Individual Task Analysis – sUAS Leaflet Dissemination

Overview

This document outlines detailed procedures for key individual tasks required for planning sUAS-based leaflet dissemination. Each task includes observed conditions, performance standards, step-by-step procedures, supporting tasks, safety factors, environmental considerations, and required knowledge (K#) and skills (S#).

Task 0008: Calculate Descent Time Using sUAS Parameters

Conditions

Given altitude above ground level (AGL), sUAS-specific descent profiles, current environmental data, and access to digital calculation tools in an operational planning environment.

Standards

Calculate descent time accurately within a 5% error margin of expected values, incorporating real-time environmental data and sUAS-specific parameters.

Performance Steps

1. Gather Altitude and Descent Rate Data

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- **Sub-steps:**
  - a. Access mission planning data for operational altitude.
  - b. Verify altitude measurements in appropriate units (feet/meters).
  - c. Retrieve standard descent rate from doctrinal references (baseline 2.5 ft/s per Table D-1).
  - d. Adjust descent rate based on sUAS platform specifications.
- **References:** FM 3-05.301 Appendix D; GTA-33_01_003 Aerial Dissemination; sUAS technical manuals.
- **Supporting Individual Task(s):**
  - Task 0005: *Gather sUAS Performance Data and Environmental Inputs.*
- **Supported Individual Tasks:**
  - Task 0011: *Calculate Total Drift Distance.*
- **Safety Factors/Hazard(s):**
  - Inaccurate calculations may lead to mission failure and unnecessary platform exposure.
- **Environmental:** Operational planning environment with digital systems and technical documentation.
- **Knowledges/Know about…:**
  - **K1:** Physics principles of aerial delivery
  - **K2:** Mathematical formulas for time calculation
  - **K3:** sUAS platform-specific performance characteristics
  - **K4:** Unit conversion standards and procedures
- **Skills:**
  - **S1:** Mathematical computation skills
  - **S2:** Technical data interpretation
  - **S3:** Critical thinking and analysis
  - **S4:** Attention to detail
- **Resources/Materials:** Calculation software; sUAS technical specifications; digital planning tools.
- **Step Notes/Cues:** Ensure measurement units are consistent (feet vs. meters) to prevent calculation
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2. **Apply Descent Time Formula**
   - **Sub-steps:**
     - a. Input altitude value into the descent time formula.
     - b. Apply the standard formula: **Descent Time = Altitude ÷ Descent Rate.**
     - c. Calculate the preliminary descent time value.
     - d. Document the preliminary calculation result.

- **References:** FM 3-05.301 Appendix D; sUAS platform documentation.
- **Supporting Individual Task(s):**
  - Task 0006: *Retrieve sUAS Technical Specifications.*
- **Supported Individual Tasks:**
  - Task 0009: *Calculate Forward Drift with sUAS Airspeed.*
- **Safety Factors/Hazard(s):**
  - Mathematical errors could lead to incorrect flight planning and mission failure.
- **Environmental:** Operational planning environment with calculation tools and reference materials.
- **Knowledges/Know about...:**
  - **K2:** Mathematical formulas for time calculation
  - **K4:** Unit conversion standards and procedures
  - **K5:** Documentation requirements and standards
- **Skills:**
  - **S1:** Mathematical computation skills
  - **S4:** Attention to detail
  - **S5:** Formula application
  - **S6:** Systematic calculation methodology
- **Resources/Materials:** Calculation software; calculator; standard formula references.
- **Step Notes/Cues:** Double-check all mathematical operations to ensure accuracy within the required 5% margin.

3. **Adjust for Environmental Factors**
   - **Sub-steps:**
     - a. Access current environmental data (temperature, pressure, humidity).
     - b. Analyze the impact of these variables on the descent rate.
     - c. Apply appropriate adjustment factors to the preliminary calculation.
     - d. Recalculate descent time with environmental factors incorporated.
   - **References:** Current weather data; environmental adjustment tables; sUAS performance guidance.
   - **Supporting Individual Task(s):**
     - Task 0007: *Collect Real-Time Environmental Data.*
   - **Supported Individual Tasks:**
     - Task 0010: *Calculate Lateral Wind Drift with Sensor Data.*
   - **Safety Factors/Hazard(s):**
     - Failure to account for environmental factors could result in significant calculation errors.
   - **Environmental:** Variable operational conditions requiring dynamic adjustments.
   - **Knowledges/Know about...:**
     - **K6:** Effects of temperature, pressure, and humidity on aerial delivery
     - **K7:** Environmental adjustment principles
     - **K8:** Real-time data integration methodology
   - **Skills:**
     - **S3:** Critical thinking and analysis
     - **S7:** Environmental data interpretation
     - **S8:** Adjustment factor application
   - **Resources/Materials:** Weather monitoring systems; environmental adjustment tables; calcula-

tion software.
- **Step Notes/Cues:** Do not skip environmental adjustments; their impact on descent characteristics is significant.

