

Part I

INTRODUCTION

OVERVIEW



Giant Leap Talon-6

Length: 10 ft 3.375 in

Diameter: 6.16 in

Weight (est.): 34.26 lbs.45.95 lbs loaded.

Motor: Cesaroni M-1400

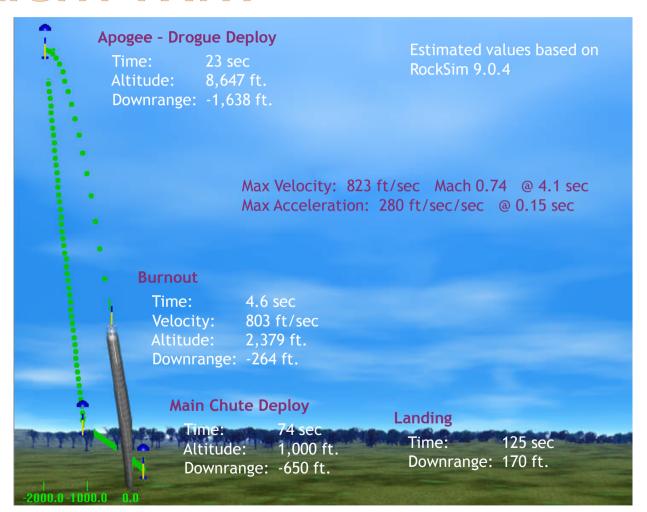
DESCRIPTION

- The Talon is basically the Talon-6 kit from <u>Giant Leap</u> <u>Rocketry</u> with some slight modifications*
 - Length: 123.375 inches
 - Diameter: 6.16 inches
 - Launch Weight: estimated at around 46 lbs.
 - Final value will be determined after all components are completed
- Planned motor:
 - Cesaroni M-1400 Classic
 - Motor Case: Cesaroni Pro75 5 grain case

FLIGHT DETAILS

- Estimated altitude: 8600 feet
 - Based on initial weight estimates of ~46 lbs
 - Wind conditions of 7-15MPH
- Recovery
 - Drouge chute at apogee
 - Giant Leap Rocketry TAC-Drogue 24" (1.9 oz cloth)
 - Main chute at 1000 feet
 - b₂ Rocketry SkyAngle, Cert 3 XL, (1.9 oz cloth)

FLIGHT PATH

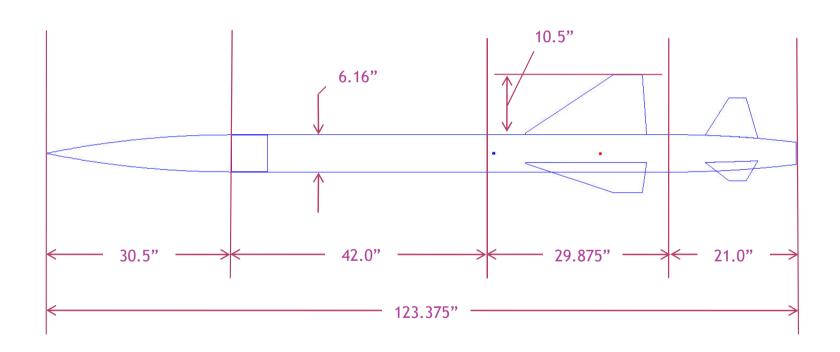


Part II

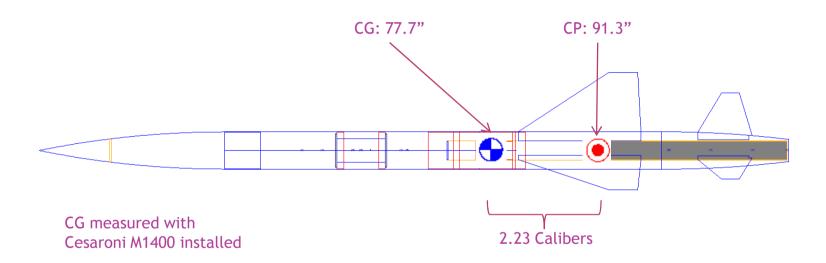
DRAWINGS

7

OUTSIDE DIMENSIONS



CP AND CG



Part III

CONSTRUCTION

SPECIFICATIONS

- Nosecone: 5-to-1 Ogive; Epoxy-based figerglass
- Tailcone: Epoxy-based fiberglass; preslotted for lower fins
- Airframe: Filament-wound fiberglass; preslotted
- Motortube: 75mm X 48"; phenolic (extended to 52")
- Recovery system
 - Booster:
 - 22 ft 5/8" Tubular Kevlar™ (external)
 - 18 ft 5/8" Tubular Kevlar™ (internal)
 - Upper Section:
 - 25 ft 5/8" Tubular Kevlar™
- Fins: 3 upper fins, 3 lower fins finished edges; 1/4" composite honeycomb with glass sandwich. Reinforced with one layer of 10 oz fiberglass followed by one layer 3 oz fiberglass.
- Bulkheads and Rings: 1/2" thick 9-ply Russian Birch
- Motor Retention: 75mm Threaded Slimline
- Delrin Rail buttons (attached through to bulkheads)

