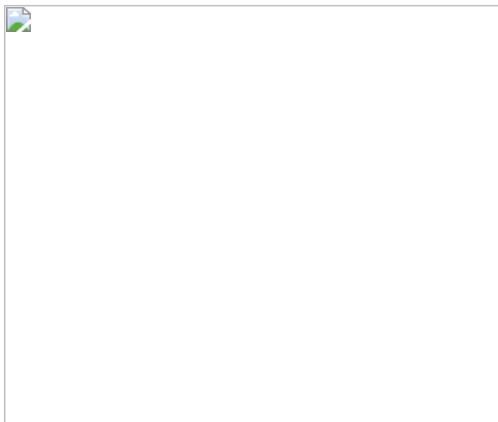




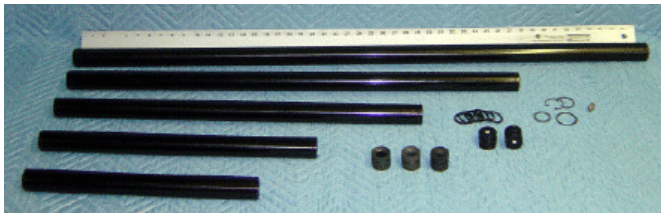
67 Contrail hybrid motors are now Tripoli certified!

152mm (1)	98mm (3)	75mm (17)
	54mm (12)	38mm (34)

Motor Designation	Total Impulse (Nt/Sec)	Burn Time (sec)	Casing Diameter	Casing Length
O6300	28,197	4.5	152mm	72 in.
M2800	6059	2.35	98mm	60 in
M2700	6034	2.3	98mm	60 in.
M1575	6546	4.2	98mm	60 in
M2281	5482	2.14	75mm	60 in
M1491	5675	3.35	75mm	54 in
M711	5507	7.22	75mm	54 in
L2525	4677	1.9	75mm	60 in
L1428	4733	3.1	75mm	60 in
L1222	3682	3.1	75mm	54 in
L800	3759	4.6	75 mm	54 in
L369	3828	10.5	75mm	54 in
K888	2400	2.67	75mm	40 in
K777	1833	2.6	75mm	40 in
K707	1385.8	1.9	75mm	32 in
K678	1847	2.8	75mm	40 in
K630	1340.6	2.2	75mm	32 in
K543	2096	3.6	75mm	32 in
K456	1628	3.7	75mm	32 in
K404	2441	6.4	75mm	40 in
K300	1909	6.5	75mm	40 in
K555	1686.4	3.04	54mm	48 in
K321	1569.9	4.89	54mm	48 in
K265	1684	6.26	54mm	48 in
K234	1656.9	7.04	54mm	48 in
J642	1115	1.73	54mm	36 in
J416	1118	2.68	54mm	36 in
J358	1108	2.79	54mm	36 in
J355	670	1.875	54mm	28 in
J292	791	2.33	54mm	28 in
J272	1138	3.88	54mm	36 in
J245	643.5	2.62	54mm	28 in
J234	1032.57	4.3	54mm	36 in
J800	928	1.2	38mm	48 in
J555	795	1.6	38mm	48 in
J345	891	2.7	38mm	48 in
J333	733	2.4	38mm	48 in
J246	673	2.8	38mm	36 in
J242	752	3.1	38mm	48 in
J222	928	4.3	38mm	48 in
J150	654	4.1	38mm	36 in
I747	341	.5	38mm	36 in.
I727	513	.7	38mm	28 in.
I500	336	1.0	38mm	28 in
I400	432	1.0	38mm	36 in
I333	556	1.7	38mm	36 in
I307	573	1.85	38mm	36 in
I290	884	1.5	38mm	36 in.
I255	430	1.7	38mm	28 in
I221	335	1.74	38mm	28 in
I210	497	2.72	38mm	36 in
I155	451	3.5	38mm	28 in
H340			38mm	28 in.
H303	170	0.6	38mm	20 in
H300	161	0.62	38mm	20 in
H277	292	1.15	38mm	28 in
H248	261.5	1.06	38mm	16 in
H246	222	0.9	38mm	20 in
H222	161	0.7	38mm	16 in
H211	206	0.97	38mm	20 in
H141	241	1.7	38mm	20 in
H121	225	1.85	38mm	20 in



