0.684	5351	0.126	0.0797	
REC	22	80	57	0.684	5615	0.126	0.0837	Max CTOS
REC	23	80	57	0.684	1257	0.126	0.0187	
REC	24	85	57	0.684	1241	0.126	0.0185	
REC	25	85	57	0.684	1937	0.126	0.0288	
REC	26	85	57	0.684	2700	0.126	0.0402	
REC	27	85	57	0.684	3308	0.126	0.0493	
REC	28	85	57	0.684	3645	0.126	0.0543	
REC	29	85	57	0.684	3994	0.126	0.0595	
REC	30	85	57	0.684	4342	0.126	0.0647	
REC	31	85	57	0.684	4654	0.125	0.0694	
REC	32	85	57	0.684	4932	0.125	0.0735	
REC	33	85	57	0.684	5372	0.125	0.0800	
REC	34	85	57	0.684	5640	0.125	0.0839	Max CTOS
REC	35	85	57	0.684	1284	0.126	0.0191	
REC	36	95	57	0.684	1317	0.125	0.0196	
REC	37	95	57	0.684	2008	0.125	0.0299	
REC	38	95	57	0.684	2625	0.125	0.0391	
REC	39	95	57	0.684	3259	0.125	0.0486	Max CTOS - Inboard spindle loads
REC	40	95	57	0.684	1323	0.125	0.0197	
REC	41	100	57	0.684	1301	0.126	0.0194	
REC	42	100	57	0.684	1909	0.125	0.0284	
REC	43	100	57	0.684	2649	0.125	0.0395	
REC	44	100	57	0.684	3311	0.125	0.0493	
REC	45	100	57	0.684	3641	0.125	0.0543	
REC	46	100	57	0.684	3988	0.125	0.0594	
REC	47	100	57	0.684	4307	0.125	0.0642	

Run TR092RN109 continued

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM/ M_{tip}	Thrust, lb	μ	C_T/σ	Notes
REC	48	100	57	0.684	4683	0.125	0.0698	
REC	49	100	57	0.684	4958	0.125	0.0739	
REC	50	100	57	0.684	5348	0.125	0.0797	
REC	51	100	57	0.684	5629	0.125	0.0839	Max CTOS
REC	52	95	57	0.684	4686	0.126	0.0699	Restarted 95 Deg from higher CTOS
REC	53	95	57	0.684	4993	0.126	0.0745	
REC	54	95	57	0.684	5253	0.126	0.0784	
REC	55	95	57	0.684	5673	0.126	0.0846	Max CTOS
REC	56	90	57	0.684	3301	0.125	0.0492	
REC	57	90	3	0.684	702	0.006	0.0104	
REC	58	90	4	200	530	0.028	0.0627	
REC	59	90		SIM				static
REC	60	90		SIM				static
ZER	61	90		SIM				
CAL	62	90		SIM				

Table 7. TTR/699 Run Log (continued)

Run TR092RN110 11/14/2018 Motor checkout (aft motors) & thrust sweeps, 478 & 569 rpm, wind off

Air Exchange Open 100%, Louver 7 Open, VS 6 in 80x Mode, VS 4 Closed, VS 3 Open

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM	Coll., deg	Thrust, lb	C_T/σ	Motor Current	Notes
ZER	1	0		SIM					
CAL	2	0		SIM					AB
ZER	3	0		SIM					
CAL	4	0		SIM					
ZER	5	0		SIM					
CAL	6	0		SIM					
REC	7	0		SIM					
REC	8	0		SIM					
REC	9	0	0	200	5	421	0.0498		
REC	10	0	15	565	6	4144	0.0615	200	
REC	11	0	21	564	10	6568	0.0978	300	
REC	12	0	24	565	13	8273	0.1232	400	
REC	13	0	27	564	15	9627	0.1437	500	
REC	14	0	27	565	16	10140	0.1510	535	
REC	15	0	17	565	6	4114	0.0612	200	
REC	16	0	16	565	5	3574	0.0532		
REC	17	0	17	564	7	4714	0.0703		
REC	18	0	19	564	9	5804	0.0865		
REC	19	0	21	565	11	6997	0.1043		
REC	20	0	23	564	13	8267	0.1233		
REC	21	0	25	565	14	8856	0.1320		
REC	22	0	26	565	15	9447	0.1404		
REC	23	0	27	565	16	10080	0.1501		
REC	24	0	26	564	15	9452	0.1410		
REC	25	0	25	564	14	8810	0.1315		
REC	26	0	25	565	13	8138	0.1212		
REC	27	0	22	565	11	6971	0.1038		
REC	28	0	20	565	9	5753	0.0857		
REC	29	0	18	564	7	4604	0.0687		
REC	30	0	16	565	5	3564	0.0530		
REC	31	0	13	481	5	2548	0.0522		
REC	32	0	14	481	7	3358	0.0688		
REC	33	0	15	481	9	4189	0.0858		
REC	34	0	18	481	11	5004	0.1028		
REC	35	0	20	481	13	5884	0.1206		
REC	36	0	21	481	14	6334	0.1297		
REC	37	0	21	481	15	6745	0.1385		
REC	38	0	23	481	16	7138	0.1463		
REC	39	0	23	481	17	7658	0.1573		
REC	40	0	24	481	18	8008	0.1644		
REC	41	0	24	481	19	8488	0.1742		
REC	42	0	25	481	20	8786	0.1804		
REC	43	0	25	481	19	8409	0.1725		
REC	44	0	24	481	18	8034	0.1650		
REC	45	0	23	481	17	7625	0.1566		
REC	46	0	23	481	16	7091	0.1456		
REC	47	0	22	481	15	6714	0.1380		
REC	48	0	21	481	14	6255	0.1284		
REC	49	0	20	481	13	5823	0.1195		

Run TR092RN110

Point Type	Data Point	Yaw, deg	VKTS	Rotor RPM	Coll., deg	Thrust, lb	C_T/σ	Motor Current	Notes
REC	50	0	18	481	11	4997	0.1025		
REC	51	0	17	481	9	4121	0.0846		
REC	52	0	16	481	7	3278	0.0672		
REC	53	0	13	481	5	2582	0.0530		
REC	54	0	7	200	5	343	0.0406		
REC	55	0		SIM					
REC	56	0		SIM					static
ZER	57	0		SIM					
CAL	58	0		SIM					

Table 7. TTR/699 Run Log (concluded)

Run TR092RN111 11/06/2018 Yaw sweep, q=75 psf, both aft motors

Aerotares: Blades Off, Exposed (Taped) Hub Yoke Bearings

Point Type	Data Point	Yaw, deg	Rotor RPM	q, psf	Notes
ZER	1	0	SIM	0	
CAL	2	0	SIM	0	AB
ZER	3	0	SIM	0	
CAL	4	0	SIM	0	
REC	5	0	SIM	0	STATIC
REC	6	0	129	0	RPM changed during point
REC	7	0	100	0	repeat point
REC	8	0	201	0	
REC	9	0	300	0	
REC	10	0	401	0	
REC	11	0	478	0	
REC	12	0	570	0	
REC	13	0	569	75	
REC	14	15	570	76	
REC	15	30	569	75	
REC	16	45	569	76	
REC	17	60	570	76	
REC	18	63	570	75	
REC	19	65	569	75	
REC	20	67	569	75	
REC	21	69	569	76	
REC	22	71	569	75	
REC	23	73	569	75	
REC	24	75	569	75	
REC	25	77	569	75	
REC	26	80	570	75	
REC	27	0	570	0	
REC	28	0	SIM	0	STATIC
ZER	29	0	SIM	0	
CAL	30	0	SIM	0	AB

Instrumentation and Derived Parameters

Rotor research data are cooperatively processed by NFAC and NASA data systems. The NFAC acquires the data and provides real-time displays of critical operational and Safety of Flight (SOF) data (Reference 14). The NASA Rotor Database Management System (RDMS) performs post-run data processing, including per-revolution windowing and resampling; computes filtered time histories, derived parameters, statistics, and spectra; and stores the data in a network-accessible database.

The NFAC data system includes multiple data streams with different capabilities (Reference 14; see also Reference 1). For each parameter, the effective bandwidth depends on the data system. Rotor data are typically stored at 256/rev sample rate (BDAS data), whereas most operating conditions and diagnostics data are stored at lower sample rates (SDAS data). Derived parameters may use data from more than one data channel,

TTR/699 data parameters are listed in a series of tables below, organized by data type: operating conditions, rotor balance, rotor coefficients, etc. The information is generally the same as is available in the RDMSClient application and Reference 15. The tables given here are intended to simplify searching by collecting nearly all parameter descriptions in one document. Organization of the tables is informed in part by the structure of the RDMS database.

The TTR rotor balance is critical for rotor research. It is described in some detail in a separate section, “Rotor Balance System.” A brief overview of other available data is given immediately below, followed by the data tables.

Table 8, Instrumentation, lists directly measured data; the table notes the data stream used for each item. Table 9 lists Derived Parameters; that is, parameters that depend upon other data or that require special calibration and scaling. Table 10 lists Rotor Coefficients, a special case of Derived Parameters for which all items are non-dimensional. Table 10 also includes non-dimensional velocities. Table 11 lists Wall Pressure measurements. Two tables, Run Parameters (Table 12) and Point Parameters (Table 13), list data status parameters, such as date and time or the number of samples in a data point.

For derived parameters, the traditional NFAC naming convention can be confusing. In particular, “net” may mean either a vector sum of orthogonal loads or the vibratory (peak-to-peak) component with mean values subtracted. In a few cases, both interpretations apply. Derived parameters may also use data from more than one data stream with different sample rates. Consult Reference 15 for relevant equations.

Microphone data were recorded and stored separately from other TTR data because of the high frequency range required. They are the only parameters that use the DDAS data system. See Reference 7 for details.

Several items appear in more than one table, either to group similar items together, such as tunnel operating conditions, or because a derived parameter is a minor variation on an instrumentation item, such as a change of units.

“Selectable” items are a special case (Table 8). The NFAC data system allows switching between different inputs in case a critical channel should fail mid-run. Manual data entry is also possible. Selectable items are not uniquely associated with any data system.

In order to maintain consistent software, a few items were carried over from earlier tests even when they were not used for TTR or were always zero. In particular, PHI and BETA are irrelevant for TTR, and PSI is replaced by TT_YAW_C. Provisions were made for an anemometer (ANAMOM) but it was never installed.

Several parameters are derived specifically for real-time SOF monitoring but are not stored in the RDMS database nor are they listed here. In other documents, primarily Reference 15, they are denoted by "_SOF" appended to the item name (“tagname”).

The reader is cautioned not to over-interpret the organization and labelling of the TTR/699 database. RDMS was originally built for different rotor systems with different test requirements and adapted for TTR/699. An important consideration was to minimize software changes, sometimes at the expense of strict consistency. For example, IROTOR would rationally be a Run Parameter, but is conventionally listed as a Point Parameter.