4. **Validate and Document Final Calculation**
   - **Sub-steps:**
     - a. Compare the calculated value with historical data or expected ranges.
     - b. Verify the calculation is within acceptable parameters.
     - c. Document the final descent time calculation with all adjustments.
     - d. Prepare the data for integration into the overall mission plan.
   - **References:** Historical mission data; performance benchmarks; calculation validation procedures.
   - **Supporting Individual Task(s):**
     - Task 0015: *Validate and Refine Calculations.*
   - **Supported Individual Tasks:**
     - Task 0016: *Integrate Calculations into Flight Plan.*
   - **Safety Factors/Hazard(s):**
     - Failure to validate could allow errors to propagate through subsequent calculations.
   - **Environmental:** Operational planning area with access to validation tools and documentation systems.
   - **Knowledges/Know about...:**
     - **K5:** Documentation requirements and standards
     - **K9:** Expected ranges for descent time values
     - **K10:** Validation methodologies
   - **Skills:**
     - **S3:** Critical thinking and analysis
     - **S4:** Attention to detail
     - **S9:** Technical documentation
   - **Resources/Materials:** Validation tools; documentation templates; mission planning systems.
   - **Step Notes/Cues:** Ensure all variables and adjustment factors are clearly documented.

Task 0009: Calculate Forward Drift with sUAS Airspeed

Conditions

Given sUAS airspeed data, a previously calculated descent time, digital calculation tools, and current environmental data within an operational planning environment.

Standards

Calculate forward drift accurately within a 5% error margin of expected values by accounting for platform airspeed, descent time, and environmental factors.

Performance Steps

1. Gather Required Input Parameters

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- **Sub-steps:**
  - a. Access the descent time calculated in Task 0008.
  - b. Verify sUAS airspeed from platform specifications (using 17 knots = 28.7 ft/s as a baseline per T
  - c. Convert airspeed to appropriate units if necessary (e.g., knots to ft/s).
  - d. Document all input parameters.
- **References:** sUAS technical specifications; calculation methodology guides.
- **Supporting Individual Task(s):**
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  - Task 0008: *Calculate Descent Time Using sUAS Parameters.*
- **Supported Individual Tasks:**
  - Task 0011: *Calculate Total Drift Distance.*
- **Safety Factors/Hazard(s):**
  - Inaccurate input values will significantly impact the accuracy of the forward drift calculation.
- **Environmental:** Operational planning environment with access to technical specifications.
- **Knowledges/Know about…:**
  - **K3:** sUAS platform-specific performance characteristics
  - **K4:** Unit conversion standards and procedures
  - **K11:** Forward drift calculation methodology
- **Skills:**
  - **S2:** Technical data interpretation
  - **S4:** Attention to detail
  - **S10:** Organized data retrieval
- **Resources/Materials:** sUAS technical specifications; mission planning tools; calculation software.
- **Step Notes/Cues:** Standard airspeed (17 knots) may need adjustment for specific platforms.
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2. **Apply Forward Drift Formula**
   - **Sub-steps:**
     - a. Input the verified airspeed and descent time into the forward drift formula.
     - b. Apply the formula: **Forward Drift = Airspeed × Descent Time.**
     - c. Compute the preliminary forward drift value.
     - d. Document the preliminary calculation result.
   - **References:** FM 3-05.301 Appendix D; forward drift calculation guides.
   - **Supporting Individual Task(s):**
     - Task 0006: *Retrieve sUAS Technical Specifications.*
   - **Supported Individual Tasks:**
     - Task 0012: *Calculate Dispersion Ellipse Dimensions.*
   - **Safety Factors/Hazard(s):**
     - Mathematical errors in formula application could lead to compounded inaccuracies.
   - **Environmental:** Operational planning environment equipped with digital calculation tools.
   - **Knowledges/Know about…:**
     - **K2:** Mathematical formulas for time calculation
     - **K11:** Forward drift calculation methodology
     - **K12:** Basics of vector physics
   - **Skills:**
     - **S1:** Mathematical computation skills
     - **S5:** Formula application
     - **S6:** Systematic calculation methodology
   - **Resources/Materials:** Calculation software; standard formula references; digital planning tools.
   - **Step Notes/Cues:** Verify that unit consistency is maintained (ft/s or m/s) throughout the calculation.
3. **Adjust for Platform-Specific Factors**
   - **Sub-steps:**
     - a. Identify any platform-specific adjustment factors based on the sUAS's aerodynamic characteristics.
     - b. Apply the necessary corrections.
     - c. Recalculate forward drift incorporating these adjustments.
     - d. Document the adjusted forward drift value.
   - **References:** sUAS technical documentation; platform performance data; Table D-4.

- **Supporting Individual Task(s):**
  - Task 0001: *Determine and Select Appropriate Aircraft Platform.*
- **Supported Individual Tasks:**
  - Task 0014: *Determine Optimal Release Point.*
- **Safety Factors/Hazard(s):**
  - Failure to adjust for platform-specific traits may lead to significant miscalculations.
- **Environmental:** Operational planning area with access to detailed platform performance data.
- **Knowledges/Know about...:**
  - **K3:** sUAS-specific performance characteristics
  - **K13:** