4D Space

Subsystem Testing Review

University of Oslo

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CDR Presentation Outline

• Section 1: Mission Overview
• Section 2: Final Design Description
• Section 3: Hardware Procurement Status
• Section 4: Subsystem Testing Results
• Section 5: Plan for ISTR
• Section 6: Plan for FMSR
• Section 7: User Guide Compliance
• Section 8: Project Management Update
1.0 Mission Overview

Name of Presenter
Mission Overview: Action Items from CDR

• Please summarize any action items from CDR

• Can be actions your team had but please include any the RS-XN program management had during your CDR
Mission Overview: Mission Statement

The experiment will demonstrate the feasibility of multipoint high-resolution electron density measurement using the 4DSPACE payload module:

- Multipoint measurement will facilitate the understanding in the ‘big picture’ of ionospheric plasma condition.

- Characterizing the plasma density at kinetic scale.

- The obtained data can be used to study plasma turbulence and instability for space weather forecast. And increase reliability of GNSS systems.
Mission Overview: Success Criteria

**Minimum Success Criteria:**
- Deliver and qualify 4DSPACE module and sub-modules for flight (educational objective)
- Release of the daughters and establish communication to the rocket and further to ground

**Comprehensive Success Criteria:**
- Continuous data retrieval for whole traveling path of the daughters,
- Retrieve valid data for calculation of electron density and platform potential
- Retrieve valid housekeeping data and TOF for calculation of the daughter’s position/path
# RS-XN 2019 Mission Timeline (1st Draft)

<table>
<thead>
<tr>
<th>Event</th>
<th>Time (sec)</th>
<th>2 sigma Low Altitude (km)</th>
<th>Nominal Altitude (km)</th>
<th>2 sigma High Altitude (km)</th>
<th>Nominal Range (km)</th>
<th>Velocity (m/s)</th>
<th>Nominal Q (psf)</th>
<th>Mach NO.</th>
<th>Flight Elevation (deg)</th>
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**Note:** The table represents the 1st Draft of the RS-XN 2019 Mission Timeline. The values and events may be subject to change based on ongoing reviews and updates.
Mission overview: Concepts of operation

Altitude

- **t ≈ 60 sec**
  - Altitude: 65 km
  - *Deploy doors*

- **t ≈ 66 sec**
  - Altitude: 74 km
  - *Despin*

- **t ≈ 62 - 72 sec**
  - Altitude: 68-80 km
  - *Deploy daughters*

- **t ≈ 32 sec**
  - Altitude: 19 km
  - *End of Malamute Burn*

- **t = 0 min**
  - *All systems on*
  - *Begin data collection*

- **t ≈ 457 sec**
  - *Splash Down*

- **Apogee**
  - t ≈ 218 sec
  - Altitude: ≈181 km
Payload Location

- Please confirm your mounting location
## Concept of Operations

<table>
<thead>
<tr>
<th>Event</th>
<th>Time On</th>
<th>Units</th>
<th>Dwell Time</th>
<th>Units</th>
<th>Event Description</th>
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<td>-300</td>
<td>(T-X) (sec)</td>
<td>900 (sec)</td>
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<td>Main power</td>
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<tr>
<td>GSE 2</td>
<td></td>
<td>(T-X) sec)</td>
<td>(sec)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TE-R</td>
<td></td>
<td>(T+X) (sec)</td>
<td>(sec)</td>
<td></td>
<td></td>
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<tr>
<td>TE-1</td>
<td>62</td>
<td>(T+X) (sec)</td>
<td>20 (sec)</td>
<td></td>
<td>Deployment signal</td>
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<tr>
<td>TE-2</td>
<td>60</td>
<td>(T+X) (sec)</td>
<td>0.1 (sec)</td>
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<td>Pyro ignition</td>
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<td></td>
<td>Pending confirmation on whether controlled TE-2 or other dedicated line.</td>
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<tr>
<td>TE-3</td>
<td></td>
<td>(T+X) (sec)</td>
<td>(sec)</td>
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</table>
2.0 Final Design Description

Name of Presenter
System Changes Since CDR

Main module
• No changes

Sub-module
• ASC radio board
  – Charging circuit moved externally to avoid leakage currents.
  – Various bug fixes (corrected from MaxiDusty version)
  – No impact on mission objectives/requirements

• mNLP board
  – No changes
System Overview: Main payload block diagram

ASC responsible for design.
System Overview: Sub-payload block diagram

UiO mNLP payload

MOSFET disconnects battery when external programming line is connected

Micro switch connects battery to regulator when released.

