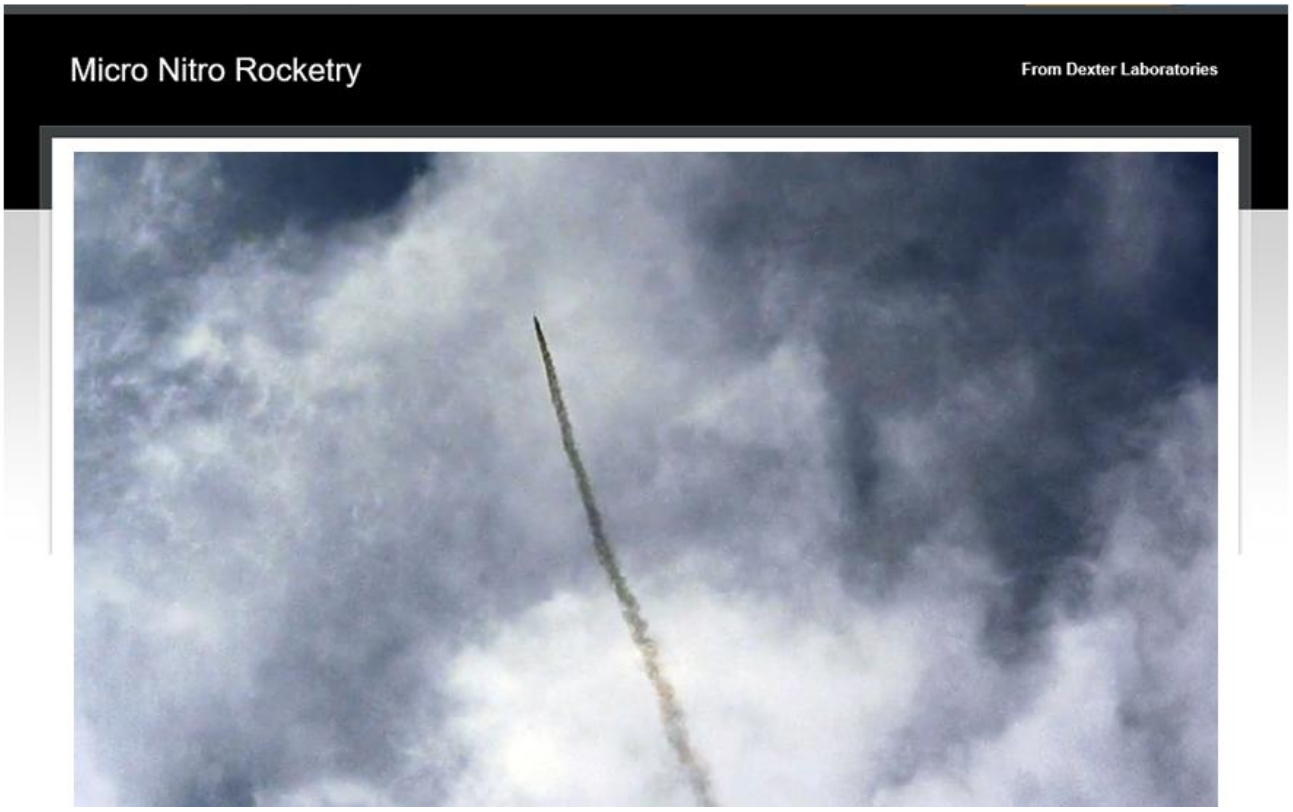
Micro Nitro Rocketry 2023 Digital Catalog



Hello and welcome back! After a two year hiatus I am happy to announce that Dexter Labs is again producing a line of products related to small cartridge-based hybrid rocket motors. These motors are takeoffs based on a design by Rene Caldera from the mid-1990s. I am "hand" machining these motors individually in very small batches (typically 4 motors per run to minimize tooling change-out time and material waste). In addition I am offering some related products:

Publications
Precision machined motors.
Consumables like O-rings and burst disks.
Replacement parts Support equipment.
Specialized rocket kits.
Other accessories.

Micro and mini-hybrid motors use whip cream dispenser chargers and shopping bag paper for propellant.

Micro and mini-hybrid motors are very safe, easy to operate and inexpensive to fly using rocket kits from us, modified Estes and Quest kits, and scratch-builds of your own design.

These small experimental motors are direct descendants of those sold in kit form by Rene Caldera (see video in Extras).

Arguably the most elegant hobby rocket motor of its size ever designed.

Learn all the details of these fascinating motors, how to test them and how to build rockets to fly with them. Order our four extensive publications totaling over 300 pages of information (all four bundled for $10)

Quick Start Guide to Flying Micro and Mini-hybrid (29 pages)

Micro and Mini-hybrid User's Guide (165 pages)

Rocket Construction Manual (158 pages)

Test Stand Paper (38 pages)

Order these papers in pdf from me by e-mail nmrockets@yahoo.com
I will bill you with a simple Pay Pal request for payment
Upon payment I will send you the three papers via e-mail
If you submit further orders from me the cost of the manuals will be credited

NOTE: For a limited time I am providing these publications free of charge to anyone interested. Just request the pdf files from me at the same above listed e-mail address.