Table 8. TTR/699 RDMS Instrumentation

Tagname	Description	Type	Units	Data Acquisition System					
				SDAS	BDAS	DDAS	SOFDAS	Derived	Virtual SOFDAS
	Rotor Azimuth								
AZRAMP_B1M	Sawtooth waveform synchronized to 1/rev; master		volts		√		√		
DataAlign_B1M	Revolution step-counter; master		volts		√		√		
AZRAMP_B1	Sawtooth waveform synchronized to 1/rev; B1 crate		volts		√				
DataAlign_B1	Revolution step-counter; B1 crate		volts		√				
AZRAMP_B2	Sawtooth waveform synchronized to 1/rev; B2 crate		volts		√				
DataAlign_B2	Revolution step-counter; B2 crate		volts		√				
	Rotor Blade								
REDB_STA32BB	Red Blade station 32.00 beam bending	1KΩ Bridge	in-lb		√		√		
REDB_STA32CB	Red Blade station 32.00 chord bending	1KΩ Bridge	in-lb		√		√		
REDB_STA58BB	Red Blade station 58.5 beam bending	1KΩ Bridge	in-lb		√		√		
REDB_STA58CB	Red Blade station 58.5 chord bending	1KΩ Bridge	in-lb		√		√		
REDB_STA70BB	Red Blade station 70.0 beam bending	1KΩ Bridge	in-lb		√		√		
REDB_STA70CB	Red Blade station 70.0 chord bending	1KΩ Bridge	in-lb		√		√		
REDB_STA70TO	Red Blade station 70.0 torsion	1KΩ Bridge	in-lb		√		√		
REDB_STA90BB	Red Blade station 90.0 beam bending	1KΩ Bridge	in-lb		√		√		
REDB_STA90CB	Red Blade station 90.0 chord bending	1KΩ Bridge	in-lb		√		√		
REDB_STA117BB	Red Blade station 117.0 beam bending	1KΩ Bridge	in-lb		√		√		
REDB_STA117CB	Red Blade station 117.0 chord bending	1KΩ Bridge	in-lb		√		√		
REDB_STA117TO	Red Blade station 117.0 torsion	1KΩ Bridge	in-lb		√		√		
	Hub & Yoke								
HB_ACCELX	X-Axis accelerometer in the instrumentation hat	piezoelectric	g		√		√		
HB_ACCELY	Y-Axis accelerometer in the instrumentation hat	piezoelectric	g		√		√		
HB_ACCELZ	Z-Axis accelerometer in the instrumentation hat	piezoelectric	g		√		√		
HB_PRESS	Pressure transducer in the instrumentation hat	350Ω Bridge	psia		√				
REDINBDSPNDL_BS	Red inboard spindle beam shear	500Ω Bridge	lb		√		√		
REDINBDSPNDL_CS	Red inboard spindle chord shear	500Ω Bridge	lb		√		√		
REDOTBDSPNDL_BS	Red outboard spindle beam shear	500Ω Bridge	lb		√		√		
REDOTBDSPNDL_CS	Red outboard spindle chord shear	500Ω Bridge	lb		√		√		
REDDL_AX	Red drive link axial load	1KΩ Bridge	lb		√		√		

Table 8. TTR/699 RDMS Instrumentation (continued)

Tagname	Description	Type	Units	Data Acquisition System					
				SDAS	BDAS	DDAS	SOFDAS	Derived	Virtual SOFDAS
GRNPTCHLK_AX	Green pitch link axial load	1KΩ Bridge	lb		√		√		
REDPTCHLK_AX	Red pitch link axial load	1KΩ Bridge	lb		√		√		
WHTPTCHLK_AX	White pitch link axial load	1KΩ Bridge	lb		√		√		
REDY_STA12BB_M	Red yoke sta 12.75 beam bending	1KΩ Bridge	in-lb		√		√		
REDY_STA12CB_M	Red yoke sta 12.75 chord bending	1KΩ Bridge	in-lb		√		√		
REDY_STA12BB	Red yoke beam bending, station 12.75, coupled calibration	1KΩ Bridge	in-lb					√	
REDY_STA12CB	Red yoke chord bending, station 12.75, coupled calibration	1KΩ Bridge	in-lb					√	
REDY_STA17BB	Red yoke sta 17.5 beam bending	1KΩ Bridge	in-lb		√		√		
REDY_STA17CB	Red yoke sta 17.5 chord bending	1KΩ Bridge	in-lb		√		√		
	Mast Strain								
MST_STA11PLB	Mast bending parallel sta 11.25 (in line with master spline)	1KΩ Bridge	in-lb		√		√		
MST_STA11PRPB	Mast bending perp sta 11.25 (90° out from master spline)	1KΩ Bridge	in-lb		√		√		
MST_STA11STRS	Mast sta 11.25 stress		psi					√	√
MST_STA11STRS_V	Net vibratory stress mast sta 11.25		psi					√	√
MST_STA16PLB	Mast bending parallel sta 16.85 (in line with master spline)	1KΩ Bridge	in-lb		√		√		
MST_STA16PRPB	Mast bending perp sta 16.85 (90° out from master spline)	1KΩ Bridge	in-lb		√		√		
MST_STA16STRS	Mast sta 16.85 stress		psi					√	√
MST_STA16STRS_V	Net vibratory stress mast sta 16.85		psi					√	√
MST_STA40PLB	Mast bending parallel sta 40.5 (in line with master spline)	1KΩ Bridge	in-lb		√		√		
MST_STA40PRPB	Mast bending perp sta 40.5 (90° out from master spline)	1KΩ Bridge	in-lb		√		√		
MST_STA11TO	Mast torque sta 11.25	1KΩ Bridge	in-lb		√		√		
MST_STA12TO_B1	Mast torque sta 12.25 A	1KΩ Bridge	in-lb		√		√		
MST_STA12TO_B2	Mast torque sta 12.25 B	1KΩ Bridge	in-lb		√		√		
	Hub Temperature								
HBSPRG_TEMP_WHT	Hub spring temp thermocouple (aligned with the white blade)	T-type	deg F		√				√
HBSPRG_TEMP_GRN	Hub spring temp thermocouple (aligned with the green blade)	T-type	deg F		√				√
HBSPRG_TEMP_RED	Hub spring temp thermocouple (aligned with the red blade)	T-type	deg F		√				√
HBSPRG_TEMP_RD_RTD	Hub spring temp RTD (aligned with the red blade)	100Ω platinum	deg C		√				√
CFBRNG_REDY_RTD	CF bearing temp RTD on red yoke	100Ω platinum	deg C		√				√
CFBRNG_REDY_RTD_180	CF bearing temp RTD on red yoke, 180° from RDT 1	100Ω platinum	deg C		√				√

Table 8. TTR/699 RDMS Instrumentation (continued)

Tagname	Description	Type	Units	Data Acquisition System					
				SDAS	BDAS	DDAS	SOFDAS	Derived	Virtual SOFDAS
	Spinner Support								
SPUPRSPRT_STA6BB	Spinner upper support beam bending at sta 5.97 red spoke	1KΩ Bridge	in-lb		√				
SPUPRSPRT_STA6CB	Spinner upper support chord bending at sta 5.97 red spoke	1KΩ Bridge	in-lb		√				
SPUPRSPRT_STA9TO_M	Spinner upper support torsion at sta 9.0 red spoke	1KΩ Bridge	in-lb		√				
SPUPRSPRT_STA9TO	Spinner upper support torsion at station 9.0, coupled calibration		in-lb					√	
AX_LD_B1	Primary axial load (beam bending green spoke)	1KΩ Bridge	lb		√				
AX_LD_B2	Secondary axial load (beam bending white spoke)	1KΩ Bridge	lb		√				
SPUPRSPRT_WHTTOR	Spinner upper support torsion at sta 9.0 white spoke	1KΩ Bridge	volts		√				
SPUPRSPRT_WHTCB	Spinner upper support chord bending at sta 5.97 white spoke	1KΩ Bridge	volts		√				
SPUPRSPRT_GRNTOR	Spinner upper support torsion at sta 9.0 green spoke	1KΩ Bridge	volts		√				
SPUPRSPRT_GRNCB	Spinner upper support chord bending at sta 5.97 green spoke	1KΩ Bridge	volts		√				
SPLWRSPRT_STA5BB	Spinner lower support beam bending at sta 5 red spoke	1KΩ Bridge	in-lb		√				
SPLWRSPRT_STA5CB	Spinner lower support chord bending at sta 5 red spoke	1KΩ Bridge	in-lb		√				
SPLWRSPRT_STA8TO	Spinner lower support torsion at sta 8.5 red spoke	1KΩ Bridge	in-lb		√				
	Swashplate								
SWDR_SHEAR	Swashplate driver bracket shear 90 azimuth (bending gage)	1KΩ Bridge	lb		√		√		
SWANTDR_SHEAR_M	Anti-drive link shear force, measured	1KΩ Bridge	lb		√		√		
SWANTDR_SHEAR	Anti-drive link shear force, accounting for bi-directional slopes	1KΩ Bridge	lb					√	
SWTB_LATB	Swashplate support tube lateral bending	1KΩ Bridge	in-lb		√		√		
SWTB_FAB	Swashplate support tube F/A bending	1KΩ Bridge	in-lb		√		√		
CTRL_ACT_A_AX	Swashplate actuator rod end A	300Ω Bridge	lb		√		√		
CTRL_ACT_B_AX	Swashplate actuator rod end B	300Ω Bridge	lb		√		√		
CTRL_ACT_C_AX	Swashplate actuator rod end C	300Ω Bridge	lb		√		√		
SWASHPLATE0AZ_M	Thermocouple close to the stationary race at 0° azimuth	Type T	deg F	√					
SWASHPLATE180AZ_M	Thermocouple close to the stationary race at 180° azimuth	Type T	deg F	√					
SWASHPLATE0AZ	Swashplate temperature in deg C (LXI T/C scanner)	Type T	deg C					√	√
SWASHPLATE180AZ	Swashplate temperature in deg C (LXI T/C scanner)	Type T	deg C					√	√
	Support Struts								
STBD_AF_B1	Starboard strut axial force primary	350Ω Bridge	in-lb		√				
STBD_AF_B2	Starboard strut axial force back-up	350Ω Bridge	in-lb		√				
STBD_SF_B1	Starboard strut side force primary	350Ω Bridge	in-lb		√				

Table 8. TTR/699 RDMS Instrumentation (continued)

Tagname	Description	Type	Units	Data Acquisition System					
				SDAS	BDAS	DDAS	SOFDAS	Derived	Virtual SOFDAS
STBD_SF_B2	Starboard strut side force back-up	350Ω Bridge	in-lb		√				
PORT_AF_B1	Port strut axial force primary	350Ω Bridge	in-lb		√				
PORT_AF_B2	Port strut axial force back-up	350Ω Bridge	in-lb		√				
PORT_SF_B1	Port strut side force primary	350Ω Bridge	in-lb		√				
PORT_SF_B2	Port strut side force back-up	350Ω Bridge	in-lb		√				
NOSE_AF_B1	Nose strut axial force primary	350Ω Bridge	in-lb		√				
NOSE_AF_B2	Nose strut axial force back-up	350Ω Bridge	in-lb		√				
NOSE_SF_B1	Nose strut side force primary	350Ω Bridge	in-lb		√				
NOSE_SF_B2	Nose strut side force back-up	350Ω Bridge	in-lb		√				
	Microphones								
MIC1	Free field microphone #1		pascal			√			
MIC2	Free field microphone #2		pascal			√			
MIC3	Surface microphone #1		pascal			√			
MIC4	Surface microphone #2		pascal			√			
	Control Console								
ACT_A_D	Primary LVDT on actuator A	LVDT	in		√		√		
ACT_B_D	Primary LVDT on actuator B	LVDT	in		√		√		
ACT_C_D	Primary LVDT on actuator C	LVDT	in		√		√		
RB_PITCH	Red blade pitch angle potentiometer, wire to blue console	5K pot.	deg		√		√		
HB_FLAP_RB	Hub flap angle, red blade		deg					√	
HB_FLAP_RB_M	Hub flapping 1 (180° from red blade, wire to blue console)	RVDT	deg		√		√		
NREV	Encoder pulse A	4096/rev			√				
NREV_90	Encoder pulse B (90 degree shift)	4096/rev			√				
1REV	Encoder index 1/rev		1/rev		√				
ACT_A_DB	Secondary LVDT on actuator A	LVDT	in		√		√		
ACT_B_DB	Secondary LVDT on actuator B	LVDT	in		√		√		
ACT_C_DB	Secondary LVDT on actuator C	LVDT	in		√		√		
GB_PITCH	Green blade pitch angle potentiometer, wire to white console	5K pot.	deg		√		√		
HB_FLAP_GRNB	Hub flapping angle, green blade		deg					√	
HB_FLAP_GRNB_M	Hub flapping 2, 180° from green blade, wire to white console	RVDT	deg		√		√		
RPM	Rotor revolutions per minute		RPM	√	√		√		

Table 8. TTR/699 RDMS Instrumentation (continued)