AIRFRAME AND CENTERING RINGS

Composite with Fiberglass Layer **Fore Airframe Forward Ring** Nosecone Thickness: 0.25" **Fiberglass Fiberglass** Birch 9-ply Length: 30.5" Length: 42" Dim: 6.0" x 3.0" Thickness: ~0.125" Width: 0.9375" Diameter: 6.16" Thickness: 0.16" (dual 0.468" rings) eBay Mounting Collar **Aft Airframe Fore Tail Ring Aft Ring** eBay

Phenolic Length: 8" ID: 3.76"

Rings

Birch 9-ply Dim: 6.0" x 3.9" Width: 0.9375" (dual 0.468" rings) Birch 9-ply Dim: 6.0" x 3.0" Width: 0.468"

Fiberglass Length: 29.875" Diameter: 6.16" Thickness: 0.16" Slotted for fins

Fins

Birch 9-ply Dim: 5.8125" x 3.0" Width: 0.9375" (dual 0.468" rings) Slotted for fins

Tailcone

Fiberglass Length: 21"

Diameter: 6.16" to 3.625"

Thickness: ~0.125"

ADHESIVES

- Rings and bulkheads mounted with West System® epoxy
 105 Resin and 205 Fast Hardener
- Motor retainer mounted with J-B WELD (8265-S)
- All other parts were assembled using 15min Epoxy
- Fillets on all key mating points (rings to airframe, rings to motor tube, bulkheads to airframes and nosecose and fins to surface of airframe) made using West System® 105 thickened with 404 High-Density Filler
- Aeropoxy for applying the fiberglass

REINFORCEMENTS

- Fin anchor points were fashioned out of 3/8x3/8 hardwood providing a 'slot' for the root edge of the fins to slide into.
 This also reinforced the centering rings.
- The fins are covered with one layer of 10 oz fiberglass fabric laminated with Aeropoxy followed by one layer of 3 oz fiberglass fabric extending out to provide fin-to-body tube reinforcement.

COMPOSITE FINS

- Aerospace Composite Fins
 - Giant Leap's new fin material
 - It is much stronger than wood, more rigid than G-10 (for equivalent thickness). Lighter than wood, 1/3 the weight of G-10.
- Each fin covered with one layer of 10 oz. fiberglass followed by one layer of 3 oz fiberglass.



An inner layer of NOMEX(TM) honeycomb, sandwiched between thin G-10 Fiberglass!



Fiberboard edging provided with kit is glued to the fins using polyurethane glue.

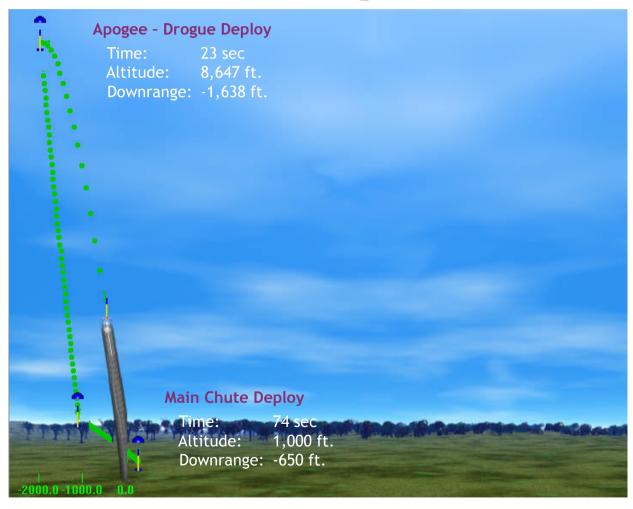
DETAILED CONSTRUCTION

- Details on the construction of the Talon (with photographs)
 can be found at:
 - http://xcalrockets.net/html/l3details.html

Part IV

RECOVERY SYSTEMS

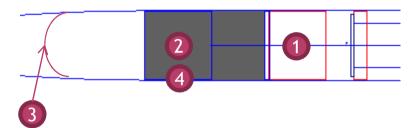
DEPLOYMENT SEQUENCE





PARACHUTE COMPARTMENTS

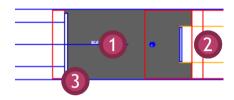
- The Main parachute will reside in the upper portion of the forward airframe (and the nosecone). The parachute will be protected by a large Kevlar™ chute protector (2)
- Because of the size of the parachute and the short space in the airframe the parachute will extend into the nosecone
- 2" elastic supports the parachute and aids in its deployment by providing force against the chute (3)
- Four nylon shear pins retain the nosecone to the airframe (4)





PARACHUTE COMPARTMENTS

- The Drogue parachute will reside in the lower portion of the forward airframe protected by a large Kevlar™ chute protector (1)
- The motor tube extension was reduced in overall length by 4" to provide additional space for the drogue and associated elements (2)
- A 3/16" hole is located in the upper portion of the airframe to relieve pressure as the rocket gains altitude preventing premature separation of the two airframes (3)



DESCENT RATES

- b2 Rocketry Manufacturer ratings for CERT-3 XL
 - CD = 2.59
 - 20 fps @ 45 lb load
- Rocksim 9.0.4 estimates:
 - Drogue parachute descent rate: 165 155 ft/sec
 - Main parachute descent rate: 24 25 ft/sec