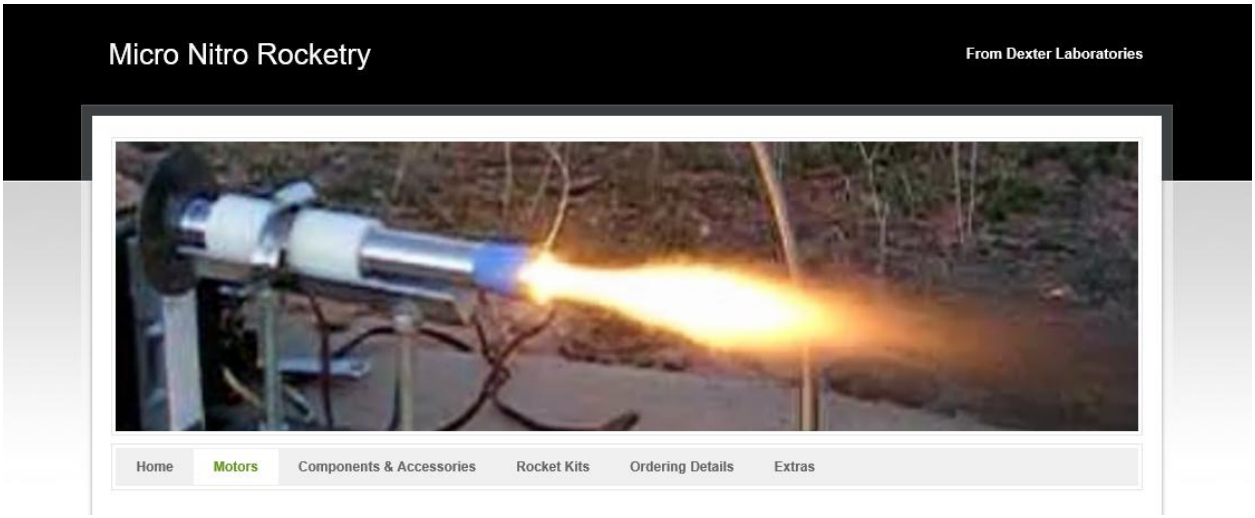
For any questions you may e-mail me at:

nmrockets@yahoo.com

Leland (Lee) R. Dexter, Ph.D.
Owner, Micro Nitro Rocketry
TRA 8306 L2
NAR 90581 L2

Dexter Labs small hybrid family (left to right):

The original 8 gram 22 mm Rene Caldera Micro-hybrid (lightweight case version)
The 16 gram 25 mm Mini-hybrid (lightweight case version)
The 16 gram 25 mm Stretch Mini-hybrid (lightweight case version)
The 16 gram 29 mm Mini-max Bi-hybrid (lightweight case version)
The 16 gram 29 mm nitrous-boosted Turbo APCP solid motor (standard case version)



PRECISION MACHINED MOTORS:

Note on prices - unfortunately, due to substantial material cost increases, my prices have increased

Micro-hybrid 22 mm, 8-gram, 0.020" injector, motor - complete hardware $99

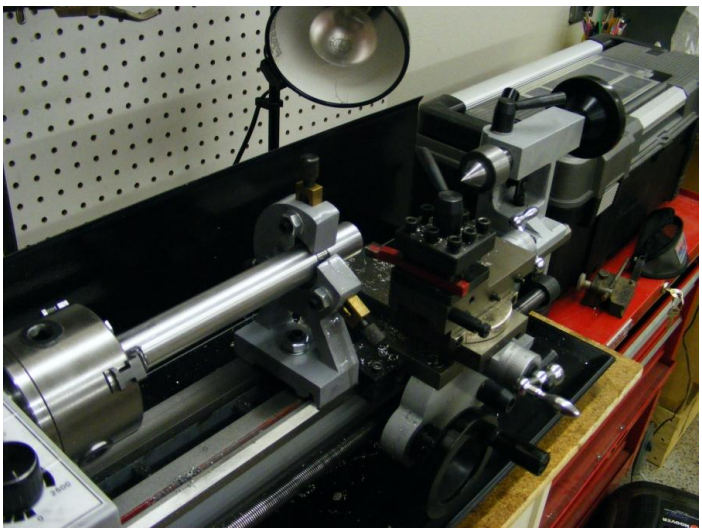
Mini-hybrid 25 mm, 16-gram, 0.025" injector motor - complete hardware $125

