Zebra Activities
(including diagnostics)

<table>
<thead>
<tr>
<th></th>
<th>Require Zebra time</th>
<th>Non-disruptive (∥ operations)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Experiment</strong> (primary)</td>
<td>Operation</td>
<td>Preparation</td>
</tr>
<tr>
<td><strong>Support</strong></td>
<td>Inspection, care, repairs</td>
<td>Maintenance</td>
</tr>
<tr>
<td></td>
<td>Adding new capability</td>
<td>Development</td>
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<tr>
<td></td>
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<td>Upgrade</td>
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</tbody>
</table>
Zebra Systems (RP)

- Laboratory (SB)
  - safety
    - procedures (SB)
    - engineering (BLG)
  - access
  - space

- Pulsed power generator
  - power flow (RP)
    - triggering (BLG)
    - modeling (RP)
    - fluids, gases (SB)
    - vacuum systems
      - maintenance (SB/AA)
      - development (AA)
  - automation and control (BLG)
  - vacuum control & measurement (AA/BLG)
  - pulsed power diagnostics (BLG/RP)
  - data (BLG)
    - recording
    - digitizer triggering
    - acquisition
    - storage
    - access (local and remote)
    - processing (Zebra signals)

- Loads (AA)
  - hardware development
  - experiment support

- Experiment coordination (RP/SB)
  - posting and discussion
  - pre- and post-experiment meetings

- Shot support (SB)
  - chamber turn-around (SB)
  - water, oil, gases (SB)
  - vacuum (SB/AA)
  - diving (SB)
  - data acquisition (BLG)
  - core diagnostics (BLG)
  - experimental diagnostics (PI/BLG,AA)
  - load (PI/AA)
  - shot coordination (RP)

- Core diagnostics (BLG/AA,SB)
  - set-up & installation
    - electrical (BLG)
    - mechanical (SB)
  - development
    - electrical (BLG)
    - mechanical (AA)
  - data (BLG)
    - recording media

(RESPONSIBLE/MOSTLIKELYRESOURCE)
# Zebra Operation
(procedures will need to be updated to reflect these changes)

<table>
<thead>
<tr>
<th></th>
<th>TA</th>
<th>AA</th>
<th>SB</th>
<th>BLG</th>
<th>DM</th>
<th>VN</th>
<th>SS</th>
<th>Exp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shot Director</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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</tr>
<tr>
<td>Console</td>
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<td>✓</td>
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<tr>
<td>Safety</td>
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<td>✓</td>
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<tr>
<td>Core Diagnostics</td>
<td>✓</td>
<td>✓</td>
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<td>✓</td>
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<tr>
<td>Trig &amp; Timing*</td>
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<td>✓</td>
<td>✓</td>
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<tr>
<td>Data Acquisition</td>
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<td>✓</td>
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<tr>
<td>Ext Diagnostics</td>
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<td>✓</td>
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<tr>
<td>Load Fabrication</td>
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<td></td>
<td>✓</td>
</tr>
<tr>
<td>Chamber Ops</td>
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<tr>
<td>Dive</td>
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<td>✓</td>
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</tbody>
</table>

*This refers to operations only; the set-up will be done and changed by BLG group

✓ = trained; ✓ = to be trained; ✓ = some trained, others to be trained
Save Tech Time for Development
- discussion status -

- **1st phase:** shot director = console operator
  - as soon as cross-training is sufficient
  - procedures will be modified to reflect these changes

- **2nd phase:** SD = CO = safety operator
  - safety computer – options:
    1. move to console
    2. mobile, remote control safety
  - safety monitors – options:
    1. move to console
    2. keep on the second floor and require experimentalist to provide safety support (person to watch monitors)
  - define and post escape route from the console
  - at least a second person present at the console during operation
  - procedures will be modified to reflect these changes
Criteria for Prioritizing Development Tasks

• **RESOURCES**
  – cost
  – developer availability
  – time on Zebra
  – current status

• **IMPACT**
  – science enabling
  – technical significance
  – number of scientists benefiting
  – improve relationships with sponsors/collaborators
  – improve/simplify machine maintenance and safety
Development - Zebra Machine

- reduce jitter
  - measure TG70 pulse
- improve laser and diagnostics access in Zebra chamber
  - low anode plate
  - increase number of diagnostics ports
- streamline Marx maintenance
  - measure Marx charge
  - measure MTG charge
  - complete second set of resistor caps
- develop pulser and set-up probe calibration in situ
- Load Current Multiplier - routine operation
- crowbar current at maximum
- control current prepulse
- build second Marx bank
- upgrade Marx bank
Development - Zebra Facility

• upgrade oil system (faster operation)
• upgrade water system (biochemical control)
• SF6 reclaiming unit away from console
• permanent MTG power supply plumbing
• develop diagnostic for oil quality
• remote control of the safety program (for yellow status only)
Development - Core Diagnostics

- GXI - CCD readout
- GXI - simplified alignment
- x-ray calibration and alignment source
- optical streak-camera jitter
- master trigger for digitizers and diagnostics
- optical trigger for diagnostics
- data storage for remote access
- develop new daq and processing system (DIAMEM)
- move dark room to second floor Zebra
- screen rooms
- other tasks
  - revive the core diagnostics student position
  - train experimental students in routine tasks
Zebra Use

• periodic scheduled maintenance
  – plan several maintenance types

• extended shifts
  – last shot to be done no later than 15 min before close
  – END group two shifts
    – 7am to 3.30pm
    – 9.30am to 6pm (1/2 hour lunch)

• daily meetings with experimentalist during campaign

• develop ZebraTech bulletin board
Purchase List

• barrier disk
• XUV gated camera
• ±100 kV power supply
Questions

• How much does a shot cost?
• How much would it cost to “complete” Zebra automation?