ASC responsible for design.

- Each sub payload is powered by a one cell 500mAh LiPo battery.
- The batteries are charged by an external circuit.
System Overview: mNLP Instrument block diagram
System Overview: Main Payload Overview

Main payload (responsible: ASC):
- Main payload design is done by Andøya Space Center.
- The design has heritage from the previous Maxidusty project and is modified to the RockSat-X platform
System Overview: Main Payload Design II

Side view

Top view

Bottom view
System Overview: Subpayload
Detailed Weight Budget

- Weight of full 4DSPACE module is estimated to ~37.1 lbs.

- Weight of skin and doors: 6.86 kg (15.12 lbs)

- The weight of one sub-module is
  - 275 g (Mechanical + ASC radio board)
  - 75 g (UiO mNLP)
  - Total: ~ 350 g (~0.77 lbs)

- Mechanical design not yet finalized and approved.
  - Expected soon
  - Most update design files sent from ASC to Wallops.

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<tr>
<th>Subsystem</th>
<th>Total Weight (lbf)</th>
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<td>4DSPACE module (excl. skin, doors &amp; sub-module)</td>
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<td>Skin</td>
<td>6.86 kg (15.12 lbs)</td>
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<td>Sub-payload x 6</td>
<td>0.35 kg (~0.77 lbs) x 6</td>
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<tr>
<td>Total</td>
<td>16.85 kg (37.1 lbs)</td>
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<td>Over/Under</td>
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Materials List:

- EN AW-6082 T6 are mostly used.
- PTFE are used on the upper and lower exit guides and other parts that require low friction.
- BOM and title block on drawings will show complete list.
- Most bolts used are A4-70 or A4-80 (Stainless). Were extra strength is required 10.9 or 12.9 steel bolts are used.
Hazardous Mechanical Items:

• There are no hazardous materiel used in the 4DSPACE module.

• The pyros used to cut the wire holding the doors in place have stored energy. The explosion and cutting action is contained inside the cutter housing.

• CG and MOI will change as a result of the release of the doors, wire and daughter payload.
Subsystem Design: Main payload
Subsystem Design: Sub-payload ASC
System Overview: Sub-payload UiO-mNLP
Subsystem Design: Detailed Power Budget

- Sub-payloads are not included as they run independently on battery and will not affect the power consumption of the main modules connected to the rocket.
- These numbers are estimates based on updated time line of 457.2 seconds.
- We are well within the available power budget
## Pin Assignments: Power

### From user guide

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<td>Timer Event Redundant (TE-RB)</td>
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<td>4</td>
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## Pin Assignments: Telemetry

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<td>Parallel Bit 13</td>
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<tr>
<td>27</td>
<td>Parallel Bit 14</td>
<td>Parallel Bit 14</td>
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<tr>
<td>28</td>
<td>Parallel Bit 15</td>
<td>Parallel Bit 15</td>
</tr>
<tr>
<td>29</td>
<td>Parallel Bit 16 (LSB)</td>
<td>Parallel Bit 16 (LSB)</td>
</tr>
<tr>
<td>30</td>
<td>Parallel Read Strobe</td>
<td>Parallel Read Strobe</td>
</tr>
<tr>
<td>31</td>
<td>N/C</td>
<td>N/C</td>
</tr>
<tr>
<td>32</td>
<td>RS-232 Data (TP1)</td>
<td>RS-232 Data (TP1)</td>
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<tr>
<td>33</td>
<td>RS-232 GND (TP2)</td>
<td>RS-232 GND (TP2)</td>
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<tr>
<td>34</td>
<td>N/C</td>
<td>N/C</td>
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<tr>
<td>35</td>
<td>N/C</td>
<td>N/C</td>
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<tr>
<td>36</td>
<td>Ground</td>
<td>GND</td>
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<tr>
<td>37</td>
<td>Ground</td>
<td>GND</td>
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</tbody>
</table>
Pin Assignments: Comments to choice of connectors

- Main board uses 2 x 26-pin d-sub
- Connection to 15-pin and 37-pin d-sub through cables.
- Convenience for compliance with existing design and allows for more flexible placing of connection point
Hazardous Electrical Items: Pyro on Main payload

- **Pyro on Main payload**
  - Main payload include a pyro system for wire cutting during deployment of sub payloads.

- **High voltage on mNLP**
  - Charge pump generates 100V for Electron emitter acceleration voltage. (see submitted schematics for more details.)
Software design: Overview ASC

Main payload

Start Master → Initialize → Doors deployed?
  No → Deploy → Broadcast
  Yes → Send status to CPLD

Doors deployed?
  No → Deploy → Broadcast
  Yes → Send status to CPLD

Broadcast → Time > EndTime?
  Yes → Send data to CPLD
  No → Received data?
    Yes → Send data to CPLD
    No → Time > StartTime
      Yes → Send data to CPLD
      No → Time = StartTime

Sub-payload ASC radio board

Start Slave → Initialize → TX = 0?
  Yes → Send IMU data
  No → Time = StartTime

TX = 0?
  Yes → Send IMU data
  No → Wait for broadcast

Wait for broadcast → Time = 0
  Yes → Start Time
  No → Set StartTime

Set StartTime → TX = 1
  Yes → Send IMU data
  No → Get temp

Get temp → Get battery current
  Yes → Get battery voltage
  No → HK = 0 AND Node num < 3?
    Yes → Get IMU data
    No → TX = 0

Node num < 3?
  Yes → Get IMU data
  No → TX = 0

HK = 0 AND Node num < 3?
  Yes → Get IMU data
  No → TX = 0
Data flow through the hardware:
- 4 channels of data runs from ADC to High End Timer (HET)
- HET stores the data in a sample buffer using Direct Memory Access (DMA)
- The Software takes the data and process and create packets from the data
- These packets are sent to the radio module over an SPI interface
  - mNLP is SPI slave
System Overview: Data-flow sub-payload UiO-mNLP

Sample Packet with raw data from HET

```
+------------------+------------------+------------------+------------------+
| 16 Bit Counter   | 32 Bit Channel 1 | 32 Bit Channel 2 | 32 Bit Channel 3 |
+------------------+------------------+------------------+------------------+
|                   | Total Size of   |                  |                  |
|                   | Sample Packet   |                  |                  |
|                   | 18 Byte         |                  |                  |
+------------------+------------------+------------------+------------------+
| 8 Bit Header     | 16 Bit Data     | 8 Bit Dummy Data |
+------------------+------------------+------------------+
```

Total Size of Sample Packet, 18 Byte
System Overview: Data-flow sub-payload UiO-mNLP

Data Packet to be sent to Radio Module

Total Size of Data packet for the radio module, 28 byte

3 Byte Sample Counter  Status Byte  24 Byte Data

2 byte of raw data for each Channel

ch1  ch2  ch3  ch4  ch1  ch2  ch3  ch4  ch1  ch2  ch3  ch4
Description of Partnerships

ASC:
- Mechanical design of main payload
  - in direct communication with Wallops to secure correct integration
- Mechanical design of daughter module
- Electrical and SW design for radio board on daughter module
- Testing at ASC

Penn State University:
- Characterization and possible improvements of antennas
De-Scopes and Off-Ramps

- No specific de-scopes or off-ramps are currently identified.
Special Requests

• Separate section for 4DSPACE module, not standard instrument deck
  – Communicated early in the project, and assume to be accepted

• Additional weight
  – Consequence of point above
  – 4DSPACE (excl. skin and doors): $7.89 \text{ kg} + 0.35 \text{ kg} \times 6 = 9.99 \text{ kg (22.02 lbs)}$
  – Skin: $6.86 \text{ kg (15.12 lbs)}$
3.0 Hardware Procurement Status

Name of Presenter
Mechanical Elements

• ASC
  • All parts have been manufactured/ordered except the enclosure for the updated version of the mother PCB.

