Mission Operations Challenges on SunRISE

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SUNRISE
SUN RADIO INTERFEROMETER SPACE EXPERIMENT

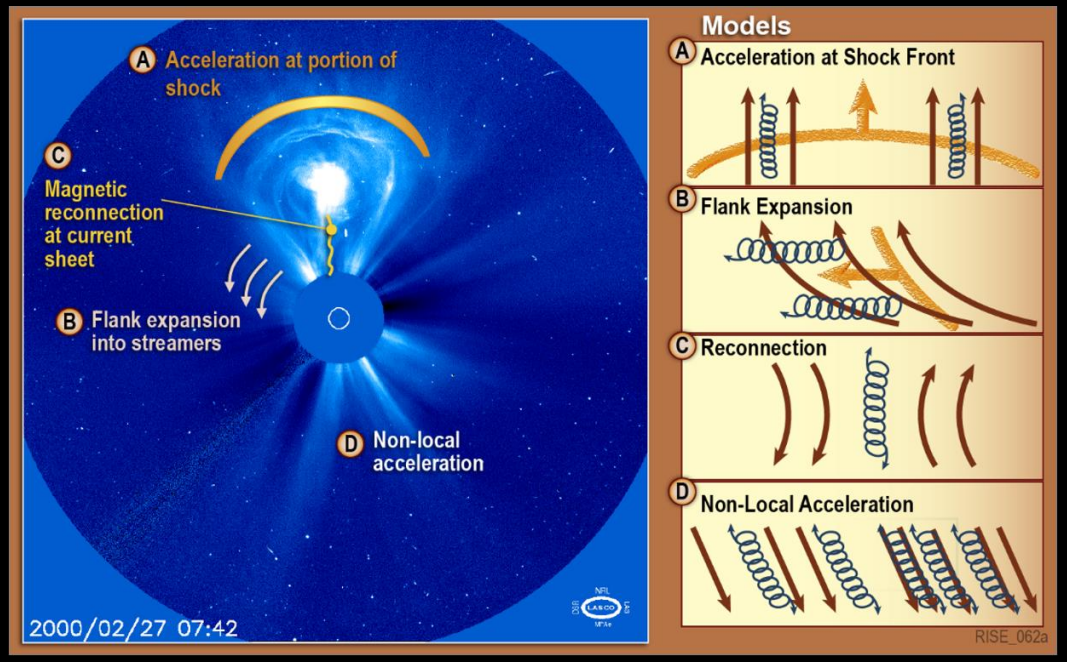


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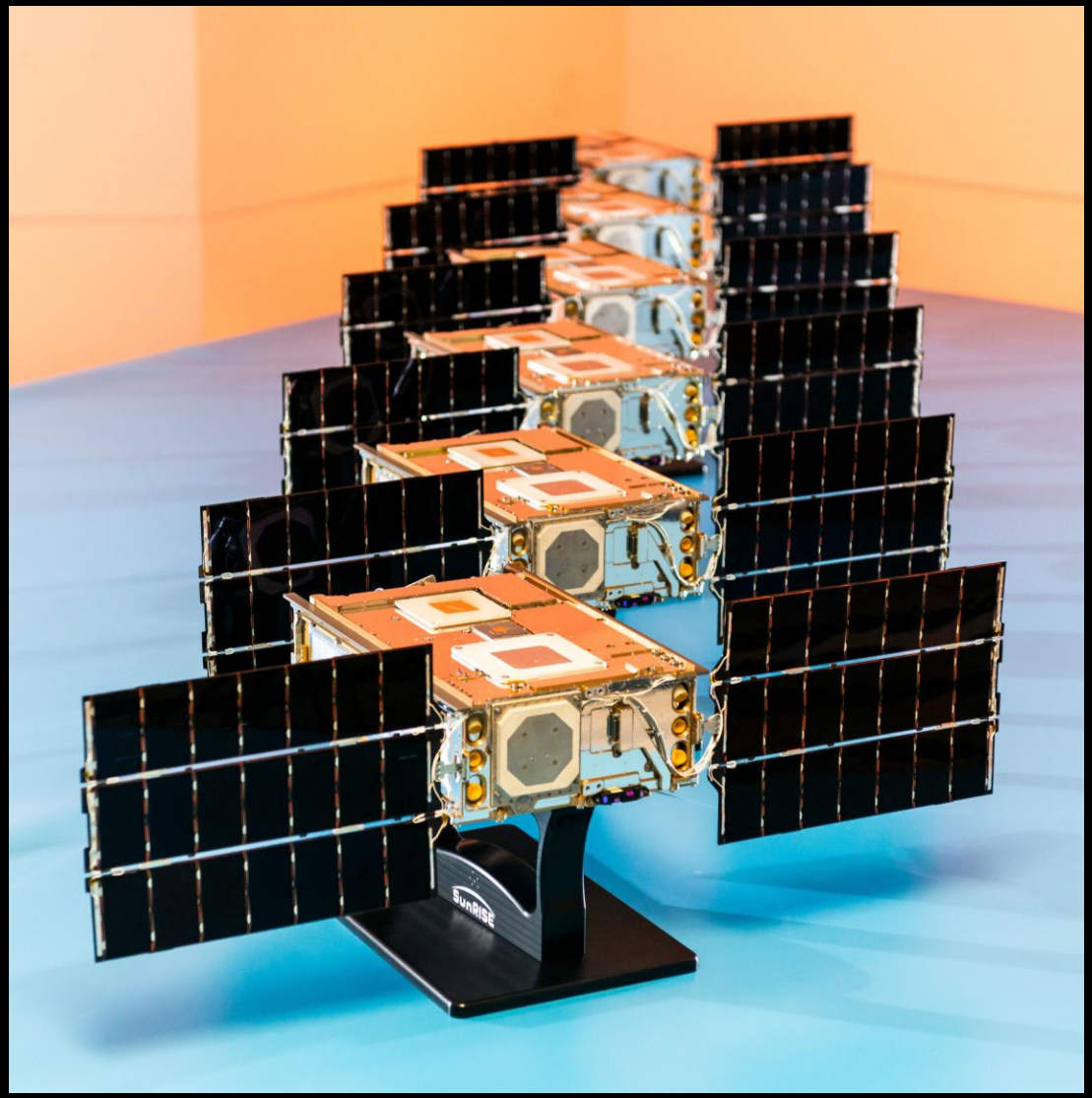
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- 6x space vehicles in GEO+ ~300km orbit
- Maintain ~10km relative spacing to achieve SAR
- Observe Type III radio bursts from coronal mass ejections
- **Key enabler:** observatory uptime > 90%