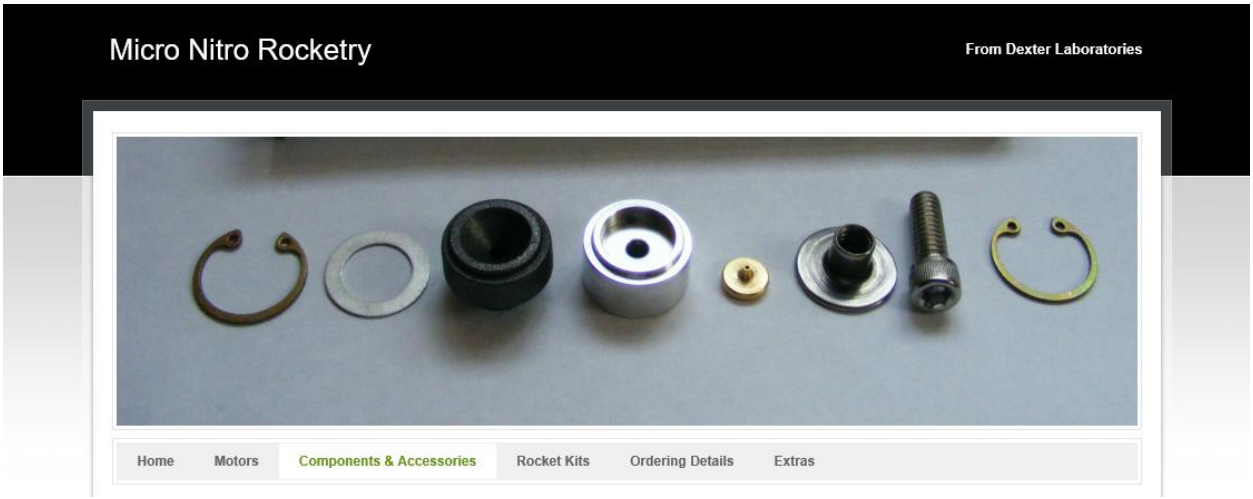
Mini-max 29 mm specialty bi-hybrid motor, 16-gram, 0.028" injector motor (beta-test) – complete hardware for the D12 version (E12 waiting on Estes improved motors) - $120
Level 2 Certification required for beta test program participation

Lightweight casing (33% lighter for the micro, 28% lighter for the mini and mini-max) add $12

***Micro and Mini-hybrid User's Guide* (165 page paper in PDF) $8**

Each motor is precision-machined from aluminum, brass, stainless steel and graphite. The motor is supplied with a copy of an extensive users guide (also available as a stand-alone product) including background and history, assembly and launch instructions, performance data, resource lists and more.



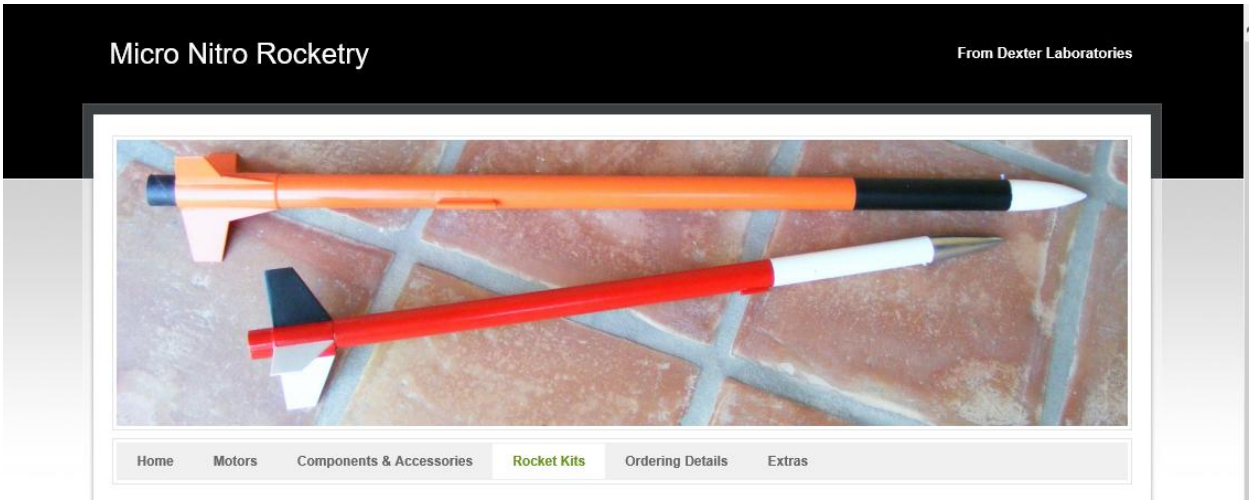


COMPONENTS, CONSUMABLES, SUPPORT TOOLS & ACCESSORIES:

Components:
Individual motor parts are not available separately at this time (except replacement parts are available to existing customers who purchased full motors)

Consumables:
Dash 009 Buna-N O-rings (for both motors) 5 pk $0.50
Dash 016 Buna-N O-rings (for the micro-hybrid) 10 pk $0.90
Dash 018 Buna-N O-rings (for the mini-hybrid) 10 pk $1.20
Dash 117 Buna-N O-rings (for the mini-max) 10 pk $1.50
Dash 016 Silicone O-rings (for the micro-hybrid) ea $0.40
Dash 018 Silicone O-rings (for the mini-hybrid) ea $0.50
Dash 117 Silicone O-rings (for the mini-max) ea $0.70
Burst disks 10 pk $0.70

Support Tools:
Burst disk punch and die set $40
Retaining ring pliers $30
Pre-heater grain cutter $15
Paper grain rolling mandrel $7
Wood dowel push-rod (9" x 3/4") $2
Initiating hex key (3/16") $2
Complete support tool kit $70



MICRO AND MINI-HYBRID PROTOTYPE ROCKET KITS:

WHIPPET (top in the photo) $39

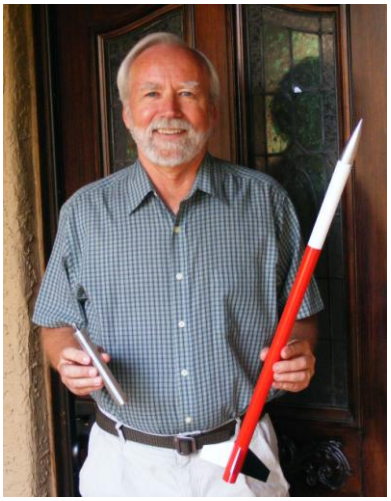
The Whippet kit is designed specifically for use with a Dexter Labs mini-hybrid motor. Lightweight altimeters such as the Perfectflite SLCF, Altus Metrum Easy Mini or Eggtimer Apogee are ideal companions for this kit. The finished rocket is 1.2" in diameter by 34.5" long and weighs 3.7 oz. Prototypes have flown to over 1000' (see videos in Extras).

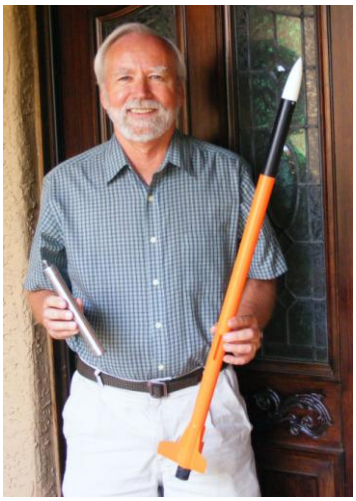
Request an info sheet and/or rocksim file from me by email nmrockets@yahoo.com

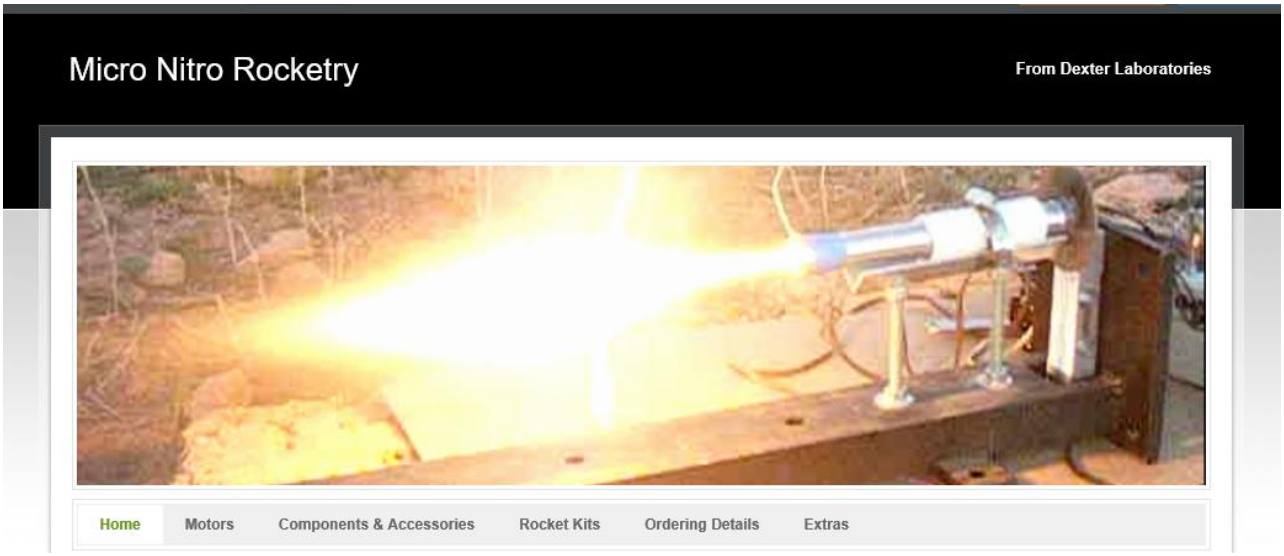
WHIPPERSNAPPER (bottom in photo) $29

The WhipperSnapper kit is designed specifically for use with a Caldera-style micro-hybrid motor from any manufacturer. Lightweight altimeters such as the Altus Metrum Easy Mini or Eggtimer Apogee altimeters, or a magnetic apogee detector (MAD) are perfect companions for this kit. The finished rocket is 1" in diameter by 27" long and weighs 2.1 oz. Prototypes have flown to over 700' (see video in Extras).