G300	100	0.25	38mm	16 in
G234	117.95	.53	38mm	28 in
G130	100	0.86	38mm	16 in
G123	142	1.15	38mm	16 in
G100	146	1.43	38mm	16 in



Contrail Rockets Hybrid Motor Hardware

Contrail **75mm and 98mm hybrid motor systems** consist of three pieces of hardware: the oxidizer tank, the combustion chamber, and the nozzle. All three are connected with hex-head flush mounting bolts. To assemble a Contrail 75mm motor, you select one of three different sizes of oxidizer tank, one of four different sizes of combustion chamber, and one of three different nozzles, and bolt them together. 75mm reload kits come with a fuel grain, a set of fill and vent tubes, an igniter, and a set of injectors that screw into the oxidizer tank. The fuel grain is cast in a paper liner; several different fuel formulas are available.

Contrail **38mm and 54mm hybrids** are monotube motors with an internal injector baffle that separates the fuel grain from the oxidizer compartment. The injector baffle can be in different positions depending on the length of the fuel grain (like the "floating injector" motors made by Ratt Works, Propulsion Polymers and Sky Ripper). There are five different 38mm motor lengths. The forward bulkhead/vent and injector baffle are the same for all 38mm motors (except for the J800, which requires a special high speed injector baffle), and they are all held in place by external snap rings. There are three different nozzles available: slow, medium and fast/x-fast. The injector orifice comes with the reload kit and is not part of the standard hardware set; it is used once and replaced. Two fuel grains are used: solid PVC, and a high regression rate fuel that is cast in a thin PVC liner.

The combinations of different motor casing lengths, different nozzles, different injector sizes, and different fuel formulas makes the Contrail hybrid motors the most flexible hybrid motor hardware available. Contrail Rockets has demonstrated a commitment to certify and produce as many practical motor combinations as possible. This makes the Contrail motor hardware an outstanding value.

You can purchase Contrail hardware in three different ways:

- ☐ **Motor Hardware Set:** One set of components for a specific certified motor combination. You specify the nozzle and combustion chamber when you order. For example, if you want an L1222, you order the 3200cc 75mm Motor Hardware Set with a Medium combustion chamber and Medium nozzle. This hardware can also accept the M1494 load.
- ☐ **Motor Hardware System:** One set of components for a specific casing size, with three nozzles included. For example, the 38mm 28 inch System includes a 28 inch casing, an injector, a forward bulkhead, and all three nozzles. It will handle all motor combinations that fit in the 28 inch casing (J250, I500, I221, I115, H277).
- ☐ **Complete Motor Hardware System:** All components for all certified motor combinations. Each System includes all casings, nozzles and parts available in that size.

Components are also sold separately. So, for example, if you get the 3200cc 75mm Hardware Set with a Medium combustion chamber nozzle for the L122 load, you can add a Long combustion chamber and Fast nozzle to allow you to use the L2525 and M2281 loads. The 38mm Injector Baffle and Forward Bulkhead are the same across all 38mm motor sizes, so once you have one 38mm Motor Hardware System you can simply add different motor casing lengths to the hardware you already have, and use more motor combinations.

Details of the Contrail 75mm hybrid motor hardware (98mm and 152mm hardware is similar)



Fuel Grains are available in several different propellant compositions. Since this is a hybrid motor, the fuel grain has no oxidizer mixed with it like conventional solid propellant. It is shippable without hazmat restrictions and does not require special storage.



There are three **Nozzles**: Slow, Medium and Fast. The nozzle itself is a precision machined piece with a graphite insert; the throat of the graphite insert determines the nozzle speed. The nozzle bolts into the aft of the Combustion Chamber with flush mounted hex head bolts and is sealed with two O-rings. There is a groove just above the bell section of the nozzle for a snap ring that serves as a

thrust ring and retention device.



The upper section of the Contrail motor is the **Tank Assembly**, which incorporates the five-port Injector.