CONTROL DEVICES - ARTS-II

Main Altimeter

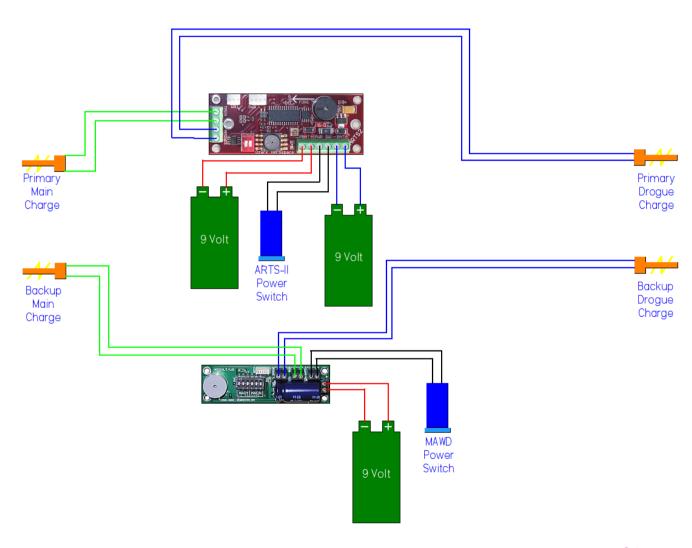
- Ozark ARTS2
 - 2 fully programmable pyro channels for chute deployments, air start, staging, etc.
 - Accelerometer as well as Barometric operation (immune to mach effects)
 - Recording sample frequency selectable: 200Hz, 100Hz, 50Hz, 20Hz, 10Hz
 - 26 min (max) recording time, 10 Samples/Sec
 - 82 sec recording time at 200 Samples/Sec
 - Terminal port for connection to a computer for data download
 - Field-reprogramable firmware
 - Two mounting options: four .125" mounting holes (#4 screw) or two #6 screws
 - Use a single 9v battery (or any 9V-25V DC power source)
 - The ARTS 2 now offers the option to use a second power source to provide extra power for the outputs.
- Second battery option used

CONTROL DEVICES - MAWD

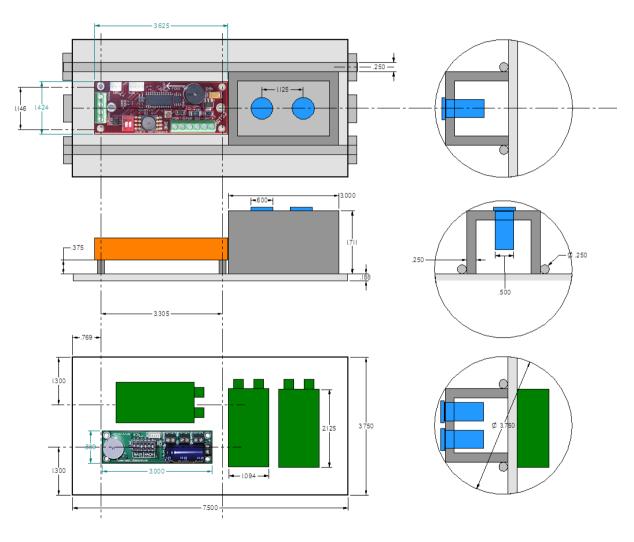
Backup Altimeter

- PerfectFlite miniAlt/WD logging dual event altimeter
 - Precision sensor works to 25,000 feet MSL
 - All data is stored in nonvolatile memory and is preserved even if power is lost
 - Deploys drogue and main chutes with audible igniter continuity check
 - Main chute deployment altitude is adjustable from 300' to 1,700' in 200' steps
 - Mach delay is adjustable from 0 to 14 seconds for high performance flights
 - Robust power supply is not affected by up to two seconds loss of power in flight
 - High accuracy A/D and precise factory calibration yields +/- 0.5% typical accuracy
 - Rugged SMD construction, stringent QC testing, and internal selfdiagnostics assure reliability
 - Measures just 3.0" L * 0.9"W * 0.7"H, fits in 24mm tube, weighs 0.7 oz.