Request an info sheet and/or rocksim file from me by email nmrockets@yahoo.com







Ordering Details:

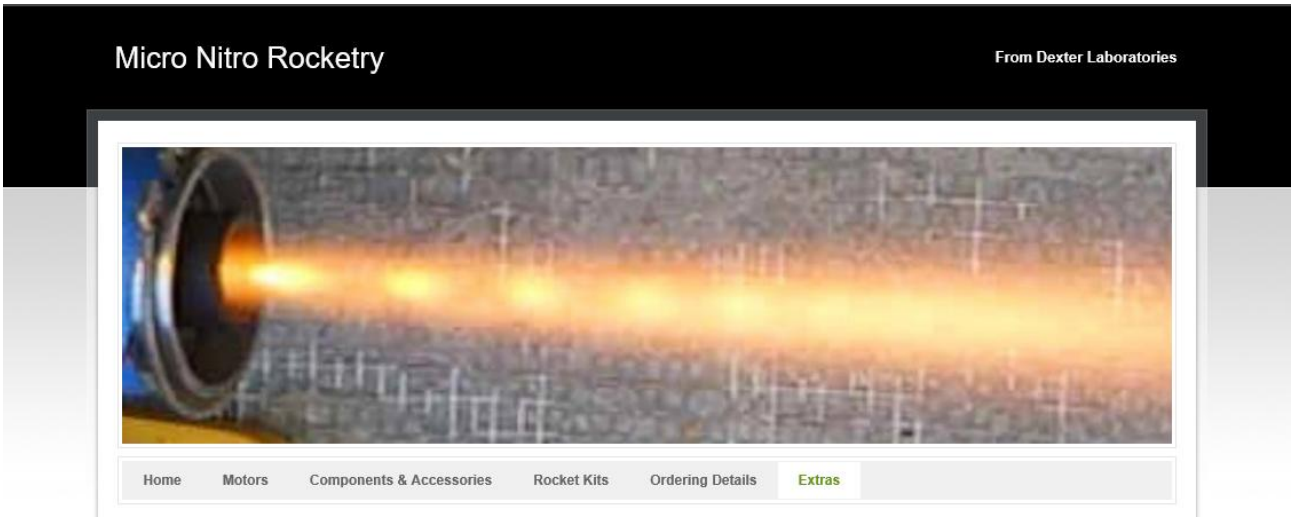
Custom Motors and Prototype Rocket Kits are Still Available

As the years have worn on my ability to spend hours doing custom machining has gradually diminished. While I am still offering items for sale to interested individuals, I am no longer focusing on manufacturing but rather researching and flying these fascinating motors. In addition, material costs have increased astronomically especially over the last couple of years. As a result my prices have increased but for custom individually built motors my rates are still well below going rates at commercial custom machine shops.

I am currently offering custom motors, prototype rocket kits (supplies very limited) and a few critical consumables for sale. The general ordering procedure is as follows:

1) **E-mail me at nmrockets@yahoo.com with your order or any further questions you may have.**
2) **I will reply with answers and a quote including shipping along with a blank liability waiver and contract form.**
3) **I will begin filling your order.**
4) **In the meantime fill out the waiver and contract form, sign it and return it to me.**
5) **When your order is complete (typically a couple weeks) I will send you a Paypal invoice**
6) **Once payment has been received I will ship your order (I am best prepared to ship USPS priority mail).**

For any questions e-mail me at:
nmrockets@yahoo.com



EXTRAS:

Table of Contents (to see the actual video links, scroll down):

Rene Caldera's (US) video showing his early micro-hybrid static and flight tests (ca. 2000) (may be blocked by Warner Music Group):

http://www.youtube.com/watch?v=DOnxS07HqVQ

Gary Scroggs' (UK) 16 gram mini-hybrid motor in a static test using his custom polyester resin / iron oxide cast fuel grain. Look for his thrust curve data toward the end of the clip (10/31/09):

http://www.youtube.com/watch?v=KBcNJBPMeJ0

Gary Scroggs' (UK) 8 gram micro-hybrid motor in a static test using his custom polyester resin / iron oxide cast fuel grain. Look for his thrust curve data toward the end of the clip (11/1/09):

http://www.youtube.com/watch?v=2flbX1lxdzI

Jim Hefkey's (NZ) static tests with "bi-hybrid" gains. Here a live Estes C6-0 motor is used as a fuel grain for a micro-hybrid. The Estes motor burns as a "booster" then ignites the hybrid which in turn burns the spent cardboard casing (12/23/11):