The oxidizer tank vents through the center port of the injector. No extra hole or fitting in the rocket body is required for the vent line. The vent line is secured outside by a special fitting that can be attached to the launch pad in a position where it is easily visible.



Each Reload kit contains a Fuel Grain, a bundle of tubing, an igniter, and five push-to-connect injector fittings. The bundle ("loom") of tubing has four outer tubes and once center tube. The center tube is the vent, and is always 1/8 inch clear tubing. Two of the outer four tubes are looped, and the other two are connected to the fill system to fill the oxidizer tank.

Fast motors use 1/4 inch diameter fill tubing. Medium motors use 3/16 diameter tubing, and Slow motors use 1/8 inch diameter fill tubing. Since the connectors are provided with each reload kit, the injector serves all three speeds.

The igniter has an internal tube that slides onto the central 1/8 inch vent tube. It also has two separate heater elements, requiring 24 volts instead of the usual 12 volts.



Contrail reloads are non-pyrotechnic as shipped. They require the addition of Pyrodex pellets as igniter boosters. This allows them to be shipped and stored without regulatory issues.

Certified 152mm Motor Combination

Motor	N2O Tank	Total Impulse nt/sec	Peak Thrust lbs	Nozzle	Burn Time seconds	Fuel Grain	Total Motor Length
O6300	15000cc	28197	2850	Fast	4.51	Black Gold	72 in.

152mm Motor Hardware Price Schedule

Catalog Number	Item Name	Price
CR-152-SYS	Complete 152mm Motor System: One tank, one combustion chamber, one nozzle	\$2495

152mm Hybrid Motor Reload Chart

Motor	Hardware Required	Fuel Type	Catalog Number	Price
O6300	Standard	Black Gold Fuel	CR-152-O6300-BG	\$1000

Certified 98mm Motor Combinations

Motor	N2O Tank	Combustion Chamber	Nozzle	Fuel Grain	Total Motor Length
M2800	5300cc	Standard	XFast	Black Gold	1524mm 60 in.
M2700	5300cc	Standard	XFast	Black Smoke	1524mm 60 in.
M1575	5300cc	Standard	Medium	Black Gold	1524mm 60 in.

98mm Motor Hardware Price Schedule

Catalog Number	Item Name	Price
CR-98-SYS	Complete 98mm Motor System: One tank, one combustion chamber, one nozzle housing, two nozzle inserts (XFast, Medium)	\$1000

98mm Hybrid Motor Reload Chart

Motor	Hardware Required	Fuel Type	Catalog Number	Price
M2800	Standard tank, combustion chamber and nozzle housing, XFast nozzle insert	Black Gold Fuel	CR-98-M2800-BGXF	\$225
M2700	Standard tank, combustion chamber and nozzle housing, XFast nozzle insert	Black Smoke Fuel	CR-98-M2700-BSXF	\$225
M1575	Standard tank, combustion chamber and nozzle housing, Medium nozzle insert	Black Gold Fuel	CR-98-M1575-BGM	\$200