• UiO
  • Electron emitter still to be modified and produced. Design and production is done at in-house mechanical workshop
Electrical Elements: ASC

- Main payload is complete (V3, rev.1)
- Sub-payload is in production externally (V2, rev.8)
- All PCB revisions are final
- The circuits for main payload and sub-payload is designed in-house
- The motor control unit and stepper motor is purchased externally

- 2 main payload PCBs sent to UiO (V2, V3) for testing
- 2 sub-payload ASC-boards sent to UiO (V1) for testing
Electrical Elements: UiO-mNLP

- mNLP instrument consist of two PCB
  - mNLP-board (Current: V2, rev.1)
  - Probe and electron emitter board. (Current: V1, rev.1)
- mNLP board produced externally
  - Components soldered internally
  - Another revision foreseen for possible minor improvements discovered during testing
- Prototype of probe-board produced internally.
  - Components currently being mounted
  - Final version to be produced externally
- All circuits are designed by UiO
- Electron-emitter to be modified and fitted to probe-board
Software Elements: Main payload

- The µC Code Master
  - Initzialize – completed
  - Deploy – completed
  - Broadcast – completed*
    - Broadcast message has to be adjusted to according to given downlink bandwidth
- Send data to CPLD – completed
  - The VHDL code describing the interface towards Wallops remains to be written
Software Elements: Sub-payload ASC board

• The µC Code Slave
  • Initialize – completed
  • Send HK data – completed
  • Get sensor data – completed
  • Send sensor data – completed
Software Elements: Sub-payload UiO-mNLP board

Completed
- Initialize
  - Check and change bias of probes
- Get data from Direct Memory Access buffer (Sample buffer)
- Testing read of data from DMA through UART interface

Ongoing
- Create packets and store in packet buffer (Ongoing)
- Send packets to radio module over SPI (ongoing)
- Define data rate
  - Continuous sampling of data from ADC
  - Transfer of data on SPI on request from sub-payload ASC radio board
4.0 Subsystem Testing Results

Name of Presenter
Subsystem Testing Results

• Main Payload

• Sub-payload (x6)
  – ASC radio board
  – UiO-mNLP board
  – UiO probe board (including electron emitter board)
Main Payload – Overview

• The main payload consist of:
  • Mechanical structure
    • Skinn – Under production
    • Doors – Under production
    • Wire – In House
    • Exit guides – Under production
    • Carousel – Produced
    • PCB enclosure – Under production
    • Antennas – In House
  • Stepper motor – In House
  • Stepper motor Controller – In House
  • Electronics
    • PCB – Produced
    • Light sensors – Ordered
    • BP-Filter – In House
    • RF-splitter/combiner – In House
• Weight: 14,8kg (excl. Sub-payloads)
• Configuration is Final
Main Payload

• **Quick Status**
  – Design completed
  – Prototype produced and function tested
  – Flight software under development
  – Flight version under production
Main Payload

Tests completed (on prototype):
• Door release
• Sub-payload Deployment
• RF Interface test

Tests to be completed (on flight version)
• Door release
• Sub-payload Deployment
• Wallops interface
• RF Interface
• Full system communication test
Risk Matrix: Main Payload

EPS.RSK.1: Loss of communication due to component failure in-flight
EPS.RSK.2: No Sub-payloads released due to stepper motor failure
EPS.RSK.3: No Sub-payloads released due to wire doesn’t get cut
EPS.RSK.4: No data retrieved due to RF communication link fails
Sub-payload ASC radio board - Overview

