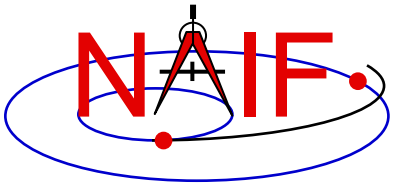


Navigation and Ancillary Information Facility

# NH/KEM and R&A review:

# Review of SPICE DSK files and related documents from NH-A-LORRI/MVIC-5-GEOPHYS-V1.0

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October 19, 2022

# What's Checked



- Checked only
  - DSKs under data/shape_models/
    - » mu69_asp_ca04_06_icp_spice_v01.bds
    - » mu69_fr2kf_hipoly_spice.bds
    - » mu69_fr2kf_lopoly_spice.bds
    - » mu69_merged_spice.bds
  - kernels included as documents under document/
    - » nh_lorri_v201_ti.txt
    - » nh_ralph_v100_ti.txt
    - » nh_shape_v01.tf
    - » nh_stars_kbo_centaur_tpc4.txt
  - coordinate system document under document/
    - » arrokoth_CSD.pdf
- Did not look at anything else – PDS labels, PDS tables, other docs, non-SPICE PDS3 products

# How Checked



- **DSK checks:**
  - check DSK comments (extracted with COMMNT)
  - check DSK summary (produced with DSKBRIEF)
  - check surface intercepts (custom programs calling DSXV, DSKXSI)
  - visual inspection of shape extracted from DSK (3dviewer.net)
  - visual inspection of DSK in observation context (Cosmographia)
- **Other kernel checks**
  - Comparison to those archived in the NH SPICE archive
  - Review of “surfaces” FK and MU69 data in PCK
  - Use of FK and PCK (DSKBRIEF, Cosmographia)
- **Coordinate document checks**
  - Review for completeness and adherence to guidelines

# Executive Summary

Navigation and Ancillary Information Facility

- **DSK look good**
  - Shape data looks consistent with observations
  - Comments look good
  - DSK are fully usable with a variety of SPICE based tools
  - Possible improvements:
    - » remake with different voxel scales to increase access speed
    - » Remake mu69_asp_ca04_06_icp_spice_v01.bds from rectangular coordinates to improve segment coverage boundaries
    - » Neither of these is a lien, just a suggestion
- **Other kernels look good**
- **Coordinate system document needs updates**
  - Currently does not include complete set of rotation constants, missing W0
  - It should be updated to include the complete set of IAU style rotation constants
    - » e.g. like in nh_stars_kbo_centaur_tpc4.txt

# Details - 1



mu69_merged_spice.bds

---

1) Comment area has reasonable comments.
   Voxel scales are set manually, according to MKDSK setup
   file in comments.
2) DSKBRIEF -full showed no unexpected file characteristics.
   When run with FK file, surface name translation is ok.
3) Spear test showed all expected hits, so plate orientation is ok.
4) Spear test was extremely slow for a DSK this small: 7.62 s.
   Using new DSK created using MKDSK automatic scales, time was 2.68 s.
   Times confirmed by multiple test runs. Due to non-star-shaped surface,
   unusually slow performance is to be expected.
5) Due to merging of models, topology checks probably are not relevant
   and were not performed.
6) Visual inspection using 3dviewer.net did not indicate errors.

# Details - 2



```
mu69_fr2kf_lopoly_spice.bds
---------------------------
1) Comment area has reasonable comments.
   Voxel scales are set manually, according to MKDSK setup
   file in comments.
2) DSKBRIEF -full showed no unexpected file characteristics.
   When run with FK file, surface name translation is ok.
3) Spear test showed all expected hits, so plate orientation is ok.
4) Spear test was extremely slow for a DSK this small: 2.34 s.
5) Topology checks were not performed.
6) Visual inspection using 3dviewer.net did not indicate errors.
```