Certified 75mm Motor Combinations

Motor	N2O Tank	Combustion Chamber	Nozzle	Fuel Grain	Total Motor Length	Catalog Number	Price
M2281	3200cc	18 in. (Long)	Fast	Fast Black	1524mm 60 in.	CR-M2281-FB	\$130
M1491	3200cc	12 in. (Medium)	Medium	Medium Black	1372mm 54 in.	CR-M1491-MB	\$95
M711	3200cc	12 in. (Medium)	Slow	Slow Black	1372mm 54 in.	CR-M711-SB	\$95
L2525	3200cc	18 in. (Long)	Fast	Black Gold Fast	1524mm 60 in.	CR-L2525-FB	\$130
L1428	3200cc	18 in. (Long)	Fast	Fast Sparky	1524mm 60 in.	CR-L1428-FS	\$95
L1222	3200cc	12 in. (Medium)	Medium	Medium Sparky	1372mm 54 in.	CR-L1222-MS	\$95
L800	3200cc	12 in. (Medium)	Medium	Black Gold	1372mm 54 in.	CR-L800-BGM	\$95
L369	3200cc	12 in. (Medium)	Slow	Sparky	1372mm 54 in.	CR-L369-SS	\$95
K888	2050cc	10 in. (Short)	Medium	Medium Black	1016mm 40 in.	CR-K888-MB	\$85
K777	2050cc	10 in. (Short)	Medium	Medium Black Gold	1016 mm 40 in	CR-K777-SM	\$75
K707	1400cc	8 in. (Mini)	Medium	Black Gold	813mm 32 in.	CR-K707-BGM	\$75
K678	2050cc	10 in. (Short)	Medium	Black Gold	1016mm 40 in	CR-K678-BGM	\$85
K630	1400cc	8 in. (Mini)	Medium	Sparky	813mm 32 in.	CR-K630-SM	\$75
K543	1400cc	8 in. (Mini)	Slow	Slow Black	813mm 32 in.	CR-K543-SB	\$75
K456	1400cc	8 in. (Mini)	Slow	Sparky	813 mm 32 in	CR-K456-BGS	\$85
K404	2050cc	10 in. (Short)	Slow	Sparky	1016mm 40 in	CR-K404-SPS	\$85
K300	2050cc	10 in. (Short)	Slow	Black Smoke	1016mm 40 in	CR-K300-BSS	\$85

75mm Motor Hardware Price Schedule

Catalog Number	Item Name	Price
CR-75-SYS	75mm Complete Motor System (all parts for all motor combinations)	\$1450.00
CR-75-3200-COMP	75mm 3200cc Motor Hardware (select a nozzle and a combustion chamber for the reload you want)	\$550.00
CR-75-3200-SET	75mm 3200cc Motor Hardware Set (includes all nozzles)	\$825.00
CR-75-2050-COMP	75mm 2050cc Motor Hardware (select a nozzle and a combustion chamber for the reload you want)	\$475.00
CR-75-2050-SET	75mm 2050cc Motor Hardware Set (includes all nozzles)	\$550.00
CR-75-1450-COMP	75mm 1450cc Motor Hardware (select a nozzle and combustion chamber for the reload you want)	\$450.00
CR-75-1450-SET	75mm 1450cc Motor Hardware Set (includes all nozzles)	\$525.00
CR-75-3200-T	75mm 3200 cc Nitrous Tank Assembly	\$325.00
CR-75-2050-T	75mm 2050cc Nitrous Tank Assembly	\$300.00
CR-75-1450-T	75mm 1400cc Nitrous Tank Assembly	\$285.00
CR-75-CC-LONG	75mm 17.875 in. (Long) Combustion Chamber	\$145.00
CR-75-CC-MED	75mm 11.875 in. (Medium) Combustion Chamber	\$135.00
CR-75-CC-SH	75mm 9.875 (Short) Combustion Chamber	\$100.00
CR-75-CC-MINI	75mm 7.875 (Mini) Combustion Chamber	\$100.00
CR-75-NOZ-FAST	75mm Nozzle (Fast)	\$140.00
CR-75-NOZ-MED	75mm Nozzle (Medium)	\$115.00

CR-75-NOZ-SLOW	75mm Nozzle (Slow)	\$100.00
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Contrail 38mm and 54mm Hybrid Motor Hardware

Contrail 38mm hybrid motors are monotube motors with internal components held in place with snap rings. There are five motor casing lengths available: 16 inch, 20 inch, 28 inch, 36 inch and 48 inch. Three nozzles are available: Slow, Medium and Fast. The Injector Baffle and Forward Bulkhead are identical throughout the motor range. The orifice that screws into the Injector Baffle is supplied with each reload kit, and is used only once.

Contrail 54mm hybrid motors are similar to the 38mm series. Four nozzles are currently available: Slow, Medium/Fast, X-Fast and XX-Fast (an X-Slow and ridiculously fast nozzle are in work). Two injectors are used: one uses a single port, and one uses three ports. As with all Contrail motors, each reload kit includes the right size injector orifices and appropriate fill tubing, configured in loops if necessary.

