MnSGC “Remote High-Power Rocketry Lessons” Fall 2021

Lessons on Tuesdays from 6:30 to 7:30 p.m.

Zoom link: <https://umn.zoom.us/j/9772902391>

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Lesson 0 – Kick-off, Oct. 9, 2021, 10 a.m. till ~12:30 p.m., Tripoli MN club launch outside of North Branch (map at <http://www.tripolimn.org/>)

* Project overview and get team tote, see examples of model and high-power rockets (including cut-away models), observe high-power rockets being launched, start to select time slot for weekly remote lesson
* Homework: recruit additional team members (if need be), decide who will attend on-line lessons and when team will have work time(s) each week in between lessons

Lesson 1, Oct. 19, 2021 – Rocketry Concepts; Parts of the Kit; Tote Contents; Epoxy Practice

* Rocket vocabulary and basic concepts (including “dual deploy”), calculating CG, CP, and SM (by hand), types of epoxy (kit comes with some, but not all), step through contents of rocket kit and tote, talk through template for Flight Readiness Review (written report)
* Homework: find a (preferably-dedicated) build space, go through the tote thoroughly and inform us of any missing parts, fin-can exercise (epoxy practice), study reading materials mentioned during lesson

Lesson 2, Oct. 26, 2021 – Building the Rocket Airframe (this will take more than one week)

* Dry-fit airframe parts, always scuff surfaces before applying epoxy (or paint), advice about building the motor-mount assembly (order is critical here) and motor retainer, advice for applying epoxy to fins (i.e. feedback on fin-can exercise), modify nosecone for forged eyebolt and to accommodate radio beeper (will require Dremel tool or stout knife), discuss when to use friction fit vs shear pins vs rivets, how to attach recovery harness to rocket parts, how to attach parachutes and flame protectors to recovery harness
* Homework: make an explicit build schedule that takes into account epoxy and paint drying times then stick to it, start to build the airframe – complete it within 3 weeks (at the very latest), study reading materials mentioned during lesson

Lesson 3, Nov. 2, 2021 – Simulating Rocket Performance

* RockSim vs OpenRocket, learn how to edit (or make from scratch) an simulation model in OpenRocket and how to launch it with various motors under various wind conditions, where to get weather conditions for North Branch flying field, start a basic model
* Homework: play with simulation software, improve the basic model (provided) for your kit rocket, simulate its performance with a Cesaroni H-225 motor under varying wind conditions, continue building airframe, study reading materials mentioned during lesson

Lesson 4, Nov. 9, 2021 – Building/Wiring the Av-Bay; Programming the Altimeter

* Dry-fit av-bay parts, plan where to place internal components and how to secure them to the sled, calculate appropriate vent hole size for av-bay, practice graphing flight data and interpreting it, learn to use AltimeterTwo device and plan how to mount it in the rocket
* Homework: build a removable av-bay, wire the components, add switch on collar, add additional vent hole(s) (if necessary), program the altimeter, practice turning it on inside a sealed av-bay, finish building the airframe, mount AltimeterTwo and learn to operate it, study reading materials mentioned during lesson

Lesson 5, Nov. 16, 2021 – Finishing the Rocket

* Advice about priming and painting the rocket, add bleed holes as need be
* Homework: prime and paint the rocket (allowing sufficient drying time between coats), finish and submit written Flight Readiness Review/Report, study reading materials mentioned during lesson

Lesson 6, different dates for different teams – Flight Readiness Review and Safety Check (done with teams individually once rocket is complete) – do this before the end of November

* Show rocket to instructor and TA by videocon (essentially go through your FRR orally), field any questions, especially about safety
* Homework: finish anything not yet done, address issues raised in the FRR/Safety Check

Lesson 7, Dec. 4 or 5, 2021 (if teams are interested and if weather permits – otherwise launch in the spring of 2022 at a standard Tripoli MN public launch in April or May) – Rocket Flight at the launch site outside North Branch, 10 a.m. till done (~3 p.m.)

* Arrive with fully-completed rocket, do ejection charge testing (with parachutes and av-bay sled out of rocket, but shear pins and rivets as for flight), test the altimeter (outside of the rocket), learn to fold parachutes and install them, learn to operate video camera and insert it, learn to operate radio beeper and insert it, install motor and verify actual weight and CM and CP and SM (add weight to nose cone, if need be), re-load the ejection charges and put av-bay back in rocket, finalize shear pins and rivets and friction fit, launch then recover the rocket, download and look at flight data (on the spot), pass off flight items to other teams (if sharing any items)
* Homework: look at flight data and discuss rocket performance, decide (no later than the end of your fall semester) whether or not to continue with rocketry (perhaps into a rocketry competition): if so, start planning – if not, please return all removable parts from the rocket (avionics, parachutes, etc.) – keep the airframe (display it on campus?)