- 6 identical Sub-payloads.
- Powered by internal Li-Ion battery
- 9 dof IMU
- Communicates with Main payload via a two-way RF-link at 2,5Ghz.
- Delivers 5V supply to UiO-mNLP instrument
- Communicates with UiO-mNLP instrument via SPI
- Subsystem Weight 275g

Hardware:
- Casing -> Produced
- PCB -> Ordered
- Batteries -> In house
- Configuration is Final
Sub-payload ASC radio board

• Quick Status
  – Design completed
  – Prototype produced and function tested
  – Flight software under development
  – Flight version under production
Sub-payload ASC radio board

Tests completed (on prototype):
• Function test
• SPI interface test
• RF interface test

Tests to be completed (on flight version):
• Function test
• SPI interface
• RF interface test
• Full system communication test
Risk Matrix: Sub-payload ASC radio board

EPS.RSK.1: Loss of communication due component failure in-flight
EPS.RSK.2: Loss of communication due to unstable flight
Status at UiO

Quick Status
- 2 ASC radio boards have been soldered, electrically tested and successfully programmed
- 1 ASC main board has been soldered, electrically tested, and successfully programmed
- ASC is currently finalizing the final version of the ASC radio board (V2, rev8)
- 2 UiO-mNLP boards have been soldered, electrically tested and successfully programmed
- 1 prototype of probe board has been made and mechanical fit to mNLP board has been tested.

What has not yet been checked out
- Communication between UiO-mNLP board and sub-payload ASC radio board
- Communication between sub-payload ASC radio board and main Payload
- Electrical interface between mNLP and probe boards
- Full mechanical integration of daughter
- Full communication chain between
Main Payload board

• Quick Status
  – latest version has been soldered and electrically tested
  – Boot loader successfully burned from Arduino on to the ATmega382p processor through ISP connector with correct voltage on the board (3V)
  – Program successfully uploaded through FTDI with correct voltage on the board (5V on power and signal)

– What has not yet been checked out
  • Communication between main payload and sub-payload
  • Wallops interface (HDL code not yet written)
Sub-Payload ASC Radio board

- Quick Status
  - BIOS successfully burned from Arduino on to the ATmega382p processor through ISP connector with correct voltage on the board (3V)
  - Program successfully uploaded through USB with correct voltage on the board (5V)

- What has not yet been checked out
  - Communication between main payload and sub-payload
  - Communication to mNLP board
Sub-Payload UiO-mNLP board

- Quick Status
  - 2 boards have been made, soldered and electrically verified

- What has not yet been checked out
  - Communication with ASC radio board
  - Electrical connection to probe board and electron emitter
Sub-Payload UiO-mNLP board

• Tests completed successfully
  – Board powered and Hercules processor has been successfully been programmed
  – Software to read data from ADC using the on-chip HET co-processor.
  – Buffering of ADC data in DMA sample buffer
  – Read out data from sample buffer using UART

• Tests to be completed
  – Read out of data through SPI interface
    • Implementation of data packet routine and SPI ongoing
  – Connection to probe board, read out of probe data, and controlling electron emitter.
Sub-Payload UiO probe board

• Quick Status
  – 1 prototype board have been made in-house, and partly mounted
  – Mechanical connection to mNLP board verified
  – Mechanical connection using mock-up of electron emitter tested

  – What has not yet been checked out
    • Electrical connection to mNLP board
      – Both probes and electron gun
Risk Matrix: (Sub-Payload mNLP instrument)

EPS.RSK1: Probes do not release
EPS.RSK2: Probes bend when release due to pressure on lid
5.0 Plan for Integrated Subsystem Testing Review (ISTR)

Name of Presenter
Test/Prototyping Plan from CDR (Nov-18)

**Test plan for sub-payloads (Completed by March 1st):**
- Electrical test of PCBs when produced and components are mounted (Jan-18)
- Functional test of software/hardware (Jan-18)
- RF Communication test between sub and main payload (Feb-18)
- Battery test (how long does the battery last) (Feb 18)
- Test electron gun in vacuum chamber (March 18)
- Verify correct mechanical release of probes (March 18)

**Test plan for main payload (Completed by March 1st):**
- Electrical test of PCBs when produced and components are mounted (Feb-18)
- Functional test of software/hardware (Feb-18)
- Spin - Release of doors & Sub-Payloads (March 2018)

**Full system test (Completed by April 1st):**
- Test probes and full readout of data for full mission time line (source current to probe)
  - Read data from probes with mNLP instrument,
  - send data to communication board,
  - Send data to main payload via wireless link
  - Monitor data sent over telemetry interface (simple GSE to be prepared)
- Calibration of probes
Test/Prototyping Plan Updated for STR

Test plan for sub-payloads (Completed by March 1st/ April 15th):
- Electrical test of PCBs when produced and components are mounted (Jan-18/Mar-18)
- Functional test of software/hardware (Jan-18/Mar-18)
- RF Communication test between sub and main payload (Feb-18/Mar-18)
- Battery test (how long does the battery last) (Feb 18/Apr-18)
- Test electron gun in vacuum chamber (March 18/Apr-18)
- Verify correct mechanical release of probes (March 18)
- *Verify mechanical connection between mNLP and probe board (March 18)*
- *Verify electrical connection between mNLP and probe board (March 18)*
- *Communication test between mNLP and ASC radio board (March 18)*
- *Verify full mechanical integration of daughter payload (March 18)*

Test plan for main payload (Completed by March 1st/April 15th):
- Electrical test of PCBs when produced and components are mounted (Feb-18/Mar-18)
- Functional test of software/hardware (Feb-18/Mar-18)
- *Verify Wallops interface (April 18)*
Test/Prototyping Plan Updated for STR

**Full system test (Completed by April 1\textsuperscript{st}/May 1\textsuperscript{st}):

- Verify full mechanical integration of daughters inside 4DSPAC module
- Test probes and full readout of data for full mission time line (source current to probe)
  - Read data from probes with mNLP instrument,
  - Process data and send to ASC radio board (SPI)
  - Send data to main payload via wireless link (RF)
  - Monitor data sent over telemetry interface (simple GSE to be prepared)
- Calibration of probes
- Spin - Release of doors & Sub-Payloads
6.0 Plan for Full Mission Simulation Review (FMSR)

Name of Presenter
Mechanical Testing

• Present a **brief** overview of the tests you need to conduct to verify overall mechanical design
• When will these tests be performed?
• Call-out any deployment tests and how they will be performed
• Discuss any mechanical inhibits you may need for Wallops testing
Electrical Testing

- Present a **brief** overview of the tests you need to conduct to verify overall electrical design
- When will these tests be performed?
- Callout any high voltage components
- Callout any internally powered components and how they will be tested
- **Discuss any electrical inhibits you may need for Wallops testing**
Electrical Testing

• Need to go through all the electrical boards to make sure there are no short circuits
• PUT UP DATES!
• Callout any high voltage components
• Callout any internally powered components and how they will be tested
Software Testing

• Consider how software and electrical depend on each other for testing
• Present a brief overview of what portions of the code need to be completed to test the electrical system at its various testing points
• When will these tests be performed?
• Discuss any software inhibits you may need for Wallops testing
System Level Testing

- Present an overview of the tests you need to conduct at the full system level
- Consider an stepped approach to testing subsystems to get to the System Level
- Mission Simulations should be a part of that
- When will these tests be performed?
System Level Testing

• We need to establish connection between our systems
  1. Connection on the daughter
  2. Connection from the daughter to the main Radio board
  3. Verifying data flow
• Mission Simulations should be a part of that
• When will these tests be performed?
7.0 User Guide Compliance