http://www.youtube.com/watch?v=UlVcuVLaPFU&feature=youtu.be

One of Jim Hefkey's (NZ) bi-hybrid flight tests. Notice the "staging" is successful but the delay between the Estes burnout and the hybrid ignition is long and causes trajectory problems:

http://youtu.be/1dkYbcrBUrY

A Whippet rocket reaches 1,036 feet altitude powered by a Dexter Labs (US) mini-hybrid motor using a 16 gram charger and bag paper fuel grain. This represents a typical mini-hybrid flight (3/29/12):

https://youtu.be/GykKE0gaj4E

A Dexter Labs (US) WhipperSnapper rocket flying on a micro-hybrid motor using an 8 gram charger and bag paper fuel grain reaches 650'. This is a fairly typical flight for this rocket and motor combination (3/29/12):

http://www.youtube.com/watch?v=xcEbeB8-cPw

A modified Quest Bright Hawk rocket reaches 1,395 feet altitude powered by a Dexter Labs (US) mini-hybrid motor using a 16 gram charger and a fuel grain cast from HTPB/powdered aluminum (4/12/13):

http://www.youtube.com/watch?v=dBWC1MWS_Pg

A Dexter Labs (US) Whippet rocket lifts off powered by a mini-hybrid motor using a 16 gram charger and an HTPB / aluminum / lampblack fuel grain (5/15/13):

http://youtu.be/6F_Yia0X1-U

This is a static firing of "test article A" which is a mock-up of a three-burn by two-stage "bi-hybrid" rocket. The booster is a standard Estes D12-0 motor. At the end of its burn the D motor lights a modified Estes C6-0 motor loaded inside a Dexter Labs (US) micro-hybrid motor. At the end of its burn the C motor lights the hybrid which then burns the spent Estes paper case as fuel. See the publications available on this site for more details (3/5/14):

http://youtu.be/FTpnCV3teiQ

A Dexter Labs mini-hybrid burning the spent case of an Estes C class motor. This is the burn that would occur as the third burn of a 3 burn by 2 stage rocket configuration (3/25/14):

http://youtu.be/RIWqTqlOm00

Take your Dramamine before viewing! Jesse Phillips (US) provided this interesting on-board video taken from his Priority Stealth flown on a Dexter Labs micro-hybrid with a poly-phenol fuel grain. The Priority Stealth is a triangular saucer-type craft designed by Art Applewhite that is built from a cut-up cardboard box (see www.artapplewhite.com). The Priority Stealth spins on ascent, flips over at apogee and auto-rotates while descending. It is highly recommended as a test vehicle for these small hybrids since the high drag keeps apogee low and the auto-rotated descent requires neither altimeter nor parachute. Try "pause-stepping" through the video to see the details of the flight including some surrounding buildings caught at apogee. Notice the serrated edge of the saucer skirt remains visible in the lower portion of the frame (3/29/14):

http://youtu.be/PIBN3Z2KZgU

Jesse Phillips (US) on-board video of a Dexter Labs micro-hybrid powered Snoodle rocket. These types of rockets are made from foam pool noodle toys similar to those developed by Dick Stafford and others. This is another way to fly these small hybrid motors without the need for a deployment mechanism (4/15/14):

http://youtu.be/XYiqOmjQZBs

Successful flight of a 3 burn by 2 stage Dexter Labs (US) "bi-hybrid" micro-hybrid. In this flight a modified WhipperSnapper rocket is boosted with an Estes D12-0 motor. At burnout the booster ignites a modified Estes C6-0 motor grain contained within the combustion chamber of the micro-hybrid by direct staging. The C6-0 fuel burns supplying "cruising thrust" through the micro-hybrid's graphite nozzle. When the C6-0 grain burns out, the pre-heater grain is ignited, again by direct staging. The pre-heater grain starts the micro-hybrid which burns the paper case of the now-spent Estes motor as fuel. In all there are three separate burns contained in two physical stages. This flight was textbook with all burns completed successfully and with a vertical trajectory under calm conditions (peak altitude estimated at 1,500 feet). For more details see the User's Guide and Rocket Construction Manual (4/8/14):

http://youtu.be/06pz_Shckn4

Another very nice 3 burn by 2 stage flight of a Dexter Labs boosted WhipperSnapper rocket powered by a micro-hybrid motor. The boost is provided by an Estes D12-0 solid fuel motor and the sustainer is powered by a modified Estes C6-0 grain. The Estes motor has had its nozzle cut off and its diameter increased to fit snugly inside the Dexter Labs Micro-hybrid motor combustion chamber. This means that the hybrid burns once with the solid grain and once again with the nitrous oxidizer. The Estes grain is ignited via "direct staging" from the D-12 booster motor. At the end of its burn, the C6 motor ignites the hybrid pre-heater grain which melts the burst disc and starts the hybrid. The hybrid then burns the paper tube of the spent Estes C6-0 motor. The flashes seen late in the clip are from "flash panels" of automotive chrome trim tape wrapped around the body tube and also applied to the fins (10-27-15):

https://youtu.be/ZZFlqwn3R6A

A Dexter Labs mini-hybrid burning an HTPB - aluminum - lampblack grain on a static test stand. You can see the 16 pound test stand actually jump a bit at peak thrust. The average thrust is around 11 N over a 2.5 second burn and peak trust showed 68 N on the test stand but the motor was not tight against the thrust ring and thus hammered the load cell a bit. Peak thrust was actually more like 40 N. Overall impulse is 27.2 N s (3/17/16):

https://youtu.be/LFR5l6R9Qww

A Dexter Labs mini-hybrid motor burning a grain made from XX paper phenolic tube. This fuel has rather interesting burn characteristics. The burn starts quickly as is typical for these small hybrid motors and peak thrust is reached smoothly with no hard start or ragged burn like for HTPB-based grains. Peak thrust is 31 N at 0.05 seconds into the burn. The depletion limb of the burn is very smooth and remarkably long, lasting 9.5 seconds with no chuffing before final flameout! Overall impulse is 24 N s (3/17/16):

https://youtu.be/HL6jZUqCrjI

A Dexter Labs Whippet rocket flying on a mini-hybrid motor powered by a paper phenolic grain reaching 700'. Since phenolic seems to burn long and slow I increased the injector orifice diameter from 0.025" to 0.028". A faster burn and greater peak thrust is the result (4/16/16):

https://youtu.be/AH25H7vrl34

This video shows the full flight (takeoff through recovery) of a lightweight version of a Dexter Labs micro-hybrid motor burning a poplar wood grain. This motor is flying in a modified Estes Air Walker airframe which reaches an altitude of 1,042 feet, my highest flying single stage micro-hybrid to date (flown on 12/12/17):

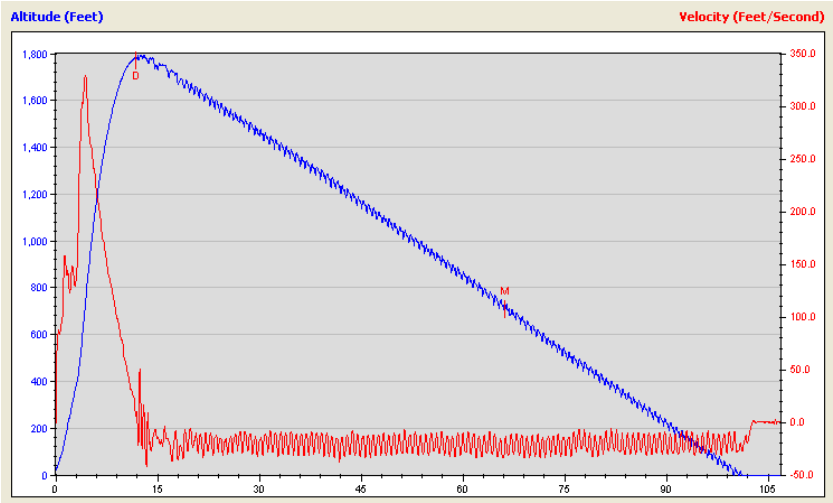
https://youtu.be/s0SiTVW054Y

A nice dusk flight of a Dexter Labs 3" Boink rocket (pool noodle airframe) flying on a mini-hybrid motor burning a grain made from compressed artificial wax fireplace log material (10/24/18):

https://youtu.be/I5VAqoy0Rgo

This is an updated and extended video to a brief one I posted showing this launch. Since it represents my first fully successful mini bi-hybrid flight and remains one of my best flights for this motor I have added the pre-flight “pibal” release, the complete flight from launch to touchdown and a clip of the recovery. "Traditional" bi-hybrid launches for the mini-hybrid motor are difficult to pull off because the launch weight is very heavy for the C6-0 motor to push from a dead start even with the recommended modifications presented in my manuals. Adding a D12-0 powered booster changes the whole picture. The D12 gets the entire system moving to 150 fps. While providing no additional acceleration, the C6 (in reality around a C9 after the drilling mods) keeps the velocity fairly constant and when the E mini-hybrid kicks in burning the case of the C motor things speed up again to 330 fps. This modified Rookie with its booster reached 1,789 feet in a 12 second ascent (see the altimeter data plotted below):

https://www.youtube.com/watch?v=6MFsdthIfTQ



A Dexter Labs 29mm Mini-max bi-hybrid motor flying in a 3" Boink rocket (pool noodle airframe). The Mini-max is burning an Estes D12-0 motor. First the Estes burns its own black powder propellant then at the end of its burn the Estes starts the 16 gram mini-hybrid which burns the cardboard of the spent case (4/15/19):

https://youtu.be/hBDuyMwHAxY

A Dexter Labs 29mm Mini-max bi-hybrid motor flying in a 3" Boink rocket CATOs within its first 5 feet of flight. The Estes E12-0 motor used as the base grain was only slightly modified. It appears that the hybrid started early while the black powder was still burning but the root cause of the CATO is still unknown and is under study. I have come to learn that Estes E12 motors suffer high CATO rates! Until Estes resolves the problem (they are aware of the issue) I recommend using only the D12 version of the Mini-max motor. Notice that the fifty foot launch distance that I use for standard micro and mini-hybrids is not safe enough for these larger mini-max motors! (4/25/19):

https://youtu.be/n39IBCwWpOU

This is a flight of a Dexter Labs 3F&NC superlight scratch-build airframe powered by a mini bi-hybrid motor and boosted by a D12-0 grain contained in a modified Estes Mongoose booster. This all produces a 3 burn by 2 stage flight with a total launch weight of 272 grams, 100 grams lighter than the two-stage Rookie flight shown above.

This rocket was never recovered but based on comparisons of flight events from the Rookie flown to a known 1,789' it is conservatively estimated that this 3F&NC flight reached over 2,100'. My best performance to date:

https://youtu.be/aiPEtlCipQw

This is a static test firing of Gordon Strodel's micro-hybrid burning an acrylic grain. The burn is classic for an acrylic grain with quick positive ignition, bright flame, and clean, smooth burn with no chuffing:

https://youtu.be/lFITTI38kIA

This is another view of Gordon's micro-hybrid burning an acrylic grain as seen in the previous clip. This time the video is slowed down and has very sensitive audio so you can hear interesting details of the burn:

https://youtu.be/FvlRNF8j7Sc

This is a static test of a mini-hybrid burning a phenolic grain that turned out completely unexpected. I have had long burns with phenolic before and that is one of the hallmarks of the material as a fuel but this burn is way longer than anything else I have ever experienced. Granted, it never produces over 1 newton of thrust but it burns for 55 seconds using only 16 grams of nitrous! Upon disassembly, the burst disk had only a pin hole but the pre-heater did ignite the main grain and the burn proceeds at a low level for almost a minute holding flame the whole time. To me, this emphasizes the variability possible with different burst disk melt characteristics and also the possibility of throttling this fuel type!

https://youtu.be/HQfEvYP18ng

Gordon Strodel's flight of a Prime Stealth saucer (Millennial's version of Art Applewhite's Priority Stealth) made from an Amazon box and powered by a micro-hybrid burning an acrylic grain. A very nice flight!

https://youtu.be/N_EqXeNXf_E

A slow motion video of the liftoff of Gordon Strodel's Prime Stealth flight powered by a micro-hybrid burning an acrylic grain. The sound effects are very interesting and "big rocket" like!!

https://youtu.be/lNEBvxhqVxo

A wild ride onboard a Dexter Labs Whippet mini-hybrid powered rocket burning poplar wood for fuel. The burn lasts 5 seconds and the rocket reaches just under 1,200 feet. The video is taken with a Fuvision mini camera simply aimed out a side port in the payload bay. Hence the video is upside-down for the descent and I have rotated the second part in editing so everything appears heads-up. I think the whistling sound is nitrous still venting at the end of the burn (but it could be air flow across the video port) and the whistle transitions into a gurgling sound as the last traces of nitrous are vented. The wire-like object flashing across some of the frames is the spent deployment charge. Despite all the yelping sounds, no puppies were harmed during the creation of this video.

https://youtu.be/5R_gL_5wyfI

This is unedited video from the ascending portion of the flight of a modified Estes Firestorm and Booster 60 two stage airframe. This configuration is relatively low flying due to drag from the camera mirror pods extending beyond the 1.6 inch diameter body tube along with the additional mass of the video camera and bay.

Booster ignition starts at 5 seconds into the video. About 1.5 seconds later the over-drilled D12-0 booster burns out and separates. Flames can be seen still issuing from the top of the booster airframe as it falls away. Virtually simultaneously the mini-hybrid comes to life by direct staging from the D12-0 and the C6-0 (actually a C9 or 10 after the modifications) black powder grain burns for another 1.5 seconds as indicated by the spiraling smoke trail following the upper stage as it develops a small wobble after separation. A few sparks are all that indicates the end of the C grain burn which has been spiked with a bit of pyrogen painted in the top of the case to carry the flame across the "gap" to the pre-heater grain. The pre-heater grain then burns for about a half second with no visible indication in the exhaust. A brief puff of smoke follows indicating ignition of the nitrous/paper third burn that lasts for about three more seconds. After a brief coast the deployment charge is detonated by the Altus Metrum Easy Mini altimeter at apogee and the parachute is seen being ejected.

The video is obtained through a port in the side of the altimeter/camera bay and a 50 degree mirror affixed to an external pod adjacent to the port. You will notice that a "halo" of horizontal scenery surrounds the vertical view due to the camera seeing around the edges of the mirror pod. Video editing is needed to cut that away.

https://youtu.be/2Utp7LFxaxY