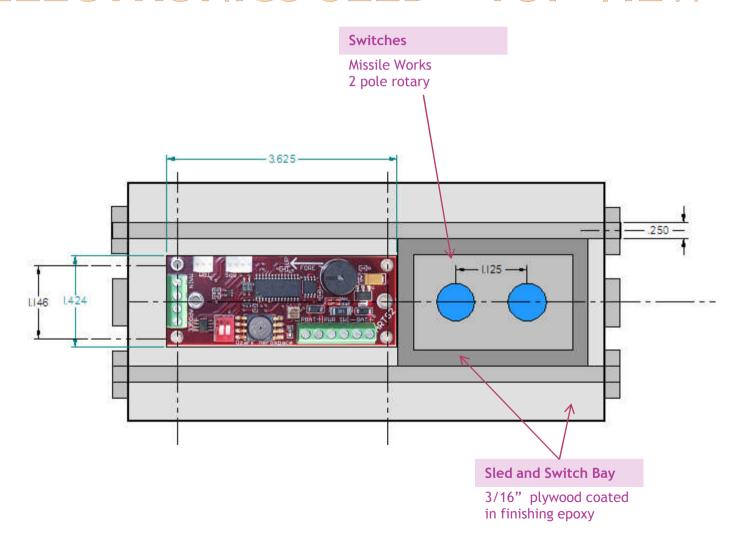
CONTROL DEVICES - WIRING



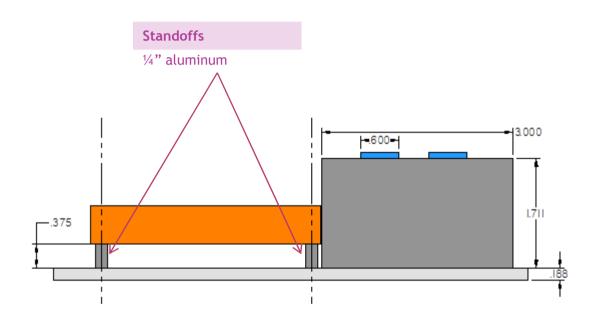
ELECTRONICS SLED - OVERVIEW



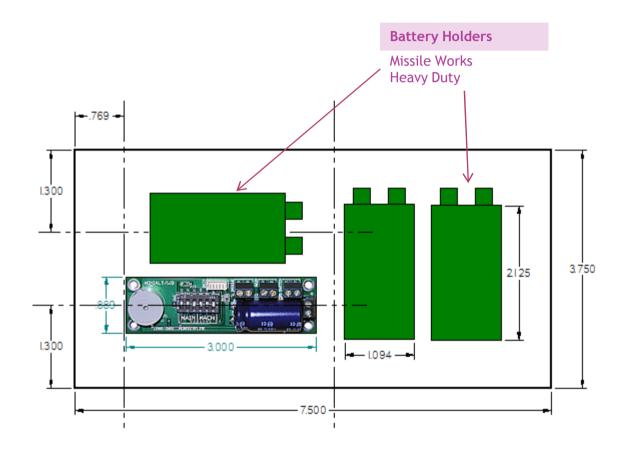
ELECTRONICS SLED - TOP VIEW



ELECTRONICS SLED - SIDE VIEW



ELECTRONICS SLED - BOTTOM

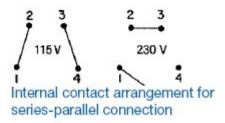


ELECTRONICS SLED

Switches

- Missile Works SW-2
- 2 pole rotary





• Features:

- High detent spring loaded cams for bobblefree operation.
- Easy operation by flatblade screwdriver in or out of the airframe.
- Use for switching or shunting applications.
- SPST or DPST operation.
 Rated for 6.3A at 250V.

Dimensions:

Length - 1.05" Head - 0.6" D x 0.1" L Body - 0.5" D

ELECTRONICS SLED

Battery Holder

- Missile Works
- BH-9
- Batteries will be held in place via electrical tape wrap completely around the holder



• Features:

- High-impact glass-filled Nylon body.
- Nickel plated steel battery contacts.
- Tin plated brass solder terminals.
- Accommodates ALL 9V batteries.
- 4 hole rigid mounting.

MAIN PARACHUTE

b₂ Rocketry CERT-3 XL

- CERT-3 series manufactured with zeroporosity 1.9 oz. silicone-coated balloon cloth
- 5/8" mil-spec tubular nylon (2,250 lbs.) suspension lines sewn around outside canopy
- UV-resistant polyester sail-maker's thread used throughout
- CERT-3 series lines attach to a heavy-duty 1,500 lb. 12/0 nickel-plated swivel



DROGUE PARACHUTE

- Giant Leap Rocketry TAC-Drogue
 - 24" Diameter
 - Extra strength 1.9oz coated, low porosity ripstop nylon

RISERS

- ½" Tubular Kevlar™ throughout
- Anchored to aft ring by knot and tape wrap
- Other anchor points sewn and attached with QuikLinks
- (See Mounting Hardware section for photos)



MOUNTING HARDWARE - 1

- Electronics Bay and Collar Assembly
 - Modified to use ¼"Quik-links
 - Fore and Aft

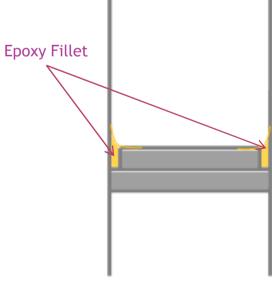




MOUNTING HARDWARE - 2

- View of eBay and Collar assembly from inside forward airframe.
 - West System epoxy used to attach to airframe
- Top ring is slightly smaller to allow epoxy to fill in and provide extra strong bond at the ring to airframe junction



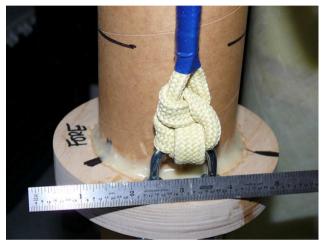


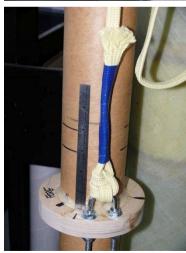


MOUNTING HARDWARE - 3

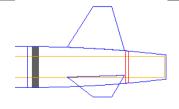
Aft centering ring

- ¼" U-Bolts
- ½" Tubular Kevlar™ tied with anchor knot.
- 6" of cord wrapped in electrical tape
- Mounted to motor tube with West
 System epoxy thickened with 404 filler











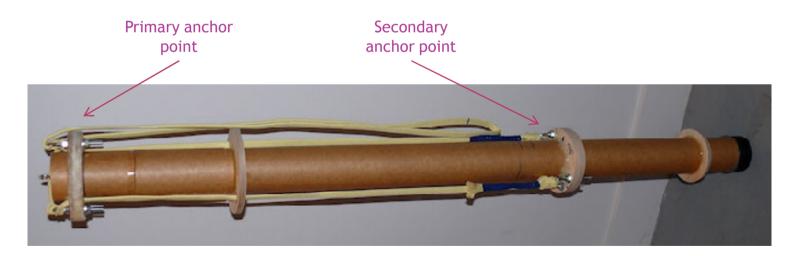
MOUNTING HARDWARE - 4

- Forward motor tube ring
 - ½" U-Bolts
 - 5/8" Tubular Kevlar™ cord (up from the aft ring) wrapped and then extended about 14"



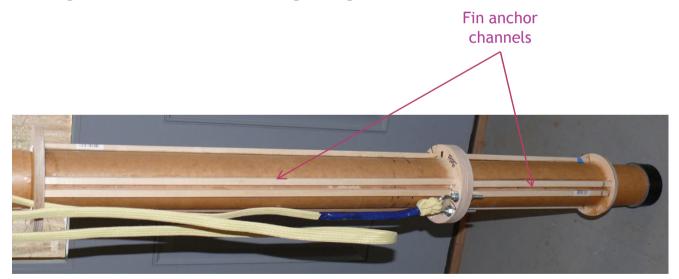
MOUNTING HARDWARE - 5

- The recovery system features a redundant anchoring system so that in the unlikely event that one attachment point fails, there's a back up anchor
- The aft centering ring provides secondary anchoring for the forward motor tube ring (not included in rebuild)



MOUNTING HARDWARE - 6

 Another modification to the original plans was the addition of fin anchor channels which provide a stronger attachment for the fin's root edge and also provides added strength to the centering rings.



PYROTECHNIC DEVICES

- MJG Technologies J-Tek3B eMatches
 - Resistance: 1 Ohm +/- 0.2 Ohms
 - Maximum no fire current: 0.3 Amps
 - Minimum All fire Current: 0.75 Amps
 - Recommended Min. Firing current: 1.00 Amps
 - Recommended Nominal Firing Current: 1.25 Amps
 - Maximum Test Current: 0.04 Amps
- Four eMatches (one in each ejection canister)

EJECTION DATA - MAIN

- Data from Chuck Pierce's Black Powder Ejection Charge Calculator
- Length of 25" was a conservative value based on length of forward section main airframe and the interior of the nosecone.
- BP needed = 5 grams

						_
Volume =	706.9	in^3		4Fg Black Pow	Fg Black Powder Gas Properties	
Dia =	6	inch		R =	22.16	ft*lbf/lbm/R
Lengh =	25	inch		Tc=	3307	R
·						
				Conversions:	1 lbm = 4	54 grams
					1 oz = 28	.3 grams
Calculation Mass of Black Powder for a desired Ejection Pressure						
Desired Pressure =	14	psi				
mass BP =	5.11	grams		m=PV/R/T		
Ejection F =	395.8	lbf		F=P*(pi/4)*d^:	2	

EJECTION DATA - DROGUE

- Data from Chuck Pierce's Black Powder Ejection Charge Calculator
- Drogue compartment length = 12"
- BP needed = 2.5 grams

Volume =	339.3	in^3		4Fg Black Pow	ack Powder Gas Properties		
Dia =	6	inch		R =	22.16	ft*lbf/lbm/R	
Lengh =	12	inch		Tc=	3307	R	
				Conversions:	1 lbm = 4	54 grams	
					1 oz = 28	.3 grams	
Calculation Mass of Black Powder for a desired Ejection Pressure							
Desired Pressure =	14	psi					
mass BP =	2.45	grams		m=PV/R/T			
Ejection F =	395.8	lbf		F=P*(pi/4)*d^2	2		

GROUND TEST DETAILS

- Using 4 grams of BP and 4 2-56 nylon screws as shear pins
 - 5 grams was a bit excessive for the smaller chute
- Ground Test successful

Part V



LAUNCH PAD

- Available system at MDRA site
 - Either 1500 or 1550 rails T-Slot rails on C-Rack or
 - 1 5/8" Unistrut on the hydraulic towers

CG AND CP

Calculated by RockSim 9.0.4

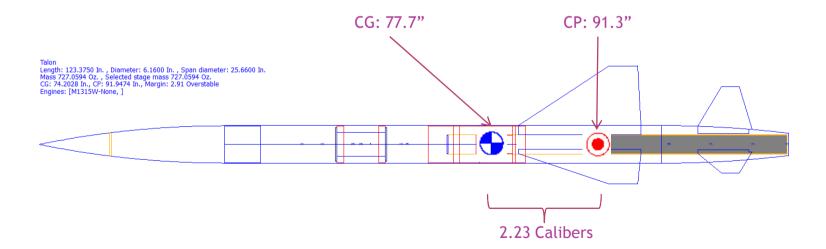
Talon

Length: 123.7500 In., Diameter: 6.1600 In., Span diameter: 25.6600 In.

Mass 735.2703 Oz. , Selected stage mass 735.2703 Oz.

CG: 77.7302 In., CP: 91.3354 In., Margin: 2.23

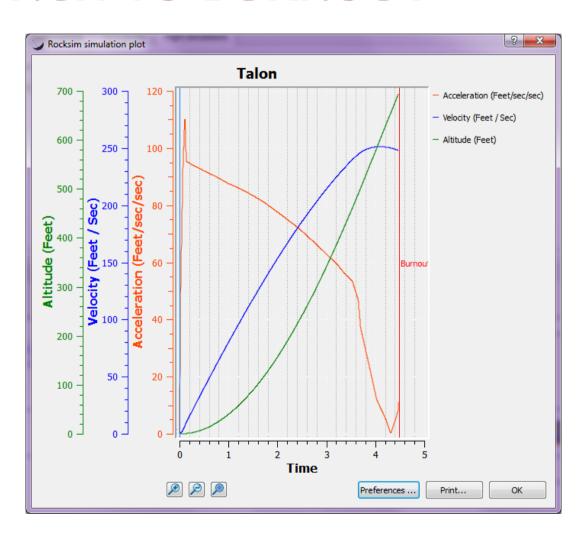
Engines: [M1400-Classic-None,]



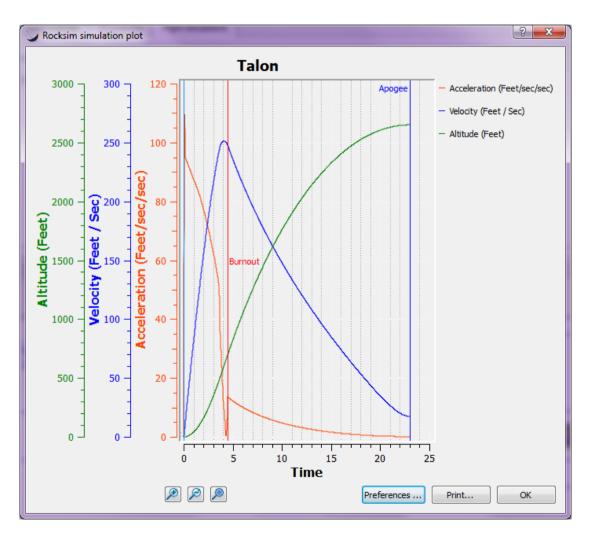
Part VI

TECHNICAL PERFORMANCE MEASURES

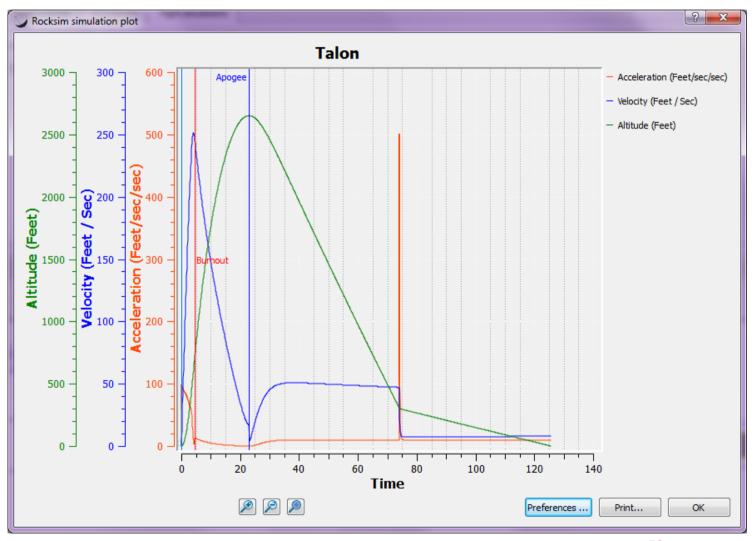
LAUNCH TO BURNOUT



LAUNCH TO APOGEE



LAUNCH TO LANDING



MOTOR

Motor Reload

Cesaroni M1400

Average Thrust: 1389 N

Peak Thrust: 2206 N

• Burn Time: 4.5 sec

Total Impulse: 6251 N-S

Motor

Pro75 P75-5G-HS

LAUNCH GUIDE DATA

- Launch guide length: 120.0000 In.
- Velocity at launch guide departure: 75 ft/s
- The launch guide was cleared at: 0.29 Seconds
- User specified minimum velocity for stable flight: 44 ft/s
- Minimum velocity for stable flight reached at: 41 in.