Name of Presenter
## User Guide Compliance: Summary

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Status/Reason (if needed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Center of gravity in 1&quot; plane of plate?</td>
<td>N/A</td>
</tr>
<tr>
<td>Weight 30.0+/− 1.0 (15.0 +/− 0.5) lbs?</td>
<td>37.1</td>
</tr>
<tr>
<td>Max Height &lt; 10.75&quot; (5.13&quot;)</td>
<td>9.5&quot;</td>
</tr>
<tr>
<td>Bottom of deck has flush mount hardware?</td>
<td>N/A</td>
</tr>
<tr>
<td>Within Keep-Out Zone</td>
<td>N/A</td>
</tr>
<tr>
<td>Using &lt; 10 A/D Lines</td>
<td>Using 2 lines</td>
</tr>
<tr>
<td>Using/Understand Parallel Line</td>
<td>Yes</td>
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<tr>
<td>Using/Understand Asynchronous Line</td>
<td>Yes (desirable/optional)</td>
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<tr>
<td>Using X GSE Line(s)</td>
<td>GSE-1</td>
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<tr>
<td>Using X Non-Redundant PWR Lines (TE-1, TE-2, TE-3)</td>
<td>TE-1 (deployment)/ TE-2 (pyro)</td>
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<tr>
<td>Using X Redundant Power Lines (TE-R)</td>
<td>no</td>
</tr>
<tr>
<td>Using &lt; 1 Ah (.5 Ah for half payload)</td>
<td>0.04 Ah</td>
</tr>
<tr>
<td>Using &lt;= 28 V</td>
<td>Yes</td>
</tr>
<tr>
<td>Using RF (If yes, list frequency and TX Power)</td>
<td>Yes, 2.5 GHz at &lt;130mW .</td>
</tr>
<tr>
<td>Using deployable?</td>
<td>Yes, 6 deployable circular «pucks»</td>
</tr>
<tr>
<td>Using ITAR and/or Export Controlled hardware</td>
<td>Holex 2800, provided by NSROC</td>
</tr>
</tbody>
</table>
8.0 Project Management Update

Name of Presenter
Team Picture

Front row: Fredrik L Winje
Middle row from the left: Huy Minh Hoang, Tom Morten Berge, Eirik Nobuki Kosaka, Ole-Martin Vister
Back row: Henrik Bjorner Lie
Management: Team Organization

**Team supervisor**
Ketil Røed

**Technical support**
UiO Electronics lab
Espen Trondsen (Engineer)

**Collaborators**
Andøya Space Center
Geir Lindahl (Engineer)
Thomas Gansmo (Engineer)
Torgeir Grønås (Engineer)

Penn State University

**Science support**
Andread Spicher (Postdoc)

**Team members**
Fredrik Lindseth Winje (Lead)
Huy Minh Hoang (Instrumentation, Science)
Eirik Nobuki Kosaka (Software)
Yassine Elfarri (Software, Instrumentation)
Simen Sørensen (Instrumentation)
Ole Martin Vister (Positioning)
Tom Morten Berge (Communication, pos.)
Henrik Bjoner Lie (Science)
Andrei Costescu (Instrumentation)
Management: Schedule

<table>
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<tr>
<th>Tasks</th>
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<th>Jun</th>
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<th>Aug</th>
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</table>
Management: Budget

- Funding **has been secured from the Norwegian Space Center (NRS)**
  - to cover engineering of payload module at Andøya Space Center
  - to cover the RockSat-XN program fee
  - to cover travel for ASC engineers to integration test at Wallops

- Instrument expected to be covered by associated research projects at UiO. Strong overlap with parallel development for e.g. ICI5 and ongoing CubeSat activities.

- Funding to support student exchange with North America has been applied for through the Norwegian Centre for International Collaboration in Education (SiU).
  - Can provide some support for travel

- ~100 kNOK (~12kUSD) has been allocated internally for travel support
- Students can apply for 50% coverage of travel and registration fee costs from NRS
- Students may additionally look for sponsoring options
# Latest Contact Matrix