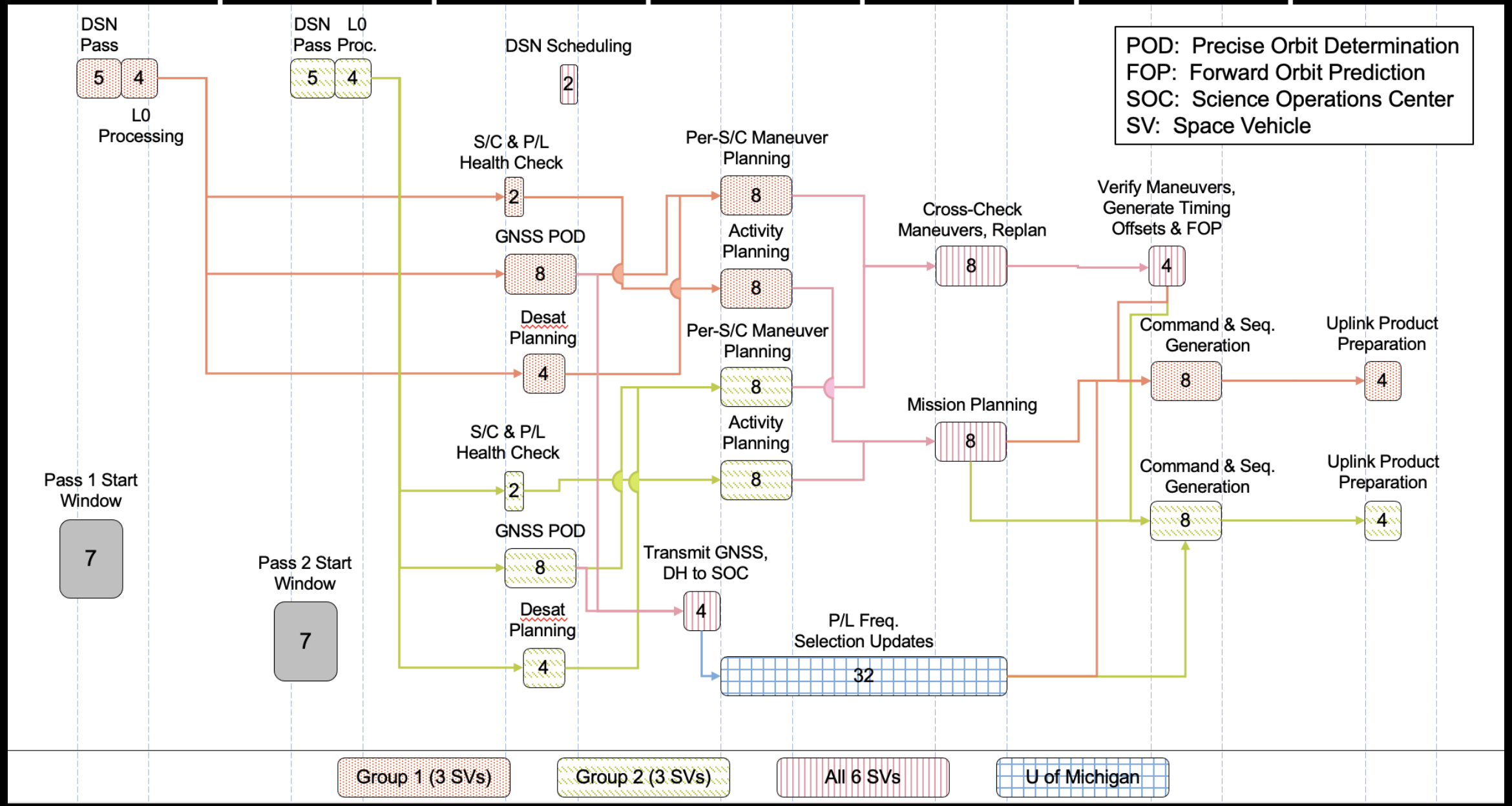


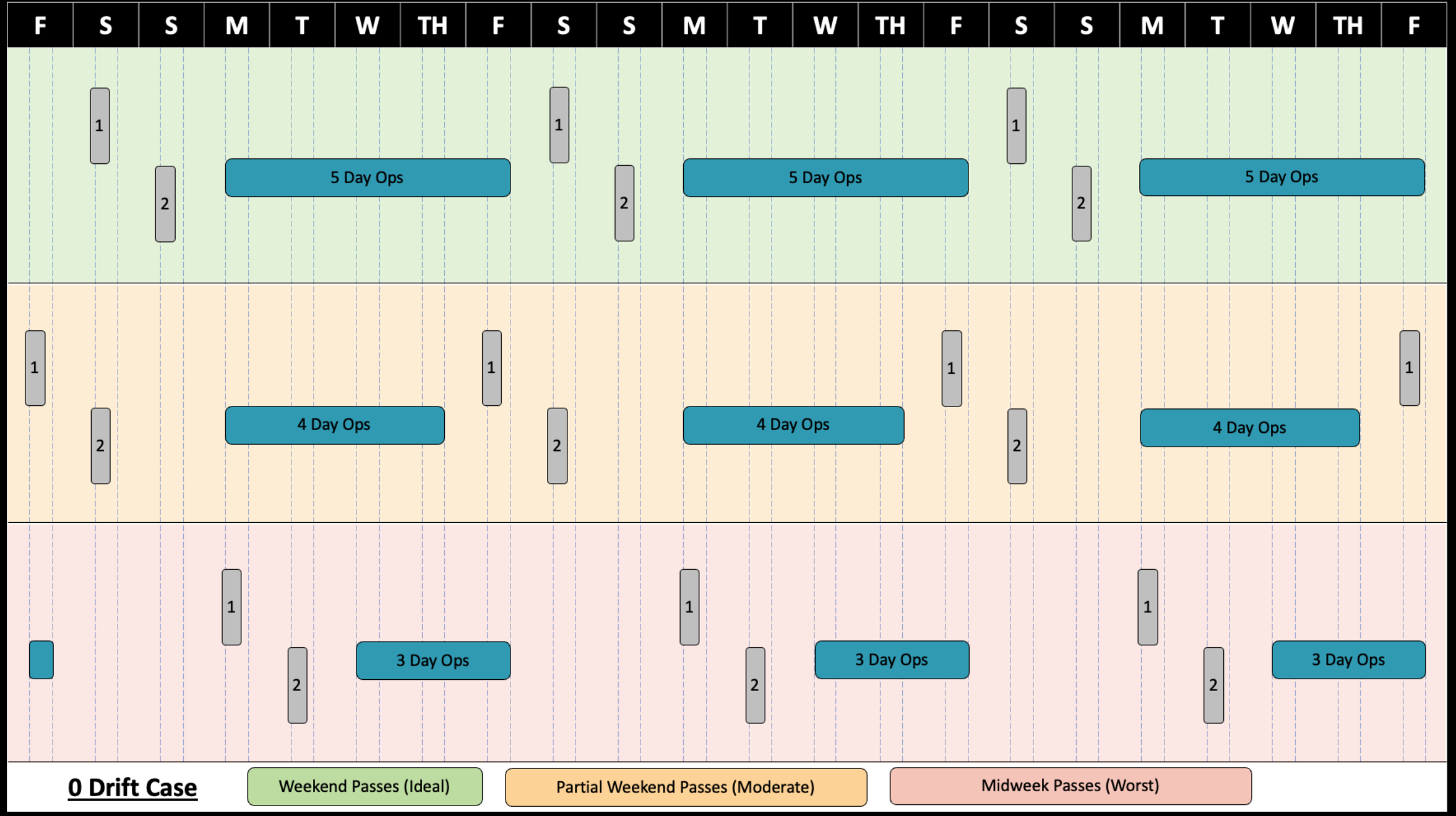
Credit: Lazio et. al

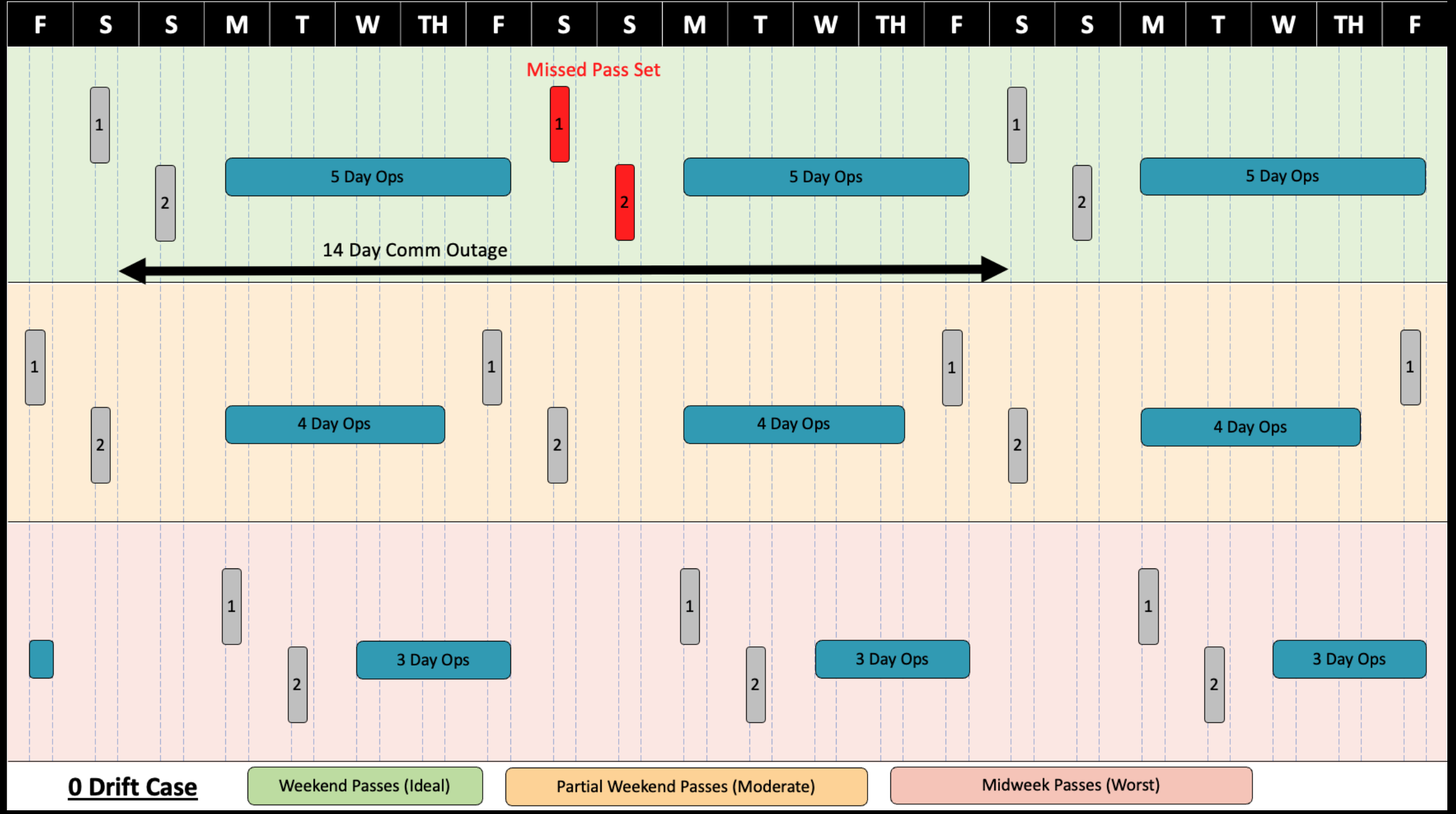


Credit: Utah State Space Dynamics Laboratory

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Day 1
Day 7
POD: Precise Orbit Determination
FOP: Forward Orbit Prediction
SOC: Science Operations Center
SV: Space Vehicle
DSN Pass
5
4
L0 Processing
DSN Pass
L0 Proc.
5
4
DSN Scheduling
2
S/C & P/L Health Check
2
GNSS POD
8
Desat Planning
4
Per-S/C Maneuver Planning
8
Activity Planning
8
Per-S/C Maneuver Planning
8
Activity Planning
8
Cross-Check Maneuvers, Replan
8
