APPENDIX 3.

NATIONAL ASSOCIATION OF ROCKETRY
CERTIFIED MODEL ROCKET MOTORS
APPROVED FOR USE IN TEAM AMERICA 2019

The commercially-made model rocket motors listed below have been subjected to rigorous safety and reliability testing conducted by the NAR Standards & Testing (S&T) Committee and are the only ones approved for sale in the U.S. or for use in this Challenge. All motors listed here are in current production. Every motor listed here will continue to be approved for use in the Team America 2019 event regardless of any subsequent announced changes to the NAR's overall official engine certification list. This list may be expanded if new motors are certified during the period of TARC; this expansion and any revised list will be communicated to all those teams enrolled in the TARC.

Download "Motor Data Sheets" from the NAR web site if you desire additional information. Each data sheet contains a thrust curve together with values from a test firing, including measured average thrust and total impulse, plus 32 data points for use in altitude simulation computer programs.

Abbreviation	**Full Manufacturer Name**
Aerotech	Aerotech
Apogee	Apogee
Cesaroni	Cesaroni Technology Incorporated
Estes	Estes Industries
Quest	Quest Aerospace Education

Note: (R) following the listed casing dimensions denotes that the motor is a reloadable motor system certified only with the manufacturer-supplied casing, closures, nozzle, and propellant. Reloadable motors are not available for sale to persons under age 18, per U.S. Consumer Products Safety Commission regulations. Also, the metal casings that reloadable motors use are quite expensive. But if the performance of these types of model rocket motor happens to be exactly what you need for your design, your supervising teacher/adult advisor can purchase them and supervise your use of them.

Manufacturer**s** of E and F motors often use letter codes right after the motor average thrust value on the label (e.g. the “FJ” in an F23FJ motor type) which designate the type of that manufacturer’s propellant used in the motor. This code, or the absence of a code, does not affect status of certification for TARC use.

Motors with “sparky” propellant or with an average thrust higher than 80 N are officially classified as “high power motors” even if their total impulse is in the F power class or below, and such motors are not listed or approved for use in TARC. Motors that are no longer in production are also not listed and may not be used.

NAR CERTIFIED MODEL ROCKET MOTORS
APPROVED FOR USE IN TEAM AMERICA 2019

As of August 16, 2018

Designation		Mfgr.	Casing Size (mm)	Propellant Mass (grams)	Total Impulse (N-sec.)
1/4A3-3T		Estes	13 x 45	0.8	0.62
1/2A3-2T,4T		Estes	13 x 45	2.0	1.25
1/2A6-2		Estes	18 x 70	2.6	1.25
A3-4T		Estes	13 x 45	3.3	2.50
A6-4		Quest	18 x 70	3.5	2.50
A8-0,3,5		Estes	18 x 70	3.3	2.50
A10-0T		Estes	13 x 45	3.6	1.88
A10-3T,PT		Estes	13 x 45	3.8	2.50
B4-2,4		Estes	18 x 70	6.0	5.00
B6-0		Estes	18 x 70	5.6	4.90
B6-2,4,6		Estes	18 x 70	5.6	5.00
B6-0,2,4		Quest	18 x 70	6.5	5.00
C6-0,3,5,7		Estes	18 x 70	10.8	9.0
C6-0		Quest	18 x 70	11.0	8.8
C6-3,5		Quest	18 x 70	12.0	8.76
C11-0,3,5,7		Estes	24 x 70	12.0	9.0
C12-4,6,8		Quest	18 x 70	10.4	9.8
D5-P		Quest	20 x 88	25.0	19.6
D8-0,3,5		Quest	24 x 70	22.0	18.6
D9W-4,7	R	Aerotech	24 x 70	10.1	20.0
D10-3,5,7		Apogee	18 x 70	9.8	18.3
D10-3,5,7		Aerotech	18 x 70	9.8	18.3
D11-P		Estes	24 x 70	24.5	18.0
D12-0,3,5,7		Estes	24 x 70	21.1	17.0
D13W-4,7,10	R	Aerotech	18 x 70	9.8	20.0
D15T-4,7	R	Aerotech	24 x 70	8.9	20.0
D16-4,6,8		Quest	18 x 79	12.5	12.4
D21T-4,7		Aerotech	18 x 70	9.6	20.0
D24T-4,7,10	R	Aerotech	18 x 70	8.8	18.5
E6-4,6,8,P		Apogee	24 x 70	22.0	37.8
E9-4,6,8,P		Estes	24 x 95	35.8	28.5
E11J-3	R	Aerotech	24 x 70	25.0	31.7
E12-0,4,6,8		Estes	24 x 95	35.9	27.2
E15W-4,7		Aerotech	24 x 65	16.2	35.0
E16-0,4,6,8		Estes	29 x 114	40.0	33.4
E16W-4,7	R	Aerotech	29 x 124	19.0	40.0
E18W-4,8	R	Aerotech	24 x 70	20.7	39.0
E20-4,7,10		Aerotech	24 x 65	16.2	35.0
E22SS-13A	R	Cesaroni	24 x 69	13.4	24.2
E23T-5,8	R	Aerotech	29 x 124	17.4	37.0
E28T-4,7	R	Aerotech	24 x 70	18.4	40.0
E30T-4,7		Aerotech	24 x 70	17.8	33.6
E30-4,7		Estes	24 x 70	17.8	33.6