<table>
<thead>
<tr>
<th>Team Name/School Here: University of Oslo / ASC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RS-XN Contact Matrix</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Role</th>
<th>Name</th>
<th>Day Phone</th>
<th>Cell Phone</th>
<th>Receive Texts?</th>
<th>Email</th>
<th>Citizenship</th>
<th>Add to mailing list?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervisor (UIO)</td>
<td>Ketil Røed</td>
<td>+4722858632</td>
<td>+4798865163</td>
<td>Yes</td>
<td><a href="mailto:ketil.roed@fys.uio.no">ketil.roed@fys.uio.no</a></td>
<td>Norway</td>
<td>Yes</td>
</tr>
<tr>
<td>Senior Engineer (UIO)</td>
<td>Espen Trondsen</td>
<td>+4722857371</td>
<td>+4793249035</td>
<td>Yes</td>
<td><a href="mailto:espen.trondsen@fys.uio.no">espen.trondsen@fys.uio.no</a></td>
<td>Norway</td>
<td>Yes</td>
</tr>
<tr>
<td>Student (UIO)</td>
<td>Fredrik Lindseth Winje</td>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:fredrilw@gmail.com">fredrilw@gmail.com</a></td>
<td>Norway</td>
<td>Yes</td>
</tr>
<tr>
<td>Student (UIO)</td>
<td>Henrik Bjønner Lie</td>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:henrikbjonnerlie@hotmail.com">henrikbjonnerlie@hotmail.com</a></td>
<td>Norway</td>
<td>Yes</td>
</tr>
<tr>
<td>Student (UIO)</td>
<td>Andrei Costescu</td>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:ancostescu@gmail.com">ancostescu@gmail.com</a></td>
<td>Romania</td>
<td>Yes</td>
</tr>
<tr>
<td>Student (UIO)</td>
<td>Ole Martin Vister</td>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:o.m.vister@fys.uio.no">o.m.vister@fys.uio.no</a></td>
<td>Norway</td>
<td>Yes</td>
</tr>
<tr>
<td>Student (PhD, UIO)</td>
<td>Huy Minh Hoang</td>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:huy.hoang@fys.uio.no">huy.hoang@fys.uio.no</a></td>
<td>Vietnam</td>
<td>Yes</td>
</tr>
<tr>
<td>Student (PhD, UIO)</td>
<td>Tom Morten Berge</td>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:t.m.berge@fys.uio.no">t.m.berge@fys.uio.no</a></td>
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</tr>
<tr>
<td>Student (UIO)</td>
<td>Simen Sørensen</td>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:simen.es@outlook.com">simen.es@outlook.com</a></td>
<td>Norway</td>
<td>Yes</td>
</tr>
<tr>
<td>Student (UIO)</td>
<td>Eirik Nobuki Kosaka</td>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:e.n.kosaka@fys.uio.no">e.n.kosaka@fys.uio.no</a></td>
<td>Norway</td>
<td>Yes</td>
</tr>
<tr>
<td>Student (UIO)</td>
<td>Yassine Elfarri</td>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:yassine.elfarri@fys.uio.no">yassine.elfarri@fys.uio.no</a></td>
<td>Norway</td>
<td>Yes</td>
</tr>
<tr>
<td>Engineer (ASC)</td>
<td>Thomas Gansmoen</td>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:thomasg@andoyspace.no">thomasg@andoyspace.no</a></td>
<td>Norway</td>
<td>Yes</td>
</tr>
<tr>
<td>Engineer (ASC)</td>
<td>Geir Lindahl</td>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:geir@andoyspace.no">geir@andoyspace.no</a></td>
<td>Norway</td>
<td>Yes</td>
</tr>
<tr>
<td>Engineer (ASC)</td>
<td>Torgeir Lauritsen Grønås</td>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:torgeirg@andoyspace.no">torgeirg@andoyspace.no</a></td>
<td>Norway</td>
<td>Yes</td>
</tr>
<tr>
<td>Postdoc</td>
<td>Andres Spicher</td>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:andres.spicher@gmail.com">andres.spicher@gmail.com</a></td>
<td>Swiss</td>
<td></td>
</tr>
</tbody>
</table>
Risks/Worries:

Communication between the six daughter payloads and the mother payload section.

If the communication link fails to establish, we would not get any measurement data from the daughters.
Conclusion

• Please list questions and concerns you would like to discuss