

19:00 – meeting started (Randy Hemann)

Attendees

20 present: Randy Hemann, Mike Carlin, Mike Quirk, Sam Petrie, John Tacinelli, Bob Fealey, Luka Bajzer, Enn Avltinger, Mark Avltinger, Isabell Lehnert, Duane Deal, C. Gawarecki, Mike Benson, Bill Davidson, Jay McLaren, John Martin, Josef Chlachula, Jerome Taubel, ?, and Brandon Wyman. (Zoom attendees: ?)

Presentation

- Katherine Melbourne, Policy Analyst, Center for Space Policy and Strategy at Aerospace Corporation.
- “Orbital Mechanics and Political Dynamics: The Physics and Strategy behind Space Warfare”
- Space as a warfighting domain
- Fundamentals of US Space Military Structures
 - USSF / USSpace.com
 - Department of War
 - Combat Forces Command
- Achieving US Space Superiority
- Counterspace Capabilities Overview
 - Bob Fealey – Q – Colorado vs Alabama.
 - Kinetic Attack: contact between object and target
 - Nonkinetic Attack
 - Space Domain Analysis
 - What is rhetoric surrounding them?
- Cooperation to conflict continuum
 - Competition (we are here now) to Crisis to Conflict.
- Strategy is constrained by physics
- Orbital speed and altitude are linked – the fundamentals
 - Satellite speed is determined by its orbit and altitude (not on mass)
 - LEO ... HEO.
- Inclination affects satellite path over Earth surface
 - Geosynchronous – 0° inclination, stays over one spot on earth.
 - 63.4° or 126° inclination example, one over the northern hemisphere, the other over the southern hemisphere.
- Satellites move predictably
 - Earth oblateness
 - 3-body effects
 - Atmospheric drag

- Solar radiation pressure
- Q – Perigee and Apogee. Slow and big view, or fast and closer view?
- Q – Retro orbits? Apparently some satellites are in retrograde orbits, but this is not common.
- ASW – Anti-Satellite Weapons.
- Cislunar orbits. Beyond Geo...Lagrange points in the Earth/Moon system.
- “Dogfighting” in space...?
 - Maneuvers use up fuel. Refueling logistics.
 - Leaving orbits ... cannot do job (?)
- Maneuvering on orbit
 - The fuel efficiency versus time tradeoff.
 - ΔV
 - Plane changes – require a lot of fuel. Very expensive.
- Speed up to slow down!
 - Very unintuitive.
 - Example of hitting a golf ball off a satellite. A cosmonaut did this maneuver from the ISS in 2006.
- Orbital Phasing
 - 2-burn sequence
 - A burn to slow down, drop to a lower orbit which causes an increase in speed, then a burn to speed up and go to a higher orbit that causes a slowdown, ending up in the original orbit, but at a different position.
- Security uses for maneuvering
 - Rendezvous and Proximity Operations
 - Video: [LSN 20 – Relative Motion & Proximity Operations](#)
- A note on norms
 - We should define a standard approach distance, right ...?
 - Some have said, in some contexts, that 10 km is a no-go zone.
 - There is no set definition of what is an appropriate “keep out zone” for satellite passes.
- Q – Randy – “The Martian” – The scene where they meet up with him leaving Mars. It is not as easy as looking at where you are going. Some example video link from the 60s is going to be sent to Randy.
- Types of kinetic engagements
 - Relevant to DA-ASATs and orbital ASATs.
 - ASATs – Ground based and Orbital. 10m for NEO, 10h for GEO.
 - Types of collisions: Head-on, T-bone, Tail-on.
- Electronic Warfare and Directed Energy
 - And a note on cyberattacks.
 - Considerations include intensity dissipation and precision.
 - Q – Micke Carlin – log4j and the Mars Rover.
 - Precision is important: frequency, polarization, signal strength.

- From the news - Things to watch for
 - Potential Russian nuclear weapon on orbit
 - Dynamic Space Operations
 - Return of space-based interceptors
- References – Books
 - “Weapons in Space: Technology, Politics, and the Rise and Fall ...” by Aaron Bateman
 - “Winning and Losing the Nuclear Peace” by Michael Krepon
 - “Phantom Orbits” by David Ignatins – A (fictional) thriller about space war!
- 20:12 – end presentation. Links will be sent out.

Recent/New Activities

Titan shadow transit September 4th

Josef and Bob went over observations of the Titan shadow transit. Bob shared two photos he took, one with a 10-inch SCT, the other with a 6-inch SCT. The photos were taken around 3 a.m., so the altitude was about 50 to 60 degrees, so very high in the sky.

September 11th public viewing at Elgin

Josef talked about the upcoming public viewing plans in Elgin, MN.

September 13th public outreach at Root River

Josef mentioned that there is also a public outreach at Root River Park this Saturday.

September 19th Member’s night at Eagle Bluff

Members plan to get together for some observing at Eagle Bluff next Friday.

September 20th Frontenac state Park event

Another public viewing/outreach event.

September 24th – Dodge Center Library

Josef mentioned that there is another public viewing/outreach event in Dodge Center. There is a plan to do a presentation inside the library with observing outside afterwards. The director has been in contact with Josef, and the event has been announced by the director. John Martin indicated it is 7 p.m. to 11 p.m. This is an event that the club has been participating in for the past two years.

StarBQ Re-cap

Randy, Jerome, Bob, and Duane shared some pictures and stories about the recent StarBQ event at Jerome’s property, “Dean Johnson Memorial Observing Field”, near Fountain. The

second night, during teardown, Jerome captured some photos and video footage of “Ozzie The Possum”. Randy shared some Insta360 camera photos, Unistellar photos (White Rose Cluster, NGC 0147, IC 342, NGC 0891, Blue Oyster Nebula, IC 289, M57/Ring Nebula and faint galaxy nearby). Bob shared a “Personal Observations 23rd” presentation with some data from the Unihedron Sky Quality Meter (21:00 – 00:20). The SQM data shows 21.27 mag/arcsec² which translates to NELM 6.26 (Naked Eye Limiting Magnitude). Bob had photos of M31, M32, and M110 taken using 6-in f/4 Quattro Reflector and SWO ASI183MC, 70 x 5-sec frames stacked in ASI Studio.

Josef mentioned the [Bright Star Catalog](#), about 9000 stars.

Duane Deal shared two pictures he had taken at the StarBQ.

John Attewell / Carl Wenning helping Tom Watson

Tom Watson is seeking help in acquiring photos taken in or near the state parks for an article in [Minnesota Trails Magazine](#). The deadline is not specifically mentioned, but the indication is ASAP. Send photos to Randy and/or John. Luka asked about Frontenac State Park, at which point John realized he had some nighttime photos from there. Bob also has some dark sky measurements that likely may be of interest. Josef suggested Bob also write up a website article on the various dark sky measurements he has done.

Root River Park signage update

Randy showed the recent update to what the signage for Root River Park will look like (12th version?). It will be a 24x18-inch sign printed on a thick aluminum with some kind of material made to resist UV exposure/fading. The park board did see and approve it. John Martin asked about the QR code, Randy indicated it goes to the calendar page.

Business

Treasurer’s report

Julie was unable to attend the meeting, so no treasurer’s report to review at this meeting.

Next month’s presentation

Discussions regarding a possible topic/presentation for next month’s meeting. John Attewell indicated he had a history presentation he could possibly do (100 years ago?) on E.E. Barnum. John Tacinelli indicated that he could do a presentation on the history of observing at the college (RCTC).

RAC Storage Unit – A proposal

Jerome had a quick presentation on possibly getting a storage unit for the RAC equipment. This would be an alternative to stashing equipment in various corners of various garages. A map of various storage unit locations was shown. John Attewell indicated that he has a friend that owns one of these, he could possibly have a chat with him. Randy pointed out that equipment totaling \$12,000 to \$15,000 in worth could possibly be coming to us, so a good storage location would be something to consider. John Martin pointed out that he has RAC signage that could be in such a storage location accessible to more members. Duan Deal asked about possibly getting a storage container, but that would need a location on some property (C. Gawarecki pointed out that a local archery club uses such a storage container, not necessarily mouse proof). This is just in the brainstorming/idea stage right now.

21:03 - adjourned.