Tagname	Description	Type	Units	Data Acquisition System					
				SDAS	BDAS	DDAS	SOFDAS	Derived	Virtual SOFDAS
	Flex-coupling								
FCTQ_B1	Primary flex-coupling torque readings	350Ω Bridge	volts		√		√		
FCTQ_B2	Back-up flex-coupling torque readings	350Ω Bridge	volts		√		√		
FCTH_B1	Primary flex-coupling residual thrust readings	350Ω Bridge	volts		√		√		
FCTH_B2	Back-up flex-coupling residual thrust readings	350Ω Bridge	volts		√		√		
T_FC_TT1	Flex-coupling temperature torque tube 1	RTD	deg F		√				
T_FC_TT2	Flex-coupling temperature torque tube 2	RTD	deg F		√				
T_FC_DIA1	Flex-coupling temperature diameter 1	RTD	deg F		√				
T_FC_DIA2	Flex-coupling temperature diameter 2	RTD	deg F		√				
	Rotor Balance Strain								
AF000_B1	Primary axial force, 0˚ flexure	5KΩ Bridge	volts		√		√		
AF090_B1	Primary axial force, 90˚ flexure	5KΩ Bridge	volts		√		√		
AF180_B1	Primary axial force, 180˚ flexure	5KΩ Bridge	volts		√		√		
AF270_B1	Primary axial force, 270˚ flexure	5KΩ Bridge	volts		√		√		
SF000_B1	Primary side force, 0˚ flexure	5KΩ Bridge	volts		√		√		
SF090_B1	Primary side force, 90˚ flexure	5KΩ Bridge	volts		√		√		
SF180_B1	Primary side force, 180˚ flexure	5KΩ Bridge	volts		√		√		
SF270_B1	Primary side force, 270˚ flexure	5KΩ Bridge	volts		√		√		
NF000_B1	Primary normal force, 0˚ flexure	5KΩ Bridge	volts		√		√		
NF090_B1	Primary normal force, 90˚ flexure	5KΩ Bridge	volts		√		√		
NF180_B1	Primary normal force, 180˚ flexure	5KΩ Bridge	volts		√		√		
NF270_B1	Primary normal force, 270˚ flexure	5KΩ Bridge	volts		√		√		
AF000_B2	Back-up axial force, 0˚ flexure	5KΩ Bridge	volts		√		√		
AF090_B2	Back-up axial force, 90˚ flexure	5KΩ Bridge	volts		√		√		
AF180_B2	Back-up axial force, 180˚ flexure	5KΩ Bridge	volts		√		√		
AF270_B2	Back-up axial force, 270˚ flexure	5KΩ Bridge	volts		√		√		
SF000_B2	Back-up side force, 0˚ flexure	5KΩ Bridge	volts		√		√		
SF090_B2	Back-up side force, 90˚ flexure	5KΩ Bridge	volts		√		√		
SF180_B2	Back-up side force, 180˚ flexure	5KΩ Bridge	volts		√		√		
SF270_B2	Back-up side force, 270˚ flexure	5KΩ Bridge	volts		√		√		
NF000_B2	Back-up normal force, 0˚ flexure	5KΩ Bridge	volts		√		√		
NF090_B2	Back-up normal force, 90˚ flexure	5KΩ Bridge	volts		√		√		

Table 8. TTR/699 RDMS Instrumentation (continued)

Tagname	Description	Type	Units	Data Acquisition System					
				SDAS	BDAS	DDAS	SOFDAS	Derived	Virtual SOFDAS
NF180_B2	Back-up normal force, 180˚ flexure	5KΩ Bridge	volts		√		√		
NF270_B2	Back-up normal force, 270˚ flexure	5KΩ Bridge	volts		√		√		
	Rotor Balance Temperature								
T_B000_MR	Metric ring balance temperature, 0˚ station	Type T	deg F	√	√				
T_B000_MP	Metric post balance temperature, 0˚ station	Type T	deg F	√	√				
T_B000_GP	Ground ring balance temperature, 0˚ station	Type T	deg F	√	√				
T_B000_GR	Ground post balance temperature, 0˚ station	Type T	deg F	√	√				
T_B045_MR	Metric ring balance temperature, 45˚ station	Type T	deg F	√	√				
T_B045_GR	Ground ring balance temperature, 45˚ station	Type T	deg F	√	√				
T_B090_MR	Metric ring balance temperature, 90˚ station	Type T	deg F	√	√				
T_B090_MP	Metric post balance temperature, 90˚ station	Type T	deg F	√	√				
T_B090_GP	Ground ring balance temperature, 90˚ station	Type T	deg F	√	√				
T_B090_GR	Ground post balance temperature, 90˚ station	Type T	deg F	√	√				
T_B135_MR	Metric ring balance temperature, 135˚ station	Type T	deg F	√	√				
T_B135_GR	Ground ring balance temperature, 135˚ station	Type T	deg F	√	√				
T_B180_MR	Metric ring balance temperature, 180˚ station	Type T	deg F	√	√				
T_B180_MP	Metric post balance temperature, 180˚ station	Type T	deg F	√	√				
T_B180_GP	Ground ring balance temperature, 180˚ station	Type T	deg F	√	√				
T_B180_GR	Ground post balance temperature, 180˚ station	Type T	deg F	√	√				
T_B225_MR	Metric ring balance temperature, 225˚ station	Type T	deg F	√	√				
T_B225_GR	Ground ring balance temperature, 225˚ station	Type T	deg F	√	√				
T_B270_MR	Metric ring balance temperature, 270˚ station	Type T	deg F	√	√				
T_B270_MP	Metric post balance temperature, 270˚ station	Type T	deg F	√	√				
T_B270_GP	Ground ring balance temperature, 270˚ station	Type T	deg F	√	√				
T_B270_GR	Ground post balance temperature, 270˚ station	Type T	deg F	√	√				
T_B315_MR	Metric ring balance temperature, 315˚ station	Type T	deg F	√	√				
T_B315_GR	Ground ring balance temperature, 315˚ station	Type T	deg F	√	√				

Table 8. TTR/699 RDMS Instrumentation (continued)

Tagname	Description	Type	Units	Data Acquisition System: SDAS	BDAS	DDAS	SOFDAS	Derived	Virtual SOFDAS
	Test Section Conditions								
ALPHA	Shaft tilt in wind tunnel axes (selectable) [= TT_YAW_C−90]		deg					√	
ALPHA_SEL	Shaft tilt input flag								
ALPHA_ANA	Shaft pitch angle [unreliable]		deg		√				
ALPHA_INP	Shaft pitch angle, manual input		deg						
ANAMOM	Tunnel speed (anemometer) [not used]								
BARO	Barometric pressure (selectable)		psia					√	
BARO_SEL	Barometric pressure input flag								
BARO_ANA_B	Barometric pressure (analog from Edwards Barocel)		psia	√	√				
BARO_ANA_M	Barometric pressure (analog from Mensor 2500)		psia		√		√		
BARO_DIG	Barometric pressure (digital from Mensor 14500)		psia	√	√				
BARO_DIG_M25	Barometric pressure (digital from Mensor 2500)		psia	√	√				
BARO_INP	Barometric pressure from factor table		psia					√	
BDAS_TIME	BDAS sample time [rarely used]		msec					√	
DDAS_TIME	DDAS sample time [rarely used]		msec					√	
SDAS_TIME	SDAS sample time [rarely used]		msec					√	
BETA	Sideslip angle (selectable) [not used]		deg						
BETA_SEL	Sideslip angle input flag								
BETA_ANA	Sideslip angle [unreliable]		deg			√			
BETA_INP	Sideslip angle, manual input		deg						
DELPTR	Total pressure correction		psf					√	
DPRS	Differential pressure (static *q*)							√	
DPRS_SEL	Differential pressure (static *q*) input flag								
DPRS_ANA_M	Differential pressure (static *q*) (analog from Mensor 2500)		psf		√				
DPRS_DIG_M	Differential pressure (static *q*) (digital from Mensor 15000)		psf	√	√				

Table 8. TTR/699 RDMS Instrumentation (continued)

Tagname	Description	Type	Units	Data Acquisition System					
				SDAS	BDAS	DDAS	SOFDAS	Derived	Virtual SOFDAS
DPRS_DIG_M25	Differential pressure (static q) (analog from Mensor 2500)		psf	√	√				
DPRS_INP	Differential pressure (static q) from factor table							√	
DPT	Dew point temperature (selectable)		deg F					√	
DPT_SEL	Dew point temperature input flag								
HUM_DPT_ANA	Dew point temperature (analog from Vaisala humidity meter)		deg F	√	√				
HUM_DPT_DIG	Dew point temperature (digital from Vaisala humidity meter)		deg F	√	√				
HUM_DPT_INP	Dew point temperature, manual input		deg F					√	
DQSP	Static plate correction		psf					√	
PA	Atmospheric pressure at tunnel centerline		psfa					√	
PHI	Roll angle (selectable) [not used]		deg						
PHI_ANA	Roll angle (positive starboard down) [unreliable]		deg		√				
PR	Tunnel reference ring pressure (selectable)		psf					√	
PR_SEL	Tunnel reference ring pressure input flag								
PR_ANA_B	Tunnel reference ring pressure (analog from Edwards Barocel)		psf		√		√		
PR_ANA_M	Tunnel reference ring pressure (analog from Mensor 2500)		psf		√				
PR_DIG	Tunnel reference ring pressure (digital from Mensor 2500)		psf	√	√				
PR_INP	Tunnel reference ring pressure, manual input		psf					√	
PSI	Yaw angle (selectable) [use TT_YAW_C]								
PSI_ANA	Yaw angle, positive clockwise looking down [unreliable]		deg		√				
PSREF	Tunnel static ring reference pressure (selectable)		psf					√	
PSREF_SEL	Tunnel static ring reference pressure input flag								
PSREF_ANA_B	Tunnel static reference pressure (analog from Edwards Barocel)		psf		√				
PSREF_ANA_M	Tunnel static reference pressure (analog from Mensor 2500)		psf		√				
PSREF_DIG	Tunnel static reference pressure (digital from Mensor 2500)		psf	√	√				
PSREF_INP	Tunnel static reference pressure, manual input		psf					√	
PS	Static pressure at tunnel centerline		psfa					√	
PT	Total pressure at tunnel centerline		psfa					√	

Table 8. TTR/699 RDMS Instrumentation (concluded)

Tagname	Description	Type	Units	Data Acquisition System					
				SDAS	BDAS	DDAS	SOFDAS	Derived	Virtual SOFDAS
Q	Corrected tunnel dynamic pressure		psf					√	
Q_SEL	Corrected tunnel dynamic pressure input flag								
QCLU	Uncorrected dynamic pressure at tunnel centerline		psf					√	
QU	Uncorrected dynamic pressure at ring locations		psf					√	
QU_SEL	Uncorrected dynamic pressure input flag								
TTF	Tunnel total temperature (selectable)		deg F					√	
TTF_SEL	Tunnel total temperature input flag								
TTF_ANA	Tunnel total temperature (analog from Fluke Black Stack 1560)		deg F		√		√		
TTF_DIG	Tunnel total temperature (digital from Fluke Black Stack 1560)		deg F	√	√				
TTF_ANA_SP	Tunnel total temperature from Fluke 1560 (analog, spare)		deg F		√				
TTF_INP	Tunnel total temperature, manual input		deg F					√	
TTR	Tunnel total temperature (Rankine)		deg R					√	
TT_YAW	Yaw angle (selectable)		deg					√	
TT_YAW_SEL	Yaw angle input flag								
TT_YAW_ANA	Yaw angle (analog source) [unreliable]		deg		√				
TT_YAW_DIG	Yaw angle (digital source)		deg	√					
TT_YAW_INP	Yaw angle, manual input		deg					√	
TT_YAW_C	Corrected yaw angle, + CW looking down, 0 deg pointing upstream		deg					√	

The support struts have two sets of strain gages, labeled “B1” and “B2”. The gage set used is appended to each strut load parameter.

Table 9. TTR/699 Derived Parameters

Tagname	Description	Units
	Operating Conditions	
ALPHA	Shaft tilt in wind tunnel axes, positive clockwise looking down	deg
CALPHA_B3	Corrected angle of attack	deg
CALPHA_B4	Corrected angle of attack	deg
CONSTF	Normalization factor for force parameters	lb
CONSTM	Normalization factor for moment parameters	ft-lb
CONSTP	Normalization factor for power parameters	ft-lb/sec
DALPHA_B3	Correction offset for angle of attack	deg
DALPHA_B4	Correction offset for angle of attack	deg
DELPTR	Total pressure correction	psf
DQSP	Static plate correction	lb/ft^2
MAT	Rotor advancing tip Mach number	N/D
MTIP	Hover tip Mach number	N/D
MTUN	Tunnel Mach number	N/D
MU	Rotor advance ratio (helicopter mode)	N/D
MUAT	Rotor advancing tip advance ratio	N/D
MUX	Inplane advance ratio (helicopter mode)	N/D
MUY	Lateral advance ratio	N/D
MUZ	Axial advance ratio (airplane mode)	N/D
OMR	Rotor tip speed	ft/s
PA	Atmospheric pressure at tunnel centerline	psfa
PS	Static pressure at tunnel centerline	psf
PT	Total pressure at tunnel centerline	psf
Q	Corrected tunnel dynamic pressure	psf
QCLU	Uncorrected dynamic pressure at tunnel centerline	psf
QU	Uncorrected dynamic pressure at ring locations	psf
REYN	Reynolds number	$10^6/ft$
RH	Test section relative humidity	%
RHO	Air density	$slug/ft^3$
TSF	Tunnel static temperature in deg F	deg F
TSR	Tunnel static temperature in deg R	deg R
TTR	Tunnel total temperature in deg R	deg R
TT_YAW_C	Corrected yaw angle, + CW looking down, 0 deg pointing upstream	deg

Table 9. TTR/699 Derived Parameters (continued)

Tagname	Description	Units
VFPS	Tunnel speed	ft/sec
VISC	Tunnel air viscosity	slug/ft-sec
VKTS	Tunnel speed	knots
VPDB	Test section dry bulb vapor pressure	psf
VPDP	Test section dew point vapor pressure	psf
	Rotor & Hub	
A1	Lateral cyclic pitch angle (positive leading edge down at 0-deg azimuth)	deg
A1B	Lateral cyclic pitch angle (backup)	deg
B1	Longitudinal cyclic pitch angle (positive leading edge down at 90-deg azimuth)	deg
B1B	Longitudinal cyclic pitch angle (backup)	deg
		lb
AF_BD_PR	Axial force from stationary control loads	lb
AF_BD_SH_A	Weight and aero tare corrected shaft axial force (positive starboard)	lb
AF_BD_SH_B	Weight and aero tare corrected shaft axial force (backup, positive starboard)	lb
AF_BD_SP	Axial force from swashplate weight	lb
		in-lb
COLL	Collective angle	deg
COLLB	Collective angle (backup)	deg
HB_FLAP_RB	Hub flap angle, red blade	deg
HB_FLAP_GRNB	Hub flapping angle, green blade	deg
IROTOR	Rotor configuration	N/D
LATGIM_GF	Gimbal lateral flap angle, green blade, fixed system	deg
LATGIM_RF	Gimbal lateral flap angle, red blade, fixed system	deg
LNGGIM_GF	Gimbal longitudinal flap angle, green blade, fixed system	deg
LNGGIM_RF	Gimbal longitudinal flap angle, red blade, fixed system	deg
MM_PRESS_FORCE	Mast module axial force from internal pressure, positive in NF direction	lb
MST_STA11STRS	Mast station 11.25 stress	psi
MST_STA11STRS_V	Net vibratory stress mast station 11.25	psi
MST_STA16STRS	Mast station 16.85 stress	psi
MST_STA16STRS_V	Net vibratory stress mast station 16.85	psi
NF_BD_PL	Normal force from pitch link loads	lb
NF_BD_PR	Normal force from stationary control loads	lb
PM_BD_PL	Pitching moment from pitch link loads	ft-lb
PM_BD_PR	Pitching moment from stationary control loads	ft-lb
PM_BD_SH_A	Weight and aero tare corrected shaft pitching moment (+ nose right)	ft-lb
PM_BD_SH_B	Weight and aero tare corrected shaft pitching moment (backup, + nose right)	ft-lb
PM_BD_SP	Pitching moment from swashplate weight	ft-lb

Table 9. TTR/699 Derived Parameters (continued)

Tagname	Description	Units
REDY_STA12BB	Red yoke beam bending, station 12.75, coupled calibration	in-lb
REDY_STA12CB	Red yoke chord bending, station 12.75, coupled calibration	in-lb
RM_BD_PL	Rolling moment from pitch link loads	ft-lb
RM_BD_PR	Rolling moment from stationary control loads	ft-lb
RM_BD_SH_A	Weight and aero tare corrected shaft rolling moment (+ nose down)	ft-lb
RM_BD_SH_B	Weight and aero tare corrected shaft rolling moment (backup, + nose down)	ft-lb
RM_BD_SP	Rolling moment from swashplate weight	ft-lb
ROTF1	Rotating force parallel to master spline	lb
ROTF2	Rotating force perpendicular to master spline	lb
ROTM1	Rotating moment parallel to master spline	ft-lb
ROTM1PL	Rotating moment 1 from pitch link loads	ft-lb
ROTM2	Rotating moment perpendicular to master spline	ft-lb
ROTM2PL	Rotating moment 2 from pitch link loads	ft-lb
SF_BD_PR	Side force from stationary control loads	lb
SF_BD_SH_A	Weight and aero tare corrected shaft side force (positive down)	lb
SF_BD_SH_B	Weight and aero tare corrected shaft side force (backup, positive down)	lb
SF_BD_SP	Side force from swashplate weight	lb
SPCOLL	Swashplate collective position	in
SPCOLL_B	Swashplate collective position (backup)	in
SPLAT	Swashplate lateral input	in
SPLONG	Swashplate longitudinal input	deg
SPA1	Swashplate A1	deg
SPB1	Swashplate B1	deg
SWANTDR_SHEAR	Anti-drive link shear force, accounting for bi-directional slopes	lb
SWASHPLATE0AZ	Swashplate temperature in deg C (LXI T/C scanner)	deg C
SWASHPLATE180AZ	Swashplate temperature in deg C (LXI T/C scanner)	deg C
SPSHEAR	Swashplate net shear load	lb
SPSHEAR_V	Swashplate net vibratory shear load	lb
SWTB_NETB	Swashplate support tube net bending moment	in-lb
SWTB_NETB_V	Swashplate support tube net vibratory bending moment	in-lb
SWTB_SP	Swashplate tube support plate stress	psi
SWTB_SP_V	Swashplate tube support plate net vibratory stress	psi
SWTB_STRESS	Swashplate support tube stress location 1	psi
SWTB_STRESS_V	Swashplate support tube vibratory stress location 1	psi
SWTB_BOLT1	Swashplate tube support plate bolt shear stress	psi
SWTB_BOLT1_V	Swashplate tube support plate bolt net vibratory shear stress	psi
SWTB_BOLT2	Swashplate tube support plate bolt tensile stress	psi
SWTB_BOLT2_V	Swashplate tube support plate bolt net vibratory tensile stress	psi

Table 9. TTR/699 Derived Parameters (continued)

Tagname	Description	Units
	Spinner	
AFATR	Tare with rotating spinner for balance axial force (positive starboard)	lb
AF_BA_SP	Spinner axial force from strain gages, parallel to master spline	lb
AX_LD_RB	Spinner axial load derived solely from red spoke strain gage	lb
HUB_ACCEL	Hub (instrumentation plate) acceleration	g
HUB_ACCEL_V	Net hub vibratory acceleration	g
NFATR	Tare with rotating spinner for balance normal force (positive forward)	lb
PMATR	Tare with rotating spinner for balance pitching moment (positive nose right)	ft-lb
RMATR	Tare with rotating spinner for balance rolling moment (positive nose down)	ft-lb
RM_BA_SP1	Spinner rolling moment from strain gages	ft-lb
RM_BA_SP2	Spinner rolling moment from strain gages	ft-lb
SFATR	Tare with rotating spinner for balance side force (positive down)	lb
SP_PRESS_FORCE	Spinner axial force from internal pressure, positive in balance NF direction	lb
SPRAX_LD	Spinner axial load from strain gages, positive in balance NF direction	lb
SPRF_PERP	Spinner rotating side force from strain gages, perpendicular to master spline	lb
SPRM_PARA1	Spinner rotating moment from spoke gages, axis parallel to master spline	ft-lb
SPRM_PARA2	Spinner rotating moment from spoke gages, axis parallel to master spline	ft-lb
SPRM_PERP	Spinner rotating moment from spoke gages, perpendicular to master spline	ft-lb
SPLWRSPRT_SLG	Spinner lower support side load	lb
SPRF_PERP	Spinner rotating side force from strain gages, perpendicular to master spline	lb
SPRM_PARA1	Spinner rotating moment from spoke gages, axis parallel to master spline	ft-lb
SPRM_PARA2	Spinner rotating moment from spoke gages, axis parallel to master spline	ft-lb
SPRM_PERP	Spinner rotating moment from spoke gages, perpendicular to master spline	ft-lb
SPUPRSPRT_STA9TO	Spinner upper support torsion, station 9.0, coupled calibration	in-lb
TQATR	Aerodynamic tare with rotating spinner for flex-coupling torque (positive CW looking towards balance)	ft-lb
	Rotor Balance Inputs	
AF_V_B3	Load readings for axial force in balance axes	volt
AF_V_B4	Load readings for axial force in balance axes	volt
FCTH_B1	Primary flex-coupling residual thrust readings	volt
FCTH_B2	Back-up flex-coupling residual thrust readings	volt

Table 9. TTR/699 Derived Parameters (continued)

Tagname	Description	Units
FCTQ_B1	Primary flex-coupling torque readings	volt
FCTQ_B2	Back-up flex-coupling torque readings	volt
FCTH_V_B3	Flex-coupling residual thrust readings in balance axes = FCTH_B1	volt
FCTH_V_B4	Flex-coupling residual thrust readings in balance axes = FCTH_B2	volt
FCTQ_V_B3	Flex-coupling torque readings in balance axes = FCTQ_B1	volt
FCTQ_V_B4	Flex-coupling torque readings in balance axes = FCTQ_B2	volt
NF_V_B3	Load readings for normal force in balance axes	volt
NF_V_B4	Load readings for normal force in balance axes	volt
PM_V_B3	Load readings for pitching moment in balance axes	volt
PM_V_B4	Load readings for pitching moment in balance axes	volt
RM_V_B3	Load readings for rolling moment in balance axes	volt
RM_V_B4	Load readings for rolling moment in balance axes	volt
SF_V_B3	Load readings for side force in balance axes	volt
SF_V_B4	Load readings for side force in balance axes	volt
YM_V_B3	Load readings for yaw moment in balance axes	volt
YM_V_B4	Load readings for yaw moment in balance axes	volt
AFWTNRB_B3	Weight tare with nonrotating blade for balance axial force (+ starboard) = 0	lb
AFWTNRB_B4	Weight tare with nonrotating blade for balance axial force (+ starboard) = 0	lb
NFWTNRB_B3	Weight tare with nonrotating blade for balance normal force (+ forward) = 0	lb
NFWTNRB_B4	Weight tare with nonrotating blade for balance normal force (+ forward) = 0	lb
PMWTNRB_B3	Wt. tare with nonrotating blade for balance pitching moment (+ nose right) = 0	ft-lb
PMWTNRB_B4	Wt. tare with nonrotating blade for balance pitching moment (+ nose right) = 0	ft-lb
RMWTNRB_B3	Weight tare with nonrotating blade for balance rolling moment (+ nose down)	ft-lb
RMWTNRB_B4	Weight tare with nonrotating blade for balance rolling moment (+ nose down)	ft-lb
SFWTNRB_B3	Weight tare with nonrotating blade for balance side force (positive down) = 0	lb
SFWTNRB_B4	Weight tare with nonrotating blade for balance side force (positive down) = 0	lb
TQWTNRB_B3	Wt. tare with nonrotating blade for flex-coupling torque (+ CW looking aft) = 0	ft-lb
TQWTNRB_B4	Wt. tare with nonrotating blade for flex-coupling torque (+ CW looking aft) = 0	ft-lb
	Rotor Balance Outputs	
AF_BAL_B3	Weight and aero tare corrected axial force (positive starboard)	lb
AF_BAL_B4	Weight and aero tare corrected axial force (positive starboard)	lb
AF_BD_B3	Axial force at rotor hub in shaft axis (positive starboard)	lb
AF_BD_B4	Axial force at rotor hub in shaft axis (positive starboard)	lb
AF_CB_B3	Bias/dbias corrected axial force (positive starboard) = AF_CI_B3	lb