E31WT-15A	R	Cesaroni	24 x 69	11.2	26.1
E75VM-17A	R	Cesaroni	24 x 69	10.4	24.8
F10-4,6,8		Apogee	29 x 93	40.0	74.3
F12J-3,5	R	Aerotech	24 x 70	30.0	45.0
F15-0,4,6,8		Estes	29 x 114	60.0	49.6
F20W-4,7		Aerotech	29 x 73	30.0	51.8
F21W-4,6,8		Aerotech	24 x 98	30.0	55.0
F22J-5,7	R	Aerotech	29 x 124	46.3	65.0
F23FJ-4,7		Aerotech	29 x 83	30.0	41.2
F24W-4,7	R	Aerotech	24 x 70	19.0	50.0
F25W-4,6,9		Aerotech	29 x 98	35.6	80.0
F26FJ-6,9		Aerotech	29 x 98	43.1	62.2
F26FJ-6		Estes	29 x 98	43.1	62.2
F27R-4,8		Aerotech	29 x 83	28.4	49.6
F29-12A	R	Cesaroni	29 x 98	30.9	54.8
F30FJ-4,6,8		Aerotech	24 x 90	31.2	47.0
F30WH/LB-6A	R	Cesaroni	24 x 133	40.0	73.1
F31CL-12A	R	Cesaroni	29 x 98	25.7	55.5
F32T-4,6,8		Aerotech	24 x 90	25.8	56.9
F32WH-12A	R	Cesaroni	29 x 98	29.9	52.8
F35W-5,8,11	R	Aerotech	24 x 95	30.0	57.1
F36SS-11A	R	Cesaroni	29 x 98	29.5	41.2
F36BS-14A	R	Cesaroni	29 x 98	25.6	51.5
F37W-S,M,L	R	Aerotech	29 x 99	28.2	50.0
F39T-3,6	R	Aerotech	24 x 70	22.7	50.0
F40W-4,7,10	R	Aerotech	29 x 124	40.0	80.0
F42T-4,8		Aerotech	29 x 83	27.0	52.9
F44W-4,8		Aerotech	24 x 70	19.7	41.5
F50T-4,6,9		Aerotech	29 x 98	37.9	80.0
F50T-4,6		Estes	29 x 98	37.9	80.0
F51BS-13A	R	Cesaroni	24 x 101	22.0	49.9
F51CL-12A	R	Cesaroni	24 x 133	33.0	75.0
F51NT-10	R	Aerotech	24 x 70	26.5	55.1
F52T-5,8,11	R	Aerotech	29 x 124	36.6	78.0
F59WT-12A	R	Cesaroni	29 x 98	26.1	57.0
F62T-S,M,L	R	Aerotech	29 x 89	30.5	51.0
F62FJ-10	R	Aerotech	24 x 95	32.2	47.6
F63R-10	R	Aerotech	24 x 95	27.6	49.5
F67W-4,6,9		Aerotech	29 x 89	30.0	61.1
F70WT-14A	R	Cesaroni	24 x 101	22.5	52.9
F79SS-13A	R	Cesaroni	24 x 133	40.1	67.8

Additional notes:

- The manufacturer-reported total impulse and propellant mass of motors often differs from the values reported above, which are based on testing by the NAR Standards & Testing Committee. The values above are the ones that will be used in TARC.