MAX DATA VALUES

- Est. Drag Coefficient: 0.35 0.78 (Calculated by RockSim 9)
- Maximum acceleration:*
 - Vertical (y): 2020 Ft./s/s
 - Horizontal (x): 8.4 Ft./s/s
 - Magnitude: 2020 Ft./s/s
- Maximum velocity:
 - Vertical (y): 809 ft/s
 - Horizontal (x): 21.8 ft/s
 - Magnitude: 823 ft/s
- Maximum range from launch site: 2258 Ft.
- Maximum altitude: 8647 Ft.
 - * Large values are calculated at Chute Deployment: actual Max accel(magnitude): 280 Ft./s/s at 0.15 sec.

LANDING DATA

- Time to landing: 125 Sec.
- Range at landing: 170 feet
- Velocity at landing: Vertical: -18.9 ft/s , Horizontal: 17.2 ft/s , Magnitude: 25.6 ft/s

Part VII-X

CHECKLISTS

PLANNING CHECKLIST

ı	Planning (Checklist				
ſ	1	Paperwork and Planning Materials				
		Check weather for wind and temperature conditions				
		Has the NAR L3CC approved the launch?				
		Have appropriate MDRA officers been notified of the flight?				
		Has all paperwork been completed and submitted?				
		-				
ſ	2	Flight profile predictions				
Ī		Rocksim's predicted altitude below the waiver				
		Motor and reload ordered for flight date				
		_				
Ε	3	Pre-Launch (at home activities)				
		PerfectFlite MiniAlt/WD tested and operational				
		ARTS-II tested and operational				
		avBay parts accounted for and any pre-assembly completed				
		New 9v batteries purchased (8)				
		Inventory				
		Nosecone				
		Forward airframe				
		Aft airframe				
		avBay				
		Upper shock cord assembly				
		Lower shock cord assembly				
		QuikLinks				
		Chute protectors (2)				
		Shear pins				
		Main Parachute				
		Drogue Parachute				
		miniAlt/WD Altimeter				
		ARTS-II Altimeter				
		Motor preparation tools and materials				
		Motor retainer ring				
		Tools for airframe assembly and inspection				
		Stands and tie downs				
		Electronic test gear				
		eMatches				
		FFFF BP				
		Tissue wadding				
		Cellulose insulation				
		General at-field equipment (shade, chairs, flight kits, computer, GPS, etc.)				
		Manuals (Altimeters)				
		NAR Certification Forms				
		Certification package (copy)				
		NAR Membership Card				