Verify Maneuvers, Generate Timing Offsets & FOP
4
Command & Seq. Generation
8
Uplink Product Preparation
4
Mission Planning
8
Command & Seq. Generation
8
Uplink Product Preparation
4
S/C & P/L Health Check
2
GNSS POD
8
Desat Planning
4
Transmit GNSS, DH to SOC
4
P/L Freq. Selection Updates
32
Pass 1 Start Window
7
Pass 2 Start Window
7
Group 1 (3 SVs)
Group 2 (3 SVs)
All 6 SVs
U of Michigan


F S S M T W TH F S S M T W TH F S S M T W TH F
1
2
5 Day Ops
1
2
5 Day Ops
1
2
5 Day Ops
1
2
4 Day Ops
1
2
4 Day Ops
1
2
4 Day Ops
1
1
2
3 Day Ops
1
2
3 Day Ops
1
2
3 Day Ops
0 Drift Case
Weekend Passes (Ideal)
Partial Weekend Passes (Moderate)
Midweek Passes (Worst)



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Summary of Challenges

1. Observatory synchronization across 2 separate command passes
   - **Solution**: artificial 4-week latency for science payload configuration updates

2. Uncertainty of prior week maneuver execution
   - **Solution:** start-of-pass maneuver verification on ground using onboard-generated rough orbit determination data

3. Type II, Class D funding profile
   - **Solution:** integrated mission operations and ground software team leveraging shared systems engineering and joint testing

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