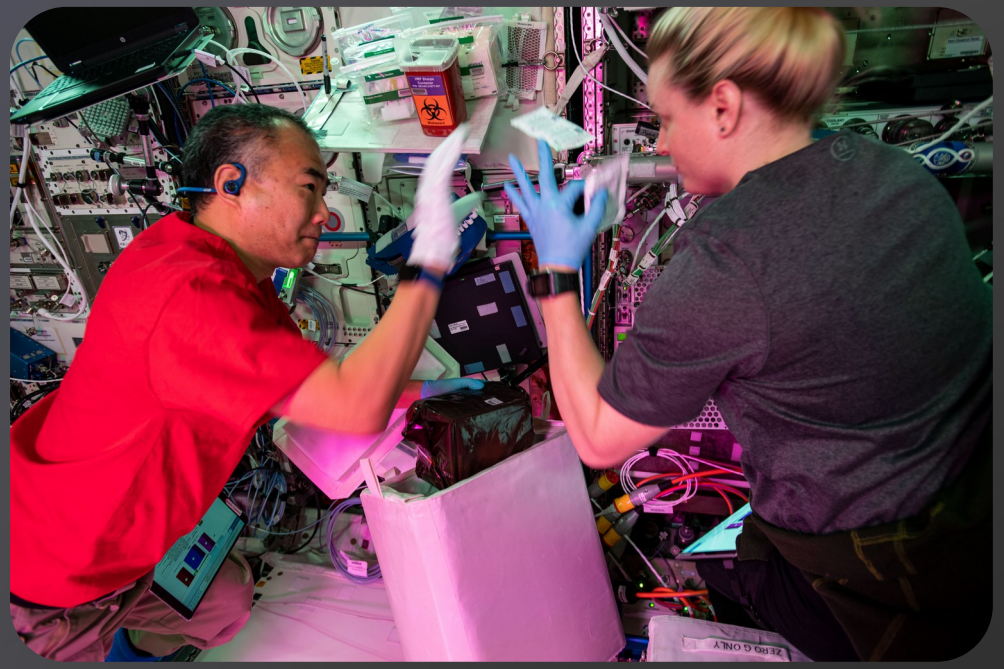
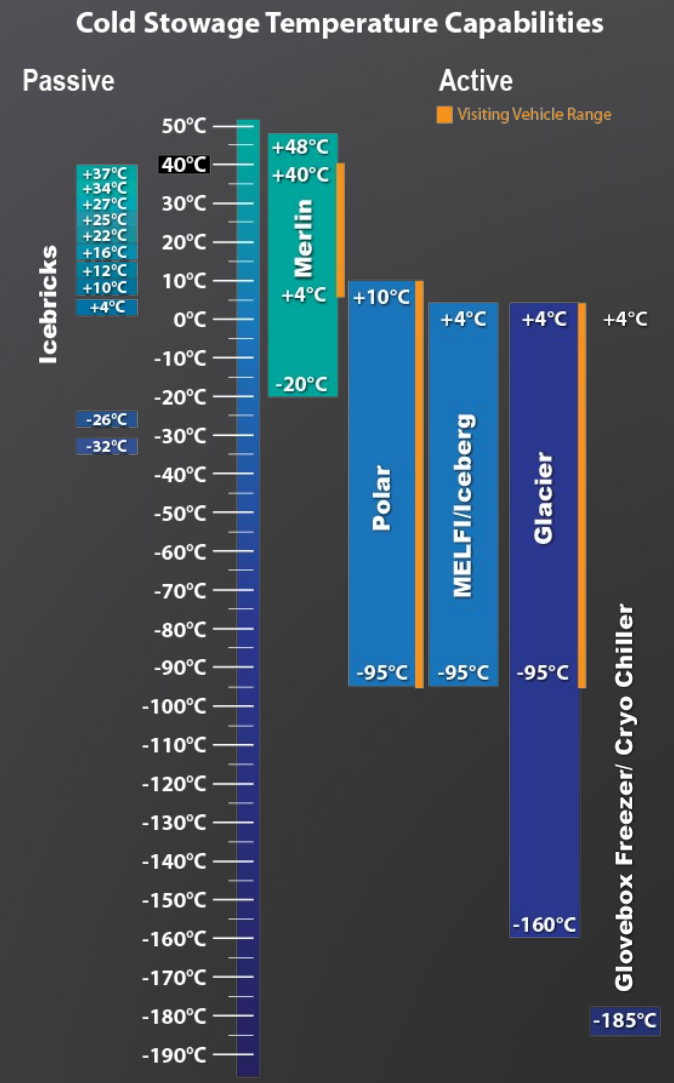
COLD STOWAGE KICKOFF



COLD STOWAGE OPERATIONS OVERVIEW

- Cold Stowage consists of hardware, both active and passive, that transports science to/from and stows science on the International Space Station (ISS) in a temperature-controlled environment
  - Active and passive systems provide more flexibility and redundancy
  - Cold Stowage will assign experiments to assets based on mission requirements and best use of space.
  - Temperature range for science support is -160°C to +48°C on ISS and -95°C to +40°C for launch and return
  - All hardware is compatible with SpaceX and Northrop Grumman (NG) vehicles.
  - Cold Stowage hardware is maintained by a joint effort between ESA, University of Alabama at Birmingham (UAB), and the JSC Cold Stowage Team which prepares the hardware for flight, including launch and landing support.
  - The Cold Stowage team is based out of Johnson Space Center in Houston, TX.
  - The Cold Stowage team also works in and maintains the Cold Stowage lab at KSC and Wallops.