PRE-FLIGHT CHECKLIST

Dro-Elia	nt Checklist
	L Damage Check
	Check Nosecone for damage
	Check upper airframe for damage
	Check lower airframe for damage
	Verify all linkage points are secure
	Check harness(es) for damage or weak points
	! Motor Assembly
	Assemble motor per manufacturer's instructions
	Electronics
	Verify all units are in safe mode
	Check batteries for condition
	Inspect electronics for damage
	Conduct altimeter checks
	Verify miniAlt is set for 900' main deployment (Switch settings: 0 1 1 0 0 0)
	Conduct ARTS-II diagnostic tests
_	Program ARTS-II for 1000' main deployment
_ <u> </u>	Verify safe status after all tests complete
- 1	Mount altimeters in avBay Install all batteries (secure with electrical tape)
H	Connect batteries to altimeters
	Verify safe status of altimeters
_	Terry and added it districted
	Pyrotechnics
	Test all eMatches for continuity and resistance (1+/-0.2 ohm nominal)
⊢	Load eMatches into ejection canisters
- ⊢	Connect eMatches to altimeters
⊢	Verify Main and Drogue leads are routed properly Plug eMatch lead routing holes to seal against ejection pressure
H	Prug eMatch lead routing holes to seal against ejection pressure For all four ejection charge cannisters:
	Load specified amount of black powder into ejection charge cannister
	Install tissue wadding or cellulose insulation into canister
	Tape end of cannister to secure charge
	Final check of wiring
	Final check of wiring
	Final check of wiring avBay
7	Final check of wring Washy Wount adday that upper airframe
	Final check of wiring av8ay Mount w8ay into upper airframe Verify forward end is toward nosecone
	Final check of wiring wifey Woult adday into upper airframe Verify forward end is toward nosecone Verify overhold hold are in alignment with airframe access holes
	Final check of wiring av8ay Mount w8ay into upper airframe Verify forward end is toward nosecone
	Final check of wiring away Mount wildby into upper airframe Verify for ward end is toward noisecone Verify south holes are in alignment with airframe access holes Blott on cover piece and verify seal Recovery System
	Final check of wiring wikery Werly forward end is toward nonecone Verify forward end is toward nonecone Verify worth other are in alignment with airframe access holes alot no cover place and verify seal Recovery System Connect aft ""hames to aft avday collar assembly
	inal check of wiring avillay avillay Mount avillay into upper airframe Mount avillay into upper airframe Verify forward end is toward nosecome verify switch holes are in alignment with airframe access holes Interest of the consequence and verify seal Recovery, system Connect aft "\" harness to aft avillay collar assembly Faster aft shockcode Connect aft "\" harness to aft avillay collar assembly Faster aft shockcode Connect aft "\" harness to aft avillay collar assembly Faster aft shockcode Connect aft \" harness to aft avillay collar assembly Faster aft shockcode Connect aft \" harness to aft avillay collar assembly Faster aft shockcode Connect aft \" harness to aft avillay collar assembly Faster aft shockcode Connect aft \" harness to aft avillay collar assembly Faster aft shockcode Connect aft \" harness to aft avillay collar assembly Faster aft shockcode Connect aft \" harness to aft avillay collar assembly Faster aft shockcode Connect aft \" harness to aft avillay collar assembly Faster aft shockcode Connect aft \" harness to aft avillay collar assembly Faster aft shockcode Connect aft \" harness to aft avillage Connect aft \" harness to
	Final check of wiring wiley wiley Werly forward end is toward nosecone Verify forward end is toward nosecone Verify worth other are in alignment with airframe access holes flot on cover place and verify seal Recovery System Connect aft ""hames to aft avday collar assembly Fasten aft shockcord Verify secure connections to both booster section and aft collar assembly
	inal check of wiring awibay awibay Mount arday into upper airframe I werry forward end is toward noise. Verify forward end is toward noise. Verify south on began en alignment with airframe access holes and no cover place and verify seal BROOMEN SYSTEM Connect aff "" harness to all avelay collar assembly risken aft shockodd Verify secure connections to both booter section and aft collar assembly Attach droger childre to Quistink.
	Final check of wiring wikery Werly forward end is toward nonecone Verify forward end is toward nonecone Verify with other are in alignment with airframe access holes alot no cover place and verify seal Bot no cover place and verify seal Recovery System Connect aft ""hammes to aft avday collar assembly Fasten aft shockcord Verify secure connections to both booster section and aft collar assembly Attach froque chulte to Quiktink Add cellulors insultation to aft end of main airframe
	Irinal check of wirring widay Would radially rind upper airframe I verify forward end is toward noscone Verify forward end is toward noscone Verify worth on bear en alignment with airframe access holes Biot no cover piace and verify seal Becomes of all "" harness to aff avelay collar assembly fastern aft shockone Connect aft "" harness to aff avelay collar assembly risken and shockone Verify secure connections to both booster section and aft collar assembly Attach drogue childr to Clustiknik Add cellulose insulation to aff end of main airframe Pask shockone, drogue and of utre protect rin out section of main airframe
	Final check of wiring wikery will will will will be provided in the conscious of the control o
	Irinal check of wirring widay Would radially rind upper airframe I verify forward end is toward noscone Verify forward end is toward noscone Verify worth on bear en alignment with airframe access holes Biot no cover piace and verify seal Becomes of all "" harness to aff avelay collar assembly fastern aft shockone Connect aft "" harness to aff avelay collar assembly risken and shockone Verify secure connections to both booster section and aft collar assembly Attach drogue childr to Clustiknik Add cellulose insulation to aff end of main airframe Pask shockone, drogue and of utre protect rin out section of main airframe
	Final check of wiring Mount andlay rint oupper airframe Verify forward end is toward nosecone Verify of words one are in alignment with airframe access holes Biot no cover place and verify seal Reconest dir V [*] hanness to aft andlay collar assembly Connect dir V [*] hanness to aft andlay collar assembly Connect dir V [*] hanness to aft andlay collar assembly Verify socime connections to hoth booster section and aft collar assembly Attach droge uchite to Quikkink Add cellulose insulation to aft end of main airframe Pack shockcord, droge and of uber protector into aft section of main airframe Attach metal repair tape to coupler Couple booster and main airframe
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	Final check of wiring Worly forward end is toward nonecone Verify forward end is toward nonecone Verify forward end is toward nonecone Verify with other are in alignment with airframe access holes Biot no cover piace and verify seal Recovery System Connect aft "Y harmes to aft avday collar assembly Fasten aft shockcod Verify secure connections to both boster section and aft collar assembly Verify secure connections to both boster section and aft collar assembly Verify secure connections to both boster section and aft collar assembly Add cellulose insulation to aft end of makin airframe Verify friction fit Couple booter and main airframe Verify friction fit Connect upper "Y harmes to upper awday collar assembly Fasten floward shockcord Verify secure connections to both nosecone and forward collar assembly Verify refriction fit Connect upper "Y harmes to upper awday collar assembly Verify refriction fit
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LAUNCH CHECKLIST

Launch Ch	necklist
1	Equipment List
	Launch site equipment available
•	Launch pad tools (knife, wrenches, tape)
	Radios
2	Mount rocket on launcher
2	Varifications and and traingtons
3	Verify launch angle and trajectory
4	Install ignitor
5	Arm Electronics
	Arm ARTS-II
	Verify ready (3 short beeps followed by high tone)
	Arm PerfectFlite
	Verify ready (3 short beeps - continuous)
5	Connect ignitor to launch system
	March all Challes Theorems and
6	Verify all flight witnesses are ready
7	Contact LCO with Flight Ready Status

POST-FLIGHT CHECKLIST

Post-	rt-Flight Checklist
	1 Verify pyro-charges are discharged
	Safe any unfired charge
	Attempt to identify reason for un-fired charge(s)
	2 Record Flight Data

CONTINGENCY CHECKLIST

Contingency Checklist			
	1	Determine misfire, lauch abort, or crash	
	2	Safe all pyro charges	
	3	Disconnect/remove ignitor	
	4	Note operating time (flight batteries need replacement)	