Table 9. TTR/699 Derived Parameters (continued)

Tagname	Description	Units
AF_CB_B4	Bias/dbias corrected axial force (positive starboard) = AF_CI_B4	lb
AF_CI_B3	Interaction corrected axial force (positive starboard) = AF_EU_B3	lb
AF_CI_B4	Interaction corrected axial force (positive starboard) = AF_EU_B4	lb
AF_CWT_B3	Weight tare corrected axial force (positive starboard)	lb
AF_CWT_B4	Weight tare corrected axial force (positive starboard)	
AF_EU_B3	Uncorrected axial force (positive starboard)	lb
AF_EU_B4	Uncorrected axial force (positive starboard)	lb
AF_UNC_B3	Combined axial force (positive starboard) = AF_UNC_B3	lb
AF_UNC_B4	Combined axial force (positive starboard) = AF_UNC_B4	lb
ATANXOL_B3	Angle of resultant rotor force	deg
ATANXOL_B3_ME	–recomputed using only the mean values of the individual inputs	deg
ATANXOL_B4	Angle of resultant rotor force	deg
ATANXOL_B4_ME	–recomputed using only the mean values of the individual inputs	deg
DEQ_B3	Equivalent drag	lb
DEQ_B3_ME	–recomputed using only the mean values of the individual inputs	lb
DEQ_B4	Equivalent drag	lb
DEQ_B4_ME	–recomputed using only the mean values of the individual inputs	lb
DRAG_W_B3	Drag force at rotor hub in wind axis (positive downstream)	lb
DRAG_W_B4	Drag force at rotor hub in wind axis (positive downstream)	lb
DRAG_WE_B3	Wall-effect corrected drag force at rotor hub in wind axis (+ downstream)	lb
DRAG_WE_B4	Wall-effect corrected drag force at rotor hub in wind axis (+ downstream)	lb
FCTH_CB_B3	Bias/dbias corrected flex-coupling thrust (positive forward) = FCTH_CI_B3	lb
FCTH_CB_B4	Bias/dbias corrected flex-coupling thrust (positive forward) = FCTH_CI_B4	lb
FCTH_CI_B3	Interaction corrected flex-coupling thrust (positive forward) = FCTH_EU_B3	lb
FCTH_CI_B4	Interaction corrected flex-coupling thrust (positive forward) = FCTH_EU_B4	lb
FCTH_EU_B3	Uncorrected flex-coupling thrust (positive forward)	lb
FCTH_EU_B4	Uncorrected flex-coupling thrust (positive forward)	lb
FCTQ_CB_B3	Bias/dbias corrected flex-coupling torque = FCTQ_CI_B3	ft-lb
FCTQ_CB_B4	Bias/dbias corrected flex-coupling torque = FCTQ_CI_B4	ft-lb
FCTQ_CI_B3	Interaction corrected flex-coupling torque = FCTQ_EU_B3	ft-lb
FCTQ_CI_B4	Interaction corrected flex-coupling torque = FCTQ_EU_B4	ft-lb
FCTQ_EU_B3	Uncorrected flex-coupling torque (+ CW looking aft)	ft-lb
FCTQ_EU_B4	Uncorrected flex-coupling torque (+ CW looking aft)	ft-lb
FE_B3	Rotor equivalent drag area	ft^2
FE_B3_ME	–recomputed using only the mean values of the individual inputs	ft^2
FE_B4	Rotor equivalent drag area	ft^2
FE_B4_ME	–recomputed using only the mean values of the individual inputs	ft^2
HFORCE_B3	Corrected rotor balance H-force (positive starboard) = AF_BD_B3	lb
HFORCE_B4	Corrected rotor balance H-force (positive starboard) = AF_BD_B4	lb

Table 9. TTR/699 Derived Parameters (continued)

Tagname	Description	Units
HP_B3	Horsepower from rotor balance	hp
HP_B4	Horsepower from rotor balance	hp
LIFT_W_B3	Lift force at rotor hub in wind axis (positive to right)	lb
LIFT_W_B4	Lift force at rotor hub in wind axis (positive to right)	lb
LIFT_WE_B3	Wall-effect corrected lift force at rotor hub in wind axis (positive to right)	lb
LIFT_WE_B4	Wall-effect corrected lift force at rotor hub in wind axis (positive to right)	lb
NF_BAL_B3	Weight and aero tare corrected normal force (positive forward)	lb
NF_BAL_B4	Weight and aero tare corrected normal force (positive forward)	lb
NF_BD_B3	Normal force at rotor hub in shaft axis (positive forward)	lb
NF_BD_B4	Normal force at rotor hub in shaft axis (positive forward)	lb
NF_CB_B3	Bias/dbias corrected normal force (positive forward) = NF_CB_B3	lb
NF_CB_B4	Bias/dbias corrected normal force (positive forward) = NF_CB_B4	lb
NF_CI_B3	Interaction corrected normal force (positive forward) = NF_EU_B3	lb
NF_CI_B4	Interaction corrected normal force (positive forward) = NF_EU_B4	lb
NF_CWT_B3	Weight tare corrected normal force (positive forward)	lb
NF_CWT_B4	Weight tare corrected normal force (positive forward)	lb
NF_EU_B3	Uncorrected normal force (positive forward)	lb
NF_EU_B4	Uncorrected normal force (positive forward)	lb
NF_UNC_B3	Combined normal force (positive forward)	lb
NF_UNC_B4	Combined normal force (positive forward)	lb
PITCH_W_B3	Pitch moment at rotor hub in wind axis (positive CW looking down)	ft-lb
PITCH_W_B4	Pitch moment at rotor hub in wind axis (positive CW looking down)	ft-lb
PITCH_WE_B3	Wall-effect corrected pitch moment at rotor hub in wind axis (+ nose right)	ft-lb
PITCH_WE_B4	Wall-effect corrected pitch moment at rotor hub in wind axis (+ nose right)	ft-lb
PM_BAL_B3	Weight and aero tare corrected pitching moment (positive nose right)	ft-lb
PM_BAL_B4	Weight and aero tare corrected pitching moment (positive nose right)	ft-lb
PM_BD_B3	Pitching moment at rotor hub in shaft axis (positive nose right)	ft-lb
PM_BD_B4	Pitching moment at rotor hub in shaft axis (positive nose right)	ft-lb
PM_CB_B3	Bias/dbias corrected pitching moment (positive nose right) = PM_CI_B3	ft-lb
PM_CB_B4	Bias/dbias corrected pitching moment (positive nose right) = PM_CI_B4	ft-lb
PM_CI_B3	Interaction corrected pitching moment (positive nose right) = PM_EU_B3	ft-lb
PM_CI_B4	Interaction corrected pitching moment (positive nose right) = PM_EU_B4	ft-lb
PM_CWT_B3	Weight tare corrected pitching moment (positive nose right)	ft-lb
PM_CWT_B4	Weight tare corrected pitching moment (positive nose right)	ft-lb
PM_EU_B3	Uncorrected pitching moment (positive nose right)	ft-lb
PM_EU_B4	Uncorrected pitching moment (positive nose right)	ft-lb
PM_UNC_B3	Combined pitching moment (positive nose right) = PM_CB_B3	ft-lb
PM_UNC_B4	Combined pitching moment (positive nose right) = PM_CB_B4	ft-lb
ROLL_W_B3	Roll moment at rotor hub in wind axis (positive starboard down)	ft-lb
ROLL_W_B4	Roll moment at rotor hub in wind axis (positive starboard down)	ft-lb

Table 9. TTR/699 Derived Parameters (continued)

Tagname	Description	Units
ROLL_WE_B3	Wall-effect corrected roll moment at rotor hub in wind axis (+ starboard down)	ft-lb
ROLL_WE_B4	Wall-effect corrected roll moment at rotor hub in wind axis (+ starboard down)	ft-lb
RM_BAL_B3	Weight and aero tare corrected rolling moment (positive starboard down)	ft-lb
RM_BAL_B4	Weight and aero tare corrected rolling moment (positive starboard down)	ft-lb
RM_BD_B3	Rolling moment at rotor hub in shaft axis (positive nose down)	ft-lb
RM_BD_B4	Rolling moment at rotor hub in shaft axis (positive nose down)	
RM_CB_B3	Bias/dbias corrected rolling moment (positive nose down) = RM_CI_B3	ft-lb
RM_CB_B4	Bias/dbias corrected rolling moment (positive nose down) = RM_CI_B4	ft-lb
RM_CI_B3	Interaction corrected rolling moment (positive nose down) = RM_EU_B3	ft-lb
RM_CI_B4	Interaction corrected rolling moment (positive nose down) = RM_EU_B4	ft-lb
RM_CWT_B3	Weight tare corrected rolling moment (positive nose down)	ft-lb
RM_CWT_B4	Weight tare corrected rolling moment (positive nose down)	
RM_EU_B3	Uncorrected rolling moment (positive nose down)	ft-lb
RM_EU_B4	Uncorrected rolling moment (positive nose down)	
RM_UNC_B3	Combined rolling moment (positive nose down) = RM_CB_B3	ft-lb
RM_UNC_B4	Combined rolling moment (positive nose down) = RM_CB_B4	ft-lb
SIDE_W_B3	Side force at rotor hub in wind axis (positive down)	lb
SIDE_W_B4	Side force at rotor hub in wind axis (positive down)	lb
SIDE_WE_B3	Wall-effect corrected side force at rotor hub in wind axis (positive down)	lb
SIDE_WE_B4	Wall-effect corrected side force at rotor hub in wind axis (positive down)	lb
SF_BAL_B3	Weight and aero tare corrected side force (positive down)	lb
SF_BAL_B4	Weight and aero tare corrected side force (positive down)	lb
SF_BD_B3	Side force at rotor hub in shaft axis (positive down)	lb
SF_BD_B4	Side force at rotor hub in shaft axis (positive down)	lb
SF_CB_B3	Bias/dbias corrected side force (positive down) = SF_CI_B3	lb
SF_CB_B4	Bias/dbias corrected side force (positive down) = SF_CI_B4	lb
SF_CI_B3	Interaction corrected side force (positive down) = SF_EU_B3	lb
SF_CI_B4	Bias/dbias corrected side force (positive down) = SF_CI_B4	lb
SF_CWT_B3	Weight tare corrected side force (positive down)	lb
SF_CWT_B4	Weight tare corrected side force (positive down)	lb
SF_EU_B3	Uncorrected side force (positive down)	lb
SF_EU_B4	Uncorrected side force (positive down)	lb
SF_UNC_B3	Combined side force (positive down)	lb
SF_UNC_B4	Combined side force (positive down)	lb
THRUST_B3	Corrected rotor balance thrust in shaft axis (positive forward) = NF_BD_B3	lb
THRUST_B4	Corrected rotor balance thrust in shaft axis (positive forward) = NF_BD_B4	lb
TORQ_B3	Torque from rotor balance (positive CW looking aft) = YM_BD_B3	ft-lb
TORQ_B4	Torque from rotor balance (positive CW looking aft) = YM_BD_B4	ft-lb
XFORCE_B3	Corrected rotor balance X-force (positive downstream) = −DRAG_WE_B3	lb
XFORCE_B4	Corrected rotor balance X-force (positive downstream) = −DRAG_WE_B4	lb
YAW_W_B3	Yaw moment at rotor hub in wind axis (positive nose down)	ft-lb
YAW_W_B4	Yaw moment at rotor hub in wind axis (positive nose down)	ft-lb

Table 9. TTR/699 Derived Parameters (concluded)

