

Term Project Expectations

- Perform the preliminary design of the elements of a crewed space systems with direct impact on humans
- Pressurized volume(s)
- Life support
- Habitat design and habitability
- Mission support (e.g., EVA)

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UNIVERSITY OF
MARYLAND

ENAE 697 - Space Human Factors and Life Support

Term Projects

Comments on Interim Submissions

- Can't find submissions by Daven Patel or Minwook Chang
- Submission was never intended to be graded - lets me know what the state of completion is
- By and large, state of completion is: woefully incomplete
- Wide range of variations, from 56 pages to 4-5 (mostly blank)
- For a 3-credit course, out-of-classroom activities should represent 90 hours over term



2019 Term Projects (Lecture #01)

- Perform the crew systems design for one of the following concepts
 - Minimum deep space habitat (e.g., high Earth orbit, lunar distant retrograde orbit)
 - Minimum lunar habitat
 - Small lunar surface pressurized rover
 - Single-person microgravity space utility vehicle
 - Lunar-capable launch and entry vehicle
 - Open to other topics suggested by students
- Work individually or in pairs
- Presentations on last days of class (?)



Evaluation Criteria (Lecture #14)

- Pressurized volume
 - Size and shape
 - Rationale for choice of interior volume
 - Single vs. multiple modules
- Life support systems
 - Atmosphere design (total pressure / % O₂)
 - Completeness (e.g., air revitalization / water reclamation / thermal / nutrition / waste management)
 - Trade studies on candidate systems
 - Equivalent systems mass analysis
 - Required mass / volume / power of each system



Evaluation Criteria

- Habitat design
 - Interior layout
 - Utilization- based layout (e.g., quiet/ noisy, clean/ dirty)
 - Safety (nominal and contingency egress)
- Logistics
 - Consumables resupply (O₂/N₂)
 - Internal/ external stowage
- EVA support
 - Egress (e.g., airlock/ suitport, nominal/ contingency, surface accessibility)
 - Denitrogenation analysis for safe egress in 4 psi suit
 - Suit support (e.g., ingress/ egress, servicing, recharge)



Evaluation Criteria

- Windows
 - Window size/number/placement
 - Sight line analysis for critical functions (e.g., driving windows)
- CAD images
 - External dimensioned three-view (top/side/front)
 - Interior layouts
 - “Glamour shot(s)” – rendering of overall system (use notional images of items not covered in this class - e.g., wheels and suspension for rover)



Expected Content of Term Project (#17)

- Title of project
- Team members
- Design reference mission(s)
 - Where, when, how
- Top-level requirements
 - e.g., Crew size, duration, EVA support, etc.
- Derived requirements
 - e.g., Habitat volume, interfaces, power, etc.
- Design elements



Term Project Design Elements

- Habitat configuration
 - Size, shape, orientation
 - Internal layout (habitable spaces, fixed equipment, etc.)
 - Atmosphere design (total pressure, ppO₂)
 - EVA support (suit pressure, denitrogenation, prebreathe times, airlock / crew lock and other interfaces)
 - Rover support (if appropriate)
 - Radiation protection (shielding makeup and configuration)
 - CAD expectations: external dimensioned 3-view, detailed interior layouts, external “beauty” image



Term Project Design Elements

- Life support analyses
 - Air reclamation
 - Water recycling
 - Food provision - storage / processing / growth
 - Waste collection and management
 - Air ventilation and handling
 - External stores for life support consumables
- Other topics of interest or necessity