# Details - 3



```
mu69_fr2kf_hipoly_spice.bds
---------------------------
1) Comment area has reasonable comments.
   Voxel scales are set manually, according to MKDSK setup
   file in comments.
2) DSKBRIEF -full showed no unexpected file characteristics.
   When run with FK file, surface name translation is ok.
3) Spear test showed all expected hits, so plate orientation is ok.
4) Spear test was extremely slow for a DSK this small: 9.94 s.
5) Topology checks were not performed.
6) Visual inspection using 3dviewer.net did not indicate errors.
```

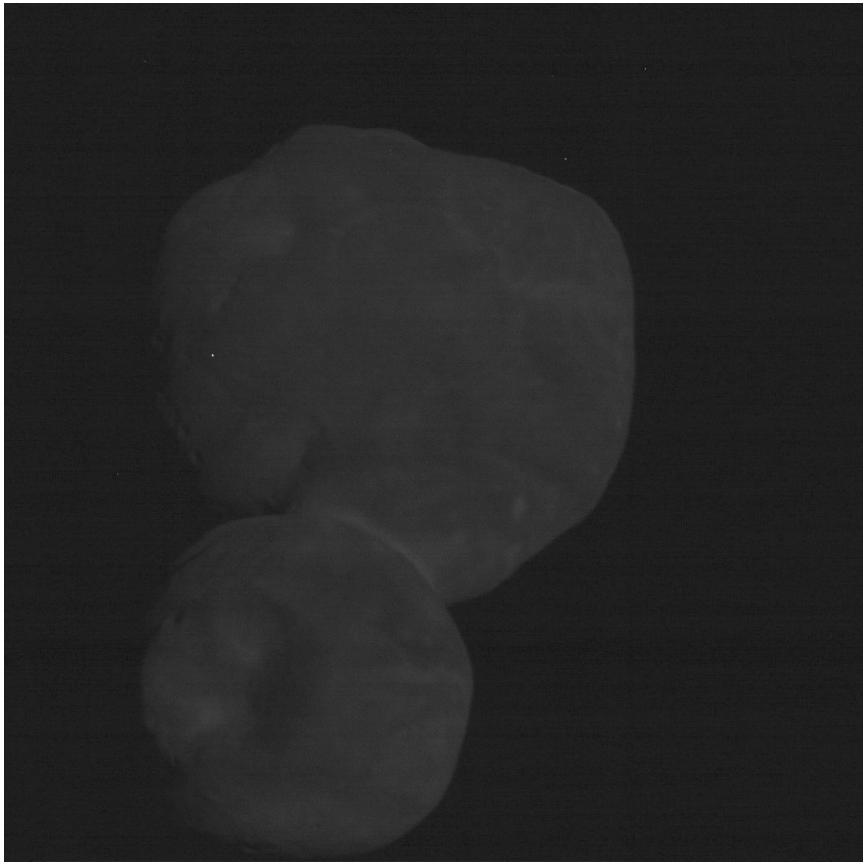
# Details - 4

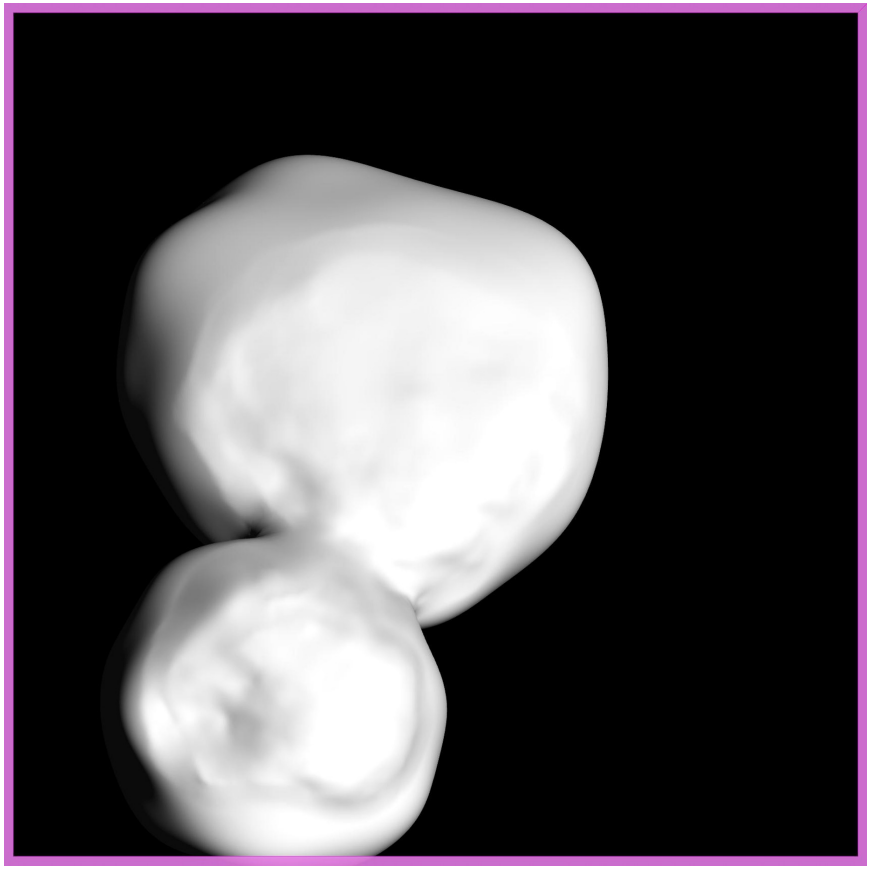
Navigation and Ancillary Information Facility

```
mu69_asp_ca04_06_icp_spice_v01.bds
----------------------------------