Tagname	Description	Units
YAW_WE_B3	Wall-effect corrected torque moment at rotor hub in wind axis (+ nose down)	ft-lb
YAW_WE_B4	Wall-effect corrected torque moment at rotor hub in wind axis (+ nose down)	ft-lb
YFORCE_B3	Rotor balance Y-force (positive down) = SF_BD_B3	lb
YFORCE_B4	Rotor balance Y-force (positive down) = SF_BD_B4	lb
YM_BAL_B3	Weight and aero tare corrected flex-coupling torque (positive CW looking aft)	ft-lb
YM_BAL_B4	Weight and aero tare corrected flex-coupling torque (positive CW looking aft)	ft-lb
YM_BD_B3	Yawing moment at rotor hub in shaft axis positive CW looking aft)	ft-lb
YM_BD_B4	Yawing moment at rotor hub in shaft axis positive CW looking aft)	ft-lb
YM_CB_B3	Bias/dbias corrected yaw moment = YM_CI_B3	ft-lb
YM_CB_B4	Bias/dbias corrected yaw moment = YM_CI_B4	ft-lb
YM_CI_B3	Interaction corrected yaw moment = YM_EU_B3	ft-lb
YM_CI_B4	Interaction corrected yaw moment = YM_EU_B4	ft-lb
YM_CWT_B3	Weight tare corrected flex-coupling torque (positive CW looking aft)	ft-lb
YM_CWT_B4	Weight tare corrected flex-coupling torque (positive CW looking aft)	ft-lb
YM_EU_B3	Uncorrected yaw moment (positive CW looking aft)	ft-lb
YM_EU_B4	Uncorrected yaw moment (positive CW looking aft)	ft-lb
YM_UNC_B3	Combined flex-coupling torque (positive CW looking aft)	ft-lb
YM_UNC_B4	Combined flex-coupling torque (positive CW looking aft)	ft-lb
	Miscellaneous	
NOSE_AF_B1_C	Nose strut axial force primary, corrected for installation	lb
NOSE_AF_B2_C	Nose strut axial force backup, corrected for installation	lb
NOSE_SF_B1_C	Nose strut side force primary, corrected for installation	lb
NOSE_SF_B2_C	Nose strut side force backup, corrected for installation	lb
PORT_AF_B2_C	Port strut axial force backup, corrected for installation	lb
PORT_SF_B1_C	Port strut side force primary, corrected for installation	lb
PORT_SF_B2_C	Port strut side force backup, corrected for installation	lb
PORT_AF_B1_C	Port strut axial force primary, corrected for installation	lb
STBD_AF_B2_C	Starboard strut axial force backup, corrected for installation	lb
STBD_SF_B1_C	Starboard strut side force primary, corrected for installation	lb
STBD_SF_B2_C	Starboard strut side force backup, corrected for installation	lb
STBD_AF_B1_C	Starboard strut axial force primary, corrected for installation	lb
STRUT_AF_B1	Total strut axial force (primary)	lb
STRUT_AF_B2	Total strut axial force (backup)	lb
STRUT_NF_B1	Total strut normal force (primary)	lb
STRUT_NF_B2	Total strut normal force (backup)	lb
STRUT_PM_B1	Total strut pitching moment (primary)	ft-lb
STRUT_PM_B2	Total strut pitching moment (backup)	ft-lb
STRUT_RM_B1	Strut yawing moment (primary)	ft-lb
STRUT_RM_B2	Strut yawing moment (backup)	ft-lb
STRUT_YM_B1	Strut rolling moment (primary)	ft-lb
STRUT_YM_B2	Strut rolling moment (backup)	ft-lb

Table 10. TTR/699 Rotor Coefficients

Tagname	Description
CAR_BD_B3	Rotor drag force coefficient in body axis
CAR_BD_B4	Rotor drag force coefficient in body axis
CAROS_BD_B3	Rotor drag force coefficient over solidity in body axis
CAROS_BD_B4	Rotor drag force coefficient over solidity in body axis
CDR_W_B3	Rotor drag force coefficient in wind axis
CDR_W_B4	Rotor drag force coefficient in wind axis
CDR_WE_B3	Rotor drag force coefficient in corrected wind axis
CDR_WE_B4	Rotor drag force coefficient in corrected wind axis
CDROS_W_B3	Rotor drag force coefficient over solidity in wind axis
CDROS_W_B4	Rotor drag force coefficient over solidity in wind axis
CDROS_WE_B3	Rotor drag force coefficient over solidity in corrected wind axis
CDROS_WE_B4	Rotor drag force coefficient over solidity in corrected wind axis
CH_B3	Rotor balance H-force coefficient
CH_B4	Rotor balance H-force coefficient
CHOS_B3	Rotor balance H-force coefficient over solidity
CHOS_B4	Rotor balance H-force coefficient over solidity
CLR_W_B3	Rotor lift force coefficient in wind axis
CLR_W_B4	Rotor lift force coefficient in wind axis
CLR_WE_B3	Rotor lift force coefficient in corrected wind axis
CLR_WE_B4	Rotor lift force coefficient in corrected wind axis
CLROS_W_B3	Rotor lift force coefficient over solidity in wind axis
CLROS_W_B4	Rotor lift force coefficient over solidity in wind axis
CLROS_WE_B3	Rotor lift force coefficient over solidity in corrected wind axis
CLROS_WE_B4	Rotor lift force coefficient over solidity in corrected wind axis
CMXR_BD_B3	Rotor rolling moment coefficient in body axis
CMXR_BD_B4	Rotor rolling moment coefficient in body axis
CMXR_W_B3	Rotor rolling moment coefficient in wind axis
CMXR_W_B4	Rotor rolling moment coefficient in wind axis
CMXR_WE_B3	Rotor rolling moment coefficient in corrected wind axis
CMXR_WE_B4	Rotor rolling moment coefficient in corrected wind axis
CMXROS_BD_B3	Rotor rolling moment coefficient over solidity in body axis
CMXROS_BD_B4	Rotor rolling moment coefficient over solidity in body axis
CMXROS_W_B3	Rotor rolling moment coefficient over solidity in wind axis
CMXROS_W_B4	Rotor rolling moment coefficient over solidity in wind axis
CMXROS_WE_B3	Rotor rolling moment coefficient over solidity in corrected wind axis
CMXROS_WE_B4	Rotor rolling moment coefficient over solidity in corrected wind axis
CMYR_BD_B3	Rotor pitching moment coefficient in body axis
CMYR_BD_B4	Rotor pitching moment coefficient in body axis
CMYR_W_B3	Rotor pitching moment coefficient in wind axis
CMYR_W_B4	Rotor pitching moment coefficient in wind axis
CMYR_WE_B3	Rotor pitching moment coefficient in corrected wind axis
CMYR_WE_B4	Rotor pitching moment coefficient in corrected wind axis
CMYROS_BD_B3	Rotor pitching moment coefficient over solidity in body axis
CMYROS_BD_B4	Rotor pitching moment coefficient over solidity in body axis
CMYROS_W_B3	Rotor pitching moment coefficient over solidity in wind axis
CMYROS_W_B4	Rotor pitching moment coefficient over solidity in wind axis
CMYROS_WE_B3	Rotor pitching moment coefficient over solidity in corrected wind axis
CMYROS_WE_B4	Rotor pitching moment coefficient over solidity in corrected wind axis

Table 10. TTR/699 Rotor Coefficients (continued)

Tagname	Description
CMZR_BD_B3	Rotor yawing moment coefficient in body axis
CMZR_BD_B4	Rotor yawing moment coefficient in body axis
CMZR_W_B3	Rotor yawing moment coefficient in wind axis
CMZR_W_B4	Rotor yawing moment coefficient in wind axis
CMZR_WE_B3	Rotor yawing moment coefficient in corrected wind axis
CMZR_WE_B4	Rotor yawing moment coefficient in corrected wind axis
CMZROS_BD_B3	Rotor yawing moment coefficient over solidity in body axis
CMZROS_BD_B4	Rotor yawing moment coefficient over solidity in body axis
CMZROS_W_B3	Rotor yawing moment coefficient over solidity in wind axis
CMZROS_W_B4	Rotor yawing moment coefficient over solidity in wind axis
CMZROS_WE_B3	Rotor yawing moment coefficient over solidity in corrected wind axis
CMZROS_WE_B4	Rotor yawing moment coefficient over solidity in corrected wind axis
CNR_BD_B3	Rotor lift force coefficient in body axis
CNR_BD_B4	Rotor lift force coefficient in body axis
CNROS_BD_B3	Rotor lift force coefficient over solidity in body axis
CNROS_BD_B4	Rotor lift force coefficient over solidity in body axis
CP_B3	Rotor power coefficient from rotor balance
CP_B4	Rotor power coefficient from rotor balance
CPOS_B3	Rotor power (torque) coefficient over solidity from rotor balance
CPOS_B4	Rotor power (torque) coefficient over solidity from rotor balance
CPOS_ID_B3	Ideal power coefficient over solidity
CPOSID_B3_ME	–recomputed using only the mean values of the individual inputs
CPOS_ID_B4	Ideal power coefficient over solidity
CPOSID_B4_ME	–recomputed using only the mean values of the individual inputs
CPOS_NI_B3	Coefficient of non-ideal power over solidity
CPOSNI_B3_ME	–recomputed using only the mean values of the individual inputs
CPOS_NI_B4	Coefficient of non-ideal power over solidity
CPOSNI_B4_ME	–recomputed using only the mean values of the individual inputs
CPRAT_B3	Ratio of measured power coefficient to the ideal power coefficient
CPRAT_B3_ME	–recomputed using only the mean values of the individual inputs
CPRAT_B4	Ratio of measured power coefficient to the ideal power coefficient
CPRAT_B4_ME	–recomputed using only the mean values of the individual inputs
CP_B3	Rotor power coefficient from rotor balance
CP_B4	Rotor power coefficient from rotor balance
CPOS_B3	Rotor power (torque) coefficient over solidity from rotor balance
CPOS_B4	Rotor power (torque) coefficient over solidity from rotor balance
CPOS_ID_B3	Ideal power coefficient over solidity
CPOSID_B3_ME	–recomputed using only the mean values of the individual inputs
CPOS_ID_B4	Ideal power coefficient over solidity
CPOSID_B4_ME	–recomputed using only the mean values of the individual inputs
CPOS_NI_B3	Coefficient of non-ideal power over solidity
CPOSNI_B3_ME	–recomputed using only the mean values of the individual inputs
CPOS_NI_B4	Coefficient of non-ideal power over solidity
CPOSNI_B4_ME	–recomputed using only the mean values of the individual inputs
CPRAT_B3	Ratio of measured power coefficient to the ideal power coefficient
CPRAT_B3_ME	–recomputed using only the mean values of the individual inputs
CPRAT_B4	Ratio of measured power coefficient to the ideal power coefficient
CPRAT_B4_ME	–recomputed using only the mean values of the individual inputs

Table 10. TTR/699 Rotor Coefficients (continued)

Tagname	Description
CT_B3	Rotor balance thrust coefficient
CT_B4	Rotor balance thrust coefficient
CTOS_B3	Rotor balance thrust coefficient over solidity
CTOS_B4	Rotor balance thrust coefficient over solidity
CX_B3	Rotor balance X-force coefficient
CX_B4	Rotor balance X-force coefficient
CXOS_B3	Rotor balance X-force coefficient over solidity
CXOS_B4	Rotor balance X-force coefficient over solidity
CYR_BD_B3	Rotor side force coefficient in body axis
CYR_BD_B4	Rotor side force coefficient in body axis
CYR_W_B3	Rotor side force coefficient in wind axis
CYR_W_B4	Rotor side force coefficient in wind axis
CYR_WE_B3	Rotor side force coefficient in corrected wind axis
CYR_WE_B4	Rotor side force coefficient in corrected wind axis
CYROS_BD_B3	Rotor side force coefficient over solidity in body axis
CYROS_BD_B4	Rotor side force coefficient over solidity in body axis
CYROS_W_B3	Rotor side force coefficient over solidity in wind axis
CYROS_W_B4	Rotor side force coefficient over solidity in wind axis
CYROS_WE_B3	Rotor side force coefficient over solidity in corrected wind axis
CYROS_WE_B4	Rotor side force coefficient over solidity in corrected wind axis
ETAP_B3	Propeller propulsive efficiency
ETAP_B3_ME	–recomputed using only the mean values of the individual inputs
ETAP_B4	Propeller propulsive efficiency
ETAP_B4_ME	–recomputed using only the mean values of the individual inputs
ETAP_GC_B3	Propulsive efficiency with Glauert correction
ETAP_GC_B3_ME	–recomputed using only the mean values of the individual inputs
ETAP_GC_B4	Propulsive efficiency with Glauert correction
ETAP_GC_B4_ME	–recomputed using only the mean values of the individual inputs
FMERIT_B3	Hover figure of merit
FMERIT_B3_ME	–recomputed using only the mean values of the individual inputs
FMERIT_B4	Hover figure of merit
FMERIT_B4_ME	–recomputed using only the mean values of the individual inputs
LOD_B3	Rotor lift-to-drag ratio
LOD_B3_ME	–recomputed using only the mean values of the individual inputs
LOD_B4	Rotor lift-to-drag ratio
LOD_B4_ME	–recomputed using only the mean values of the individual inputs
MAT	Rotor advancing tip Mach number
MTIP	Hover tip Mach number
MTUN	Tunnel Mach number
MU	Rotor advance ratio
MUAT	Rotor advancing tip advance ratio
MUX	Inplane advance ratio
MUY	Lateral advance ratio
MUZ	Axial advance ratio