Contrail 38mm and 54mm motors are ignited with a special resistor igniter that requires 24 volts. Pyrodex pellets are required for ignition. Pyrodex pellets are commonly available at gun and recreation stores (including many Wal-Mart and K-Mart stores, or online) and do not require special storage or permits. Full details are in the Contrail instructions; [contact us if you have any questions.](#)



Certified 38mm Motor Combinations

Motor Designation	Casing Length (inches)	Fuel Grain	Nozzle Speed	Average Thrust (Nt)	Peak Thrust (Nt)	Total Impulse (Nt/Sec)	Burn Time (Sec)	Price 3-pack
J800	48	HP	XXF*	758	4840	928	1.2	\$80
J555	48	HP	**X-Fast	497	2500	795	1.6	\$70
J345	48	PVC	Fast	318	1222	891	2.7	\$50
J333	48	HP	Fast	305	1227	733	2.4	\$60
J242	48	PVC	Medium	242	875	752	3.1	\$45

J222	48	HP	Medium	216	786	928	4.3	\$60
J246	36	HP	Medium	238	490	673	2.8	\$60
J150	36	HP	Slow	155	490	654	4.1	\$60
I727	36	HP	XXF				.7	\$80
I400	36	HP	**X-Fast	398	1006	432	1	\$70
I333	36	PVC	Fast	329	853	556	1.7	\$50
I307	36	HP	Fast	308	777	573	1.85	\$60
I290	36	Sparky	Fast					\$70
I210	36	PVC	Medium	182	648	497	2.72	\$45
I747	28	HP	XXF*				.5	\$80
I500	28	HP	**X-Fast	479	1069	336	0.7	\$70
I255	28	HP	Medium	255	736	430	1.7	\$60
I221	28	PVC	Medium	203	433	335	1.74	\$45
I155	28	HP	Slow	155	366	451	3.5	\$60
H340	28	Sparky	Fast					\$70
H277	28	HP	Fast	252	793	292	1.15	\$60
H246	28	PVC	Fast	246	746	262	1.1	\$60
H246	20	HP	Medium	238	653	222	0.9	\$60
H303	20	PVC	Fast	283	752	170	0.6	\$45
H300	20	HP	Fast	259	710	161	0.62	\$60
H211	20	PVC	Medium	211	674	206	0.97	\$45
H141	20	PVC	Slow	141	297	241	1.7	\$45
H121	20	HP	Slow	121	294	225	1.85	\$60
H222	16	HP	Medium	225	619	161	0.7	\$60
G300	16	PVC	Fast	288	689	100	0.25	\$45
G130	16	PVC	Medium	115	706	100	0.86	\$45
G123	16	HP	Slow	123	413	142	1.15	\$60
G100	16	PVC	Slow	101	230	146	1.43	\$45

Notes:

* XXF motors requires a special injector baffle and nozzle, sold separately.

***X-Fast" uses the Fast nozzle, so there are only three nozzles in the complete set (Slow, Medium, Fast). "X-Fast" refers to the combination of the Fast nozzle and 5/16 inch injector fitting (the fitting comes with the reload pack).

Certified 54mm Motor Combinations

Motor Designation	Casing Length (inches)	Fuel Grain	Nozzle Speed	Average Thrust (Nt)	Total Impulse (Nt/Sec)	Burn Time (Sec)	Price (Single load)
J245	28	Black Gold	Slow	245	644	2.62	\$44
J292	28	Sparky	Slow	291	791	2.33	\$44
J355	28	Black Gold	Medium	357	670	1.875	\$44
J234	36	Black Gold	Slow	239	1033	4.3	\$44
J272	36	Sparky	Slow	276	1138	3.88	\$44
J358	36	Black Gold	Medium	358	1108	2.79	\$44
J416	36	Sparky	Medium	416	1118	2.68	\$44
J642	36	Black Gold	X-Fast	633	1115	1.73	\$54
K234	48	Black Gold	Slow	234	1657	7.04	\$44
K265	48	Sparky	Slow	265	1684	6.26	\$44
K321	48	Black Gold	Medium	320	1570	4.89	\$44
K555	48	Black Gold	X-Fast	554	1686	3.04	\$54