1) Comment area has reasonable comments.
   Voxel scales are set manually, according to MKDSK setup
   file in comments.


2) DSKBRIEF -full showed no unexpected file characteristics,
   except that segment lon/lat bounds indicate full coverage.
   This may be the only practical choice for the plate set of
   this DSK.


   When run with FK file, surface name translation is ok.


3) Spear test based on DSKXV (used for all other DSK spear tests)
   showed 13659 hits out of 32580 rays, which is
   reasonable. Test showed 3 "errors," which were hits on the
   opposite side of the object from the ray vertices. These
   indicate inward-facing plates, but these plates may be valid.
```

# Details - 5

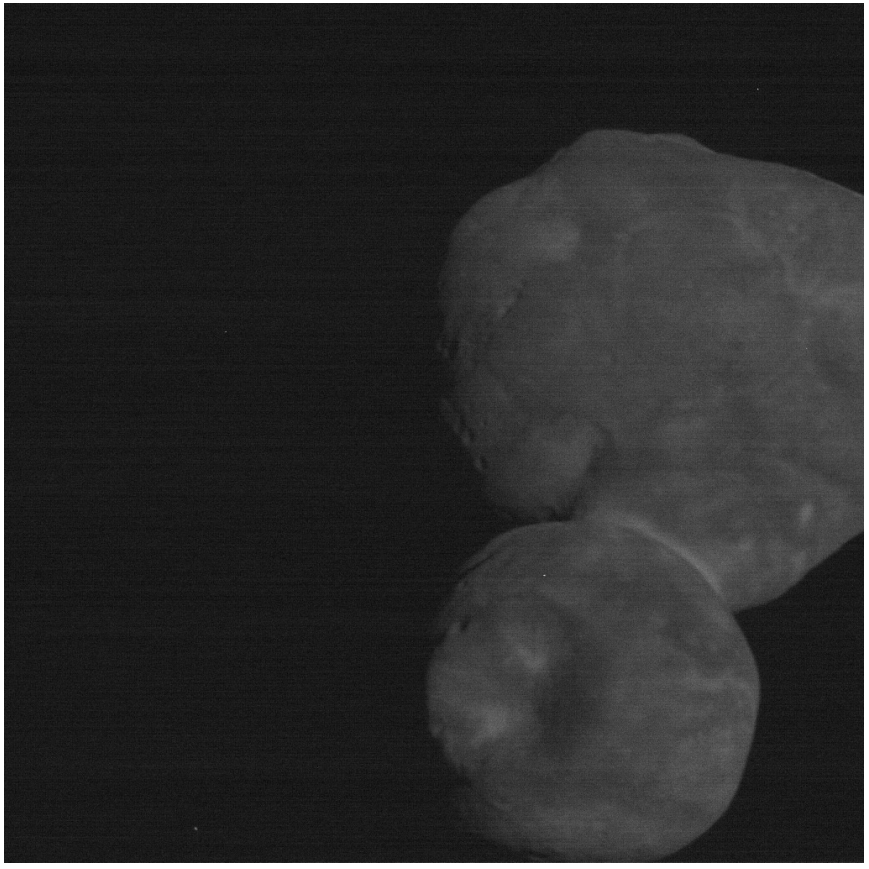
Navigation and Ancillary Information Facility