Table 10. TTR/699 Rotor Coefficients (concluded)

Tagname	Description
MUZ_GC_B3	Axial advance ratio with Glauert correction
MUZ_GC_B3_ME	–recomputed using only the mean values of the individual inputs
MUZ_GC_B4	Axial advance ratio with Glauert correction
MUZ_GC_B4_ME	–recomputed using only the mean values of the individual inputs
VOVH_B3	Non-dimensional hover induced velocity
VOVH_B3_ME	–recomputed using only the mean values of the individual inputs
VOVH_B4	Non-dimensional hover induced velocity
VOVH_B4_ME	–recomputed using only the mean values of the individual inputs
VPOV_B3	Glauert propeller correction factor (V′/V)
VPOV_B3_ME	–recomputed using only the mean values of the individual inputs
VPOV_B4	Glauert propeller correction factor (V′/V)
VPOV_B4_ME	–recomputed using only the mean values of the individual inputs

Table 11. TTR/699 RDMS 40x80 Wall Pressures

Tagname	Description	Tagname	Description
WP_A_04	Ring A (downstream), panel 4	WP_K_04	Ring K, panel 4
WP_A_09	Ring A (downstream), panel 9	WP_K_09	Ring K, panel 9
WP_A_12	Ring A (downstream), panel 12	WP_K_12	Ring K, panel 12
WP_A_15	Ring A (downstream), panel 15	WP_K_15	Ring K, panel 15
WP_A_18	Ring A (downstream), panel 18	WP_K_18	Ring K, panel 18
WP_A_25	Ring A (downstream), panel 25	WP_K_23	Ring K, panel 23
WP_A_31	Ring A (downstream), panel 31	WP_K_30	Ring K, panel 30
WP_A_35	Ring A (downstream), panel 35	WP_K_35	Ring K, panel 35
WP_A_38	Ring A (downstream), panel 38	WP_K_38	Ring K, panel 38
WP_A_41	Ring A (downstream), panel 41	WP_K_41	Ring K, panel 41
WP_A_44	Ring A (downstream), panel 44	WP_K_44	Ring K, panel 44
WP_A_48	Ring A (downstream), panel 48	WP_K_49	Ring K, panel 49
WP_COM_01	Ring COM, panel 1	WP_L_04	Ring L, panel 4
WP_COM_02	Ring COM, panel 2	WP_L_09	Ring L, panel 9
WP_COM_03	Ring COM, panel 3	WP_L_12	Ring L, panel 12
WP_COM_04	Ring COM, panel 4	WP_L_15	Ring L, panel 15
WP_COM_05	Ring COM, panel 5	WP_L_18	Ring L, panel 18
WP_COM_06	Ring COM, panel 6	WP_L_23	Ring L, panel 23
WP_COM_07	Ring COM, panel 7	WP_L_30	Ring L, panel 30
WP_COM_08	Ring COM, panel 8	WP_L_35	Ring L, panel 35
WP_COM_09	Ring COM, panel 9	WP_L_38	Ring L, panel 38
WP_COM_10	Ring COM, panel 10	WP_L_41	Ring L, panel 41
WP_COM_11	Ring COM, panel 11	WP_L_44	Ring L, panel 44
WP_COM_12	Ring COM, panel 12	WP_L_49	Ring L, panel 49
WP_COM_13	Ring COM, panel 13	WP_M_04	Ring M, panel 4
WP_COM_14	Ring COM, panel 14	WP_M_09	Ring M, panel 9
WP_C_15	Ring C, panel 15	WP_M_18	Ring M, panel 18
WP_C_18	Ring C, panel 18	WP_M_23	Ring M, panel 23
WP_C_23	Ring C, panel 23	WP_M_30	Ring M, panel 30
WP_C_30	Ring C, panel 30	WP_M_35	Ring M, panel 35
WP_C_35	Ring C, panel 35	WP_M_38	Ring M, panel 38
WP_C_38	Ring C, panel 38	WP_M_41	Ring M, panel 41
WP_C_41	Ring C, panel 41	WP_M_44	Ring M, panel 44
WP_C_44	Ring C, panel 44	WP_M_49	Ring M, panel 49
WP_C_49	Ring C, panel 49	WP_N_05	Ring N, panel 5
WP_D_04	Ring D, panel 4	WP_N_09	Ring N, panel 9
WP_D_09	Ring D, panel 9	WP_N_12	Ring N, panel 12
WP_D_12	Ring D, panel 12	WP_N_15	Ring N, panel 15
WP_D_15	Ring D, panel 15	WP_N_18	Ring N, panel 18
WP_D_18	Ring D, panel 18	WP_N_23	Ring N, panel 23
WP_D_23	Ring D, panel 23	WP_N_30	Ring N, panel 30
WP_D_30	Ring D, panel 30	WP_N_35	Ring N, panel 35
WP_D_35	Ring D, panel 35	WP_N_38	Ring N, panel 38
WP_D_38	Ring D, panel 38	WP_N_41	Ring N, panel 41
WP_D_41	Ring D, panel 41	WP_N_44	Ring N, panel 44
WP_D_44	Ring D, panel 44	WP_N_49	Ring N, panel 49

Table 11. TTR/699 RDMS 40x80 Wall Pressures (continued)

Tagname	Description	Tagname	Description
WP_E_04	Ring E, panel 4	WP_P_05	Ring P, panel 5
WP_E_09	Ring E, panel 9	WP_P_09	Ring P, panel 9
WP_E_12	Ring E, panel 12	WP_P_12	Ring P, panel 12
WP_E_15	Ring E, panel 15	WP_P_18	Ring P, panel 18
WP_E_18	Ring E, panel 18	WP_P_23	Ring P, panel 23
WP_E_30	Ring E, panel 30	WP_P_30	Ring P, panel 30
WP_E_35	Ring E, panel 35	WP_P_35	Ring P, panel 35
WP_E_38	Ring E, panel 38	WP_P_38	Ring P, panel 38
WP_E_41	Ring E, panel 41	WP_P_41	Ring P, panel 41
WP_E_44	Ring E, panel 44	WP_P_44	Ring P, panel 44
WP_E_49	Ring E, panel 49	WP_P_49	Ring P, panel 49
WP_F_04	Ring F, panel 4	WP_R_04	Ring R, panel 4
WP_F_09	Ring F, panel 9	WP_R_09	Ring R, panel 9
WP_F_12	Ring F, panel 12	WP_R_12	Ring R, panel 12
WP_F_15	Ring F, panel 15	WP_R_15	Ring R, panel 15
WP_F_18	Ring F, panel 18	WP_R_18	Ring R, panel 18
WP_F_23	Ring F, panel 23	WP_R_23	Ring R, panel 23
WP_F_30	Ring F, panel 30	WP_R_35	Ring R, panel 35
WP_F_38	Ring F, panel 38	WP_R_41	Ring R, panel 41
WP_F_41	Ring F, panel 41	WP_R_44	Ring R, panel 44
WP_F_49	Ring F, panel 49	WP_S_30	Ring S, panel 30
WP_G_04	Ring G, panel 4	WP_S_35	Ring S, panel 35
WP_G_09	Ring G, panel 9	WP_S_38	Ring S, panel 38
WP_G_12	Ring G, panel 12	WP_S_41	Ring S, panel 41
WP_G_15	Ring G, panel 15	WP_S_44	Ring S, panel 44
WP_G_18	Ring G, panel 18	WP_S_49	Ring S, panel 49
WP_G_23	Ring G, panel 23	WP_T_04	Ring T, panel 4
WP_G_30	Ring G, panel 30	WP_T_09	Ring T, panel 9
WP_G_35	Ring G, panel 35	WP_T_12	Ring T, panel 12
WP_G_38	Ring G, panel 38	WP_T_15	Ring T, panel 15
WP_G_41	Ring G, panel 41	WP_T_18	Ring T, panel 18
WP_G_44	Ring G, panel 44	WP_T_23	Ring T, panel 23
WP_G_49	Ring G, panel 49	WP_V_04	Ring V, panel 4
WP_H_04	Ring H, panel 4	WP_V_09	Ring V, panel 9
WP_H_09	Ring H, panel 9	WP_V_12	Ring V, panel 12
WP_H_12	Ring H, panel 12	WP_V_18	Ring V, panel 18
WP_H_15	Ring H, panel 15	WP_V_23	Ring V, panel 23
WP_H_18	Ring H, panel 18	WP_V_30	Ring V, panel 30
WP_H_23	Ring H, panel 23	WP_V_35	Ring V, panel 35
WP_H_30	Ring H, panel 30	WP_V_38	Ring V, panel 38
WP_H_35	Ring H, panel 35	WP_V_41	Ring V, panel 41
WP_H_38	Ring H, panel 38	WP_V_44	Ring V, panel 44
WP_H_41	Ring H, panel 41	WP_V_49	Ring V, panel 49
WP_H_44	Ring H, panel 44	WP_X_04	Ring X (upstream), panel 4
WP_H_49	Ring H, panel 49	WP_X_09	Ring X (upstream), panel 9

Table 11. TTR/699 RDMS 40x80 Wall Pressures (concluded)

Tagname	Description	Tagname	Description
WP_J_04	Ring J, panel 4	WP_X_12	Ring X (upstream), panel 12
WP_J_09	Ring J, panel 9	WP_X_15	Ring X (upstream), panel 15
WP_J_12	Ring J, panel 12	WP_X_18	Ring X (upstream), panel 18
WP_J_15	Ring J, panel 15	WP_X_23	Ring X (upstream), panel 23
WP_J_18	Ring J, panel 18	WP_X_30	Ring X (upstream), panel 30
WP_J_23	Ring J, panel 23	WP_X_35	Ring X (upstream), panel 35
WP_J_30	Ring J, panel 30	WP_X_38	Ring X (upstream), panel 38
WP_J_35	Ring J, panel 35	WP_X_41	Ring X (upstream), panel 41
WP_J_38	Ring J, panel 38	WP_X_44	Ring X (upstream), panel 44
WP_J_41	Ring J, panel 41	WP_X_49	Ring X (upstream), panel 49
WP_J_44	Ring J, panel 44		
WP_J_49	Ring J, panel 49		

Table 12. TTR/699 Run Parameters
See the RDMS glossary for detailed descriptions.