COLD STOWAGE HARDWARE OVERVIEW

Active Hardware

- MELFI is a freezer/refrigerator located on ISS which has 4 insulated dewars that can be set to +2°C, -35°C, or -95°C.
- Glacier is a freezer/refrigerator that can support samples from -95°C to +4°C for launch/return and -160°C to +4°C on ISS.
- Polar is a freezer/refrigerator that can support samples from -95°C to +10°C for launch/return and on ISS.
- Iceberg is a freezer/refrigerator that supports samples from -95°C to +4°C on ISS.
- Merlin is an incubator/refrigerator/freezer that supports samples from +4°C to +40°C for launch/return and from -10°C to +48°C on ISS.
- Rapid Freeze hardware consists of a Cryo Chiller and Glovebox Freezer. They provide a -185°C interface for samples requiring rapid freeze (close to LN2 rates).

Passive Hardware

- Double Coldbags are insulated stowage bags used to transport samples to and from ISS on visiting vehicles
- Mini Coldbag is a smaller version of a Double Coldbag commonly used to transfer samples between assets on-orbit
- Ice Bricks provide cooling or incubation to samples stored inside Double Coldbags/Mini Coldbags
  - Ice Brick temperatures include -32°C, -26°C, +4°C, +10°C, +12°C, +16°C, +22°C, +25°C, +27°C, +34°C and +37°C

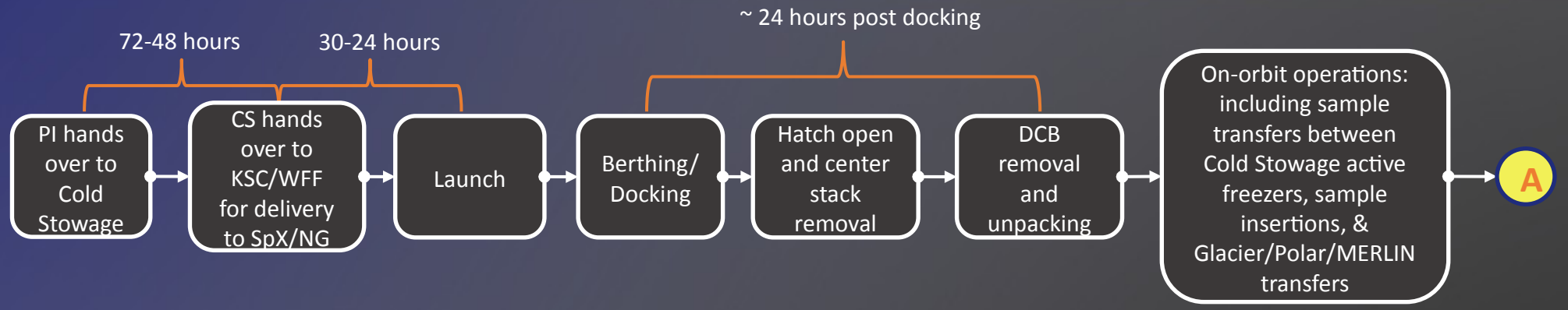
COLD STOWAGE SERVICES

Rapid freeze ground control unit available for testing in PI's labs.

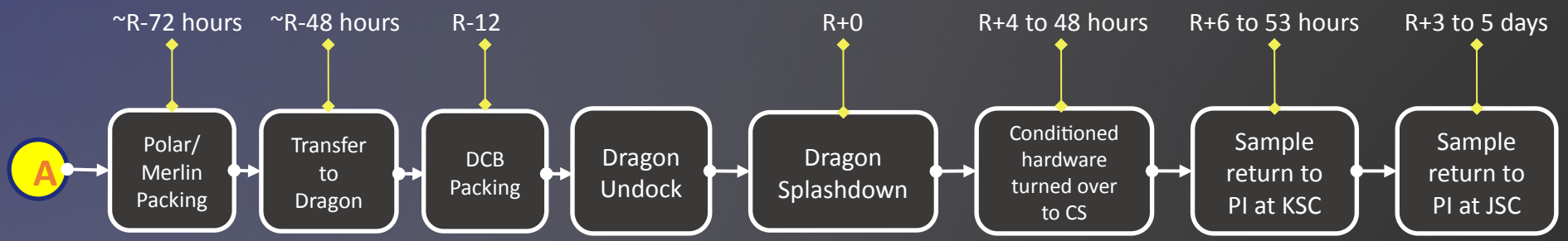
Thermal testing of science experiments to 57000 App H requirements

Consultation regarding operation sequence, packaging, etc.

COLD STOWAGE MISSION FLOW



Last sample insertion for conditioning must occur NLT 24 hours from DCB or Polar packing*



*Note: Durations will vary, final determination is done on a case-by-case basis and must take into account the entire ops flow for the mission and launch/return vehicle

COLD STOWAGE DO'S & DON'TS

DO

- Accurately document ascent, on orbit, and return requirements on the Cold Stowage form
  - Accurately documenting sample dimensions and temperature requirements allows for the maximum amount of science to fly each mission
- Request input from the Cold Stowage Team when developing packing solutions and complete fit checks with CS assets early in the development process
- Keep Cold Stowage in the loop with payload specific real time ops planning
- Remove unnecessary air pockets inside sealed bags/ziplocs, space is limited inside cold assets

DON'T

- Handover dimensionally incorrect hardware for late load into the vehicle
- Change sample container size/dimensions or bundle samples together without informing Cold Stowage
- Stick labels on outer bagging material, labels may fall off when frozen
- Use large unnecessary bagging materials
- For more information on Cold Stowage, including existing Cold Stowage Forms, a current Cold Stowage Plan, and to request Cold Stowage verification testing support, visit the following website: https://iss.sp.jsc.nasa.gov/Int/OB/CarrierPayload/coldstowage/SitePages/Home.aspx