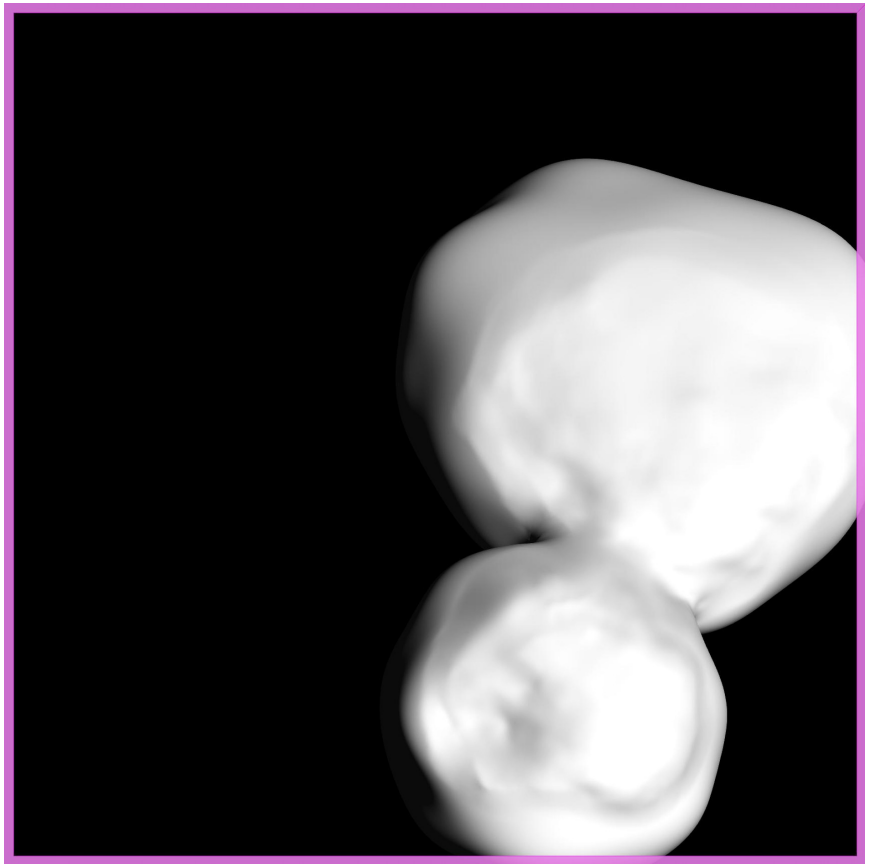




# Details - 6

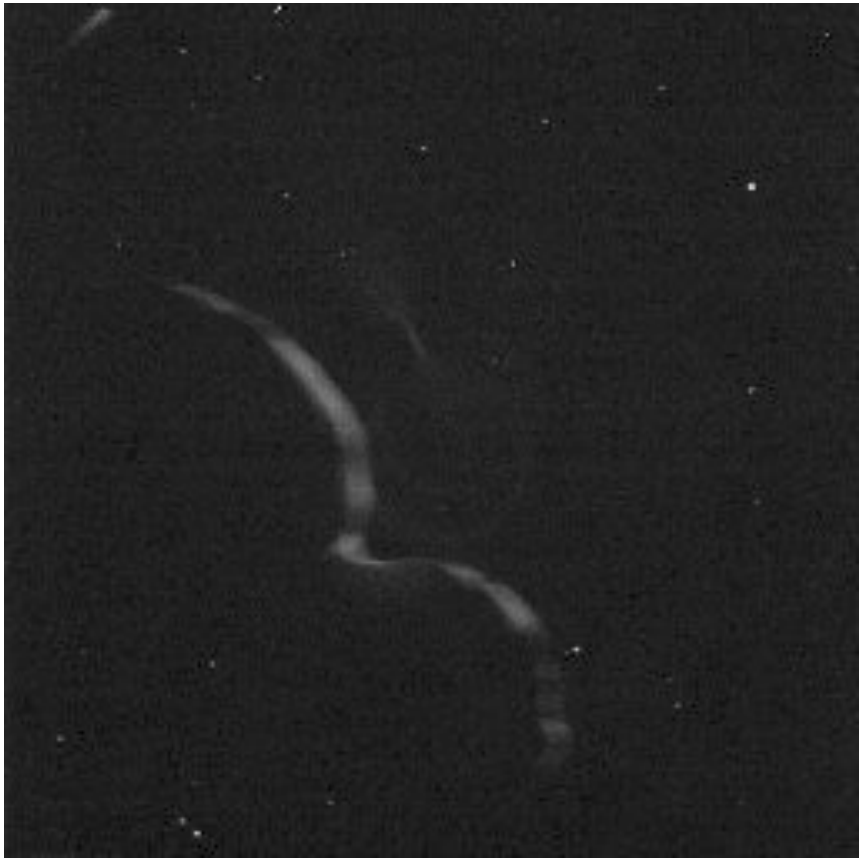
Navigation and Ancillary Information Facility

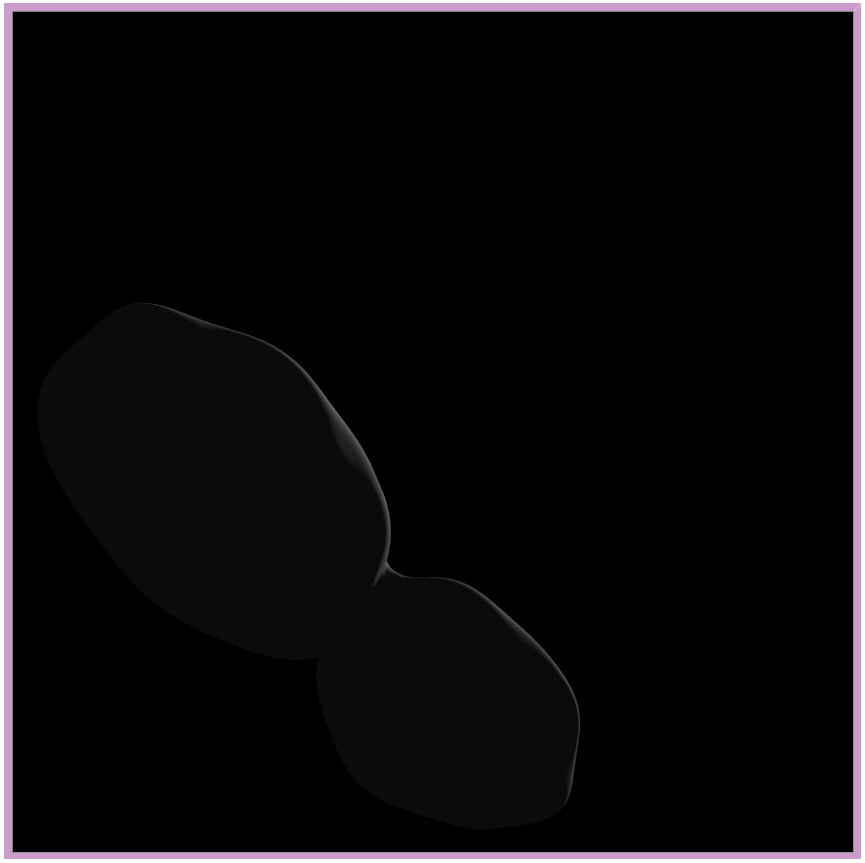




# Details - 7

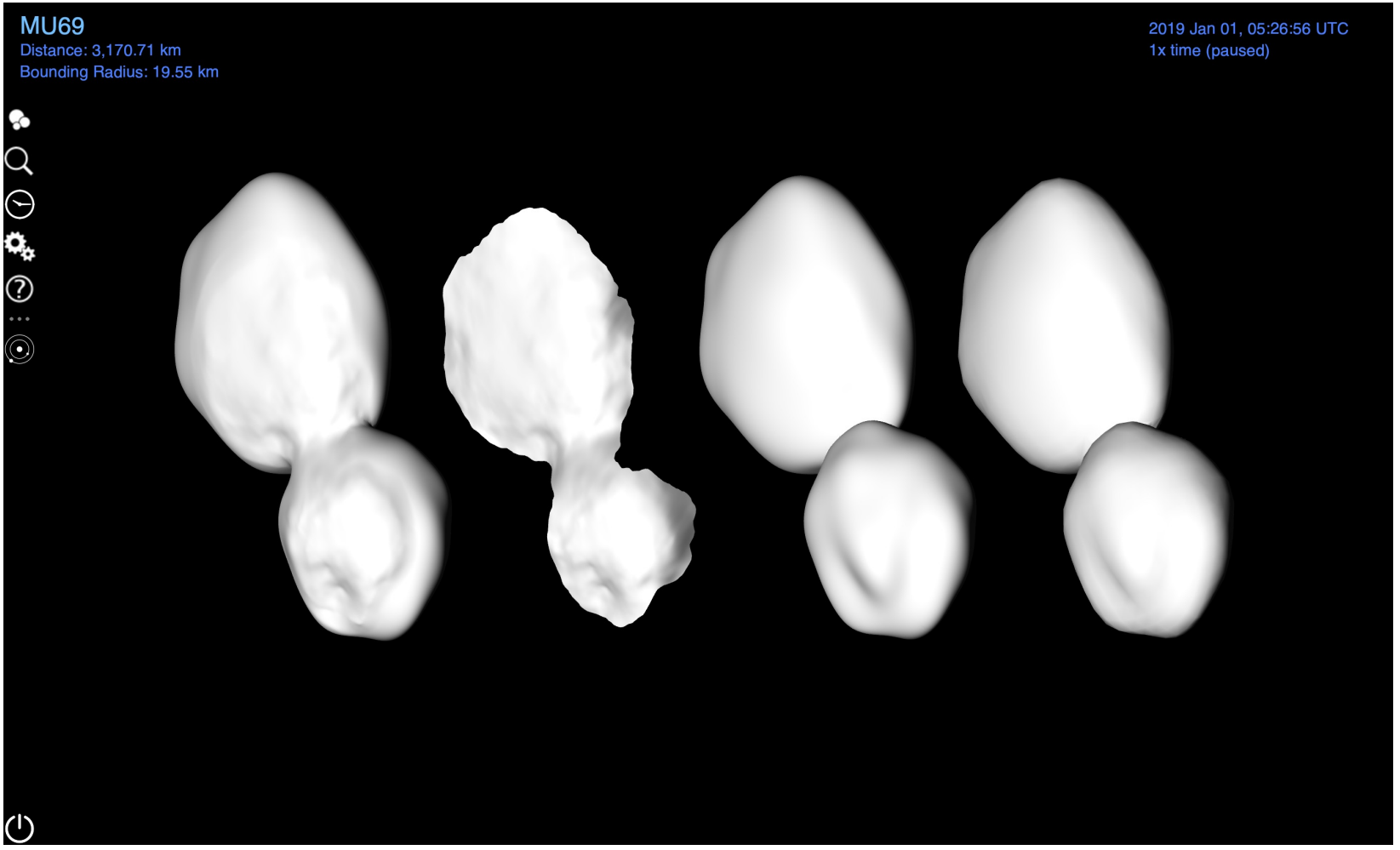
Navigation and Ancillary Information Facility





# Details - 8

Navigation and Ancillary Information Facility



# Details - 9

Navigation and Ancillary Information Facility