Tagname	Description	Notes
PHASE_NUMBER	Integer value indicating the phase number within the scope	always = 1
CONSTANT_ID	Integer value indicating the set of constants used within the scope of a run	always = 1
ZERO_PT	Zero point number used in the data reduction process	
CAL_PT	Calibration point number used in the data reduction process	
ALPHA_REF	Reference angle of attack for weight tares	always = 0
PSI_REF	Reference yaw angle for weight tares	always = 0
ALPHA_SEL	Flag indicating if the angle is an input (0) or measured (1)	always = 0
PSI_SEL	Flag indicating if the angle is an input (0) or measured (1)	always = 0
PHI_SEL	Flag indicating if the angle is an input (0) or measured (1)	always = 0
BARO_SEL	Flag indicating if the barometric pressure is an input (0) or measured (2, 4)	
TS_ANA_DIG	Flag indicating if the test conditions are based on analog (0) or digital (1) inputs	always = 1
QU_SEL	Flag indicating if uncorrected q is a direct (0) or differential (1) measurement	
BDAS_CHANS	Number of BDAS channels read in from the RxxxBDAS.rcfg file	
BDAS_SCANS	Number of BDAS scans per rev read in from the RxxxBDAS.rcfg file	
DDAS_CHANS	Number of DDAS channels read in from the RxxxDDAS.rcfg file	
DDAS_SCANS	Number of BDAS scans per rev read in from the RxxxDDAS.rcfg file	
SDAS_CHANS	Number of SDAS channels read in from the RxxxSDAS.rcfg file	always = 0
SDAS_SCANS	Number of SDAS scans per rev read in from the RxxxSDAS.rcfg file	always = 0
USER_CHANS	Number of USERDAS channels	always = 0
USER_SCANS	Number of USERDAS scans per rev	always = 0
BAL_ATARE	Balance aero tare set number	always = 0
BAL_WTARE	Balance weight tare set number	always = 0
LDC_ATARE	Load cell aero tare set number	always = 0
LDC_WTARE	Load cell weight tare set number	always = 0
SCL_ATARE	Scale aero tare set number	always = 0
SCL_WTARE	Scale weight tare set number	always = 0
DESCRIPTION	Brief description of a run, used to identify the type of run	
BETA_SEL	Sideslip angle input flag (not used for TTR)	always = 0
TT_YAW_SEL	Flag indicating if the turntable yaw angle is an input (2) or measured (0)	
Q_SEL	Corrected tunnel dynamic pressure input flag	always = 0
PR_SEL	Tunnel reference ring pressure input flag	
PSREF_SEL	Tunnel static ring reference pressure input flag	
DPRS_SEL	Differential pressure (static q) input flag	
TTF_SEL	Tunnel total temperature input flag	
DPT_SEL	Dew point temperature input flag	always = 0
SIGNROT	Rotor rotation direction, looking from front, +1 for CCW, −1 for CW	always = 1
SIGNTABLE	T-frame orientation, looking from top, +1 for CCW, −1 for CW	

Table 13. TTR/699 RDMS Point Parameters
See the RDMS glossary for detailed descriptions.

Tagname	Description	Notes
TYPE	Integer code indicating the point type	0-5
TYPE_DESC	Text string describing the point type (see TYPE)	
QUALITY_FLAG	Quality flag: 0 = bad, 1= good	Always = 1
QUALITY_DESC	Quality flag description (see QUALITY_FLAG)	Always = “good”
BDAS_REVS	Number of BDAS revs read in from the RxxxPxxxBDAS.etim file	
BDAS_SAMPLES	Number of BDAS samples read in from the RxxxPxxxBDAS.etim file	
BDAS_TIME	BDAS sample time (msec) read in from the RxxxPxxxBDAS.etim file	
DDAS_REVS	Number of DDAS revs read in from the RxxxPxxxDDAS.etim file	
DDAS_SAMPLES	Number of DDAS samples read in from the RxxxPxxxDDAS.etim file	
DDAS_TIME	DDAS sample time (msec) read in from the RxxxPxxxDDAS.etim file	
SDAS_REVS	Number of SDAS revs read in from the RxxxPxxxSDAS.etim file	
SDAS_SAMPLES	Number of SDAS samples read in from the RxxxPxxxSDAS.etim file	
SDAS_TIME	SDAS sample time (msec) read in from the RxxxPxxxSDAS.etim file	Always = 0
USER_REVS	Number of USERDAS revs	Always = 0
USER_SAMPLES	Number of USERDAS samples	Always = 0
USER_TIME	USERDAS sample time	Always = 0
ALPHA_INP	ALPHA (factor table angle of attack) value	Always = 0
PSI_INP	PSI (factor table yaw angle) value	Always = 0
PHI_INP	PHI (factor table roll angle) value	Always = 0
BARO_INP	BARO (factor table barometric pressure) value	Always = 0
Q_INP	*q* (factor table dynamic pressure) value	Always = 0
MIC_COEF_SET	Calibration set used to reduce microphone data	1-4
DESCRIPTION	Brief description of a point	Not used
ACQ_DATE_TIME	Point acquisition time	
RED_DATE_TIME	Point data reduction time	Not used
BETA_INP	Sideslip angle, manual input	Always = 0
TT_YAW_INP	Yaw angle, manual input	
PR_INP	Tunnel reference ring pressure, manual input	Always = 0
PSREF_INP	Tunnel static reference pressure, manual input	Always = 0
DPRS_INP	Differential pressure (static *q*) from factor table	Always = 0
TTF_INP	Tunnel total temperature, manual input	Always = 0
HUM_DPT_INP	Dew point temperature, manual input	Always = 0
IROTOR	Rotor configuration: 0 = rotor off, 1 = rotor on; constant during a run	

Table 14 summarizes the blade strain gage locations. The torsion gage at station 70 (REDB_STA70TO) failed during Run 86.

Table 14. Blade Strain Gages

Station	Beam	Chord	Torsion
0.21 *R*	x	x	
0.37 *R*	x	x	
0.45 *R*	x	x	x
0.58 *R*	x	x	
0.75 *R*	x	x	x

Rotor Balance System

Rotor balance data are critical for research and require the most elaborate processing (Reference 15). Summary descriptions of the axis system, measurement ranges and uncertainties, and naming convention are given here.

Aircraft nacelle tilt is simulated by yawing the TTR in the test section. Zero-deg yaw is airplane mode, with the rotor pointing into the wind, and 90-deg yaw is helicopter mode, with the rotor edgewise to the flow. This arrangement best fits the rig and rotor into the oblong 40x80 test section. TTR uses a traditional NFAC rotor axis system, but turned on its side so that rotation in yaw simulates aircraft nacelle pitch (Figure 6). Figure 6 gives the axis system labels; note that this is *not* a consistent right-handed axis system: by convention, roll and yaw moments are reversed in polarity (Table 15).

Table 15. Rotor Balance Load Definitions and Polarities

Load	Label	Axis	Positive Direction
Axial Force	AF	*x*	right
Side Force	SF	*y*	down
Normal Force (thrust)	NF	*z*	forward
Lateral Moment	RM	*x*	nose down
Normal Moment	PM	*y*	nose right
Torque	YM	*z*	opposite to rotation

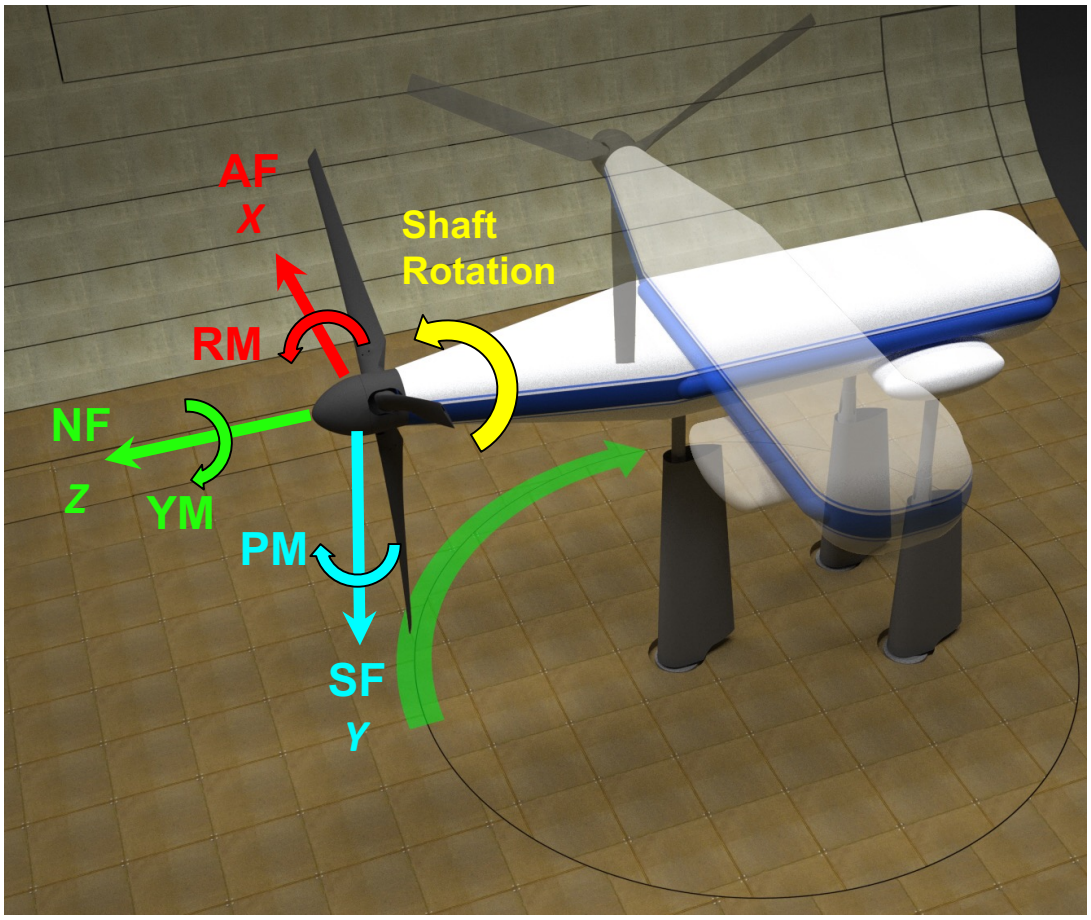

Fig. 6. TTR balance axis system, referenced to the rotor hub. In airplane orientation, the x-axis points starboard. In helicopter orientation, the x-axis points aft.

The TTR rotor balance has two independent sets of strain gages, each with its own set of calibration coefficients. By tradition, a set of strain gages and associated calibration coefficients is called a "balance" (not to be confused with the physical rotor balance; the distinction will be made herein where necessary). The best of several such balances derived for the TTR are the "B3" and "B4" balances. Many derived parameters, notably rotor coefficients, are computed for both balances. The balance used is denoted by "B3" or "B4" appended to each coefficient where relevant.

Warning: the RDMS database contains parameters computed with other balance calibrations, noted by "B1", "B2", and "B5" suffixes. These parameters are for diagnostics only and are strongly deprecated for research purposes. The reader is further warned not to confuse these alternative balance parameters with backup parameters, typically strain gages, also labeled "B1" and "B2," or with strut bending gages.

The rotor balance was calibrated when installed on the TTR. Calibration procedures are described in References 4 and 12; the results are summarized in Table 16. The rotor balance data include time-interpolated corrections for zero offsets. The wind-tunnel scales were always locked, so all rotor loads were measured by the balance.

For reference, Table 16 lists the calibration ranges and uncertainties (±2σ errors) for both B3 and B4 balance calibrations. The B3 data are recommended for research use.

The TTR rotor balance is overdesigned for the 699 rotor. The rotor has a gimballed hub, so it cannot sustain large moments. The balance was calibrated over different load ranges (Reference 4); Table 16 gives calibration uncertainties referenced to the reduced load ranges appropriate for the 699 rotor.

Table 16. Rotor Balance Calibration Ranges and Uncertainties

Hub Load	Range	B3 2σ Error	B3 2σ/Range	B4 2σ Error	B4 2σ/Range
Normal force, NF	15,148 lb	120 lb	0.80 %	137 lb	0.90 %
In-plane horizontal, AF	±8,250 lb	25 lb	0.15 %	24 lb	0.14 %
In-plane vertical, SF	±8,250 lb	18 lb	0.11 %	17 lb	0.11 %
Hub moment, vertical axis, PM	±7,500 ft-lb	175 ft-lb	1.16 %	179 ft-lb	1.19 %
Hub moment, horizontal, RM	±7,500 ft-lb	225 ft-lb	1.50 %	217 ft-lb	1.44 %
Torque, YM	22,338 ft-lb	93 ft-lb	0.42 %	93 ft-lb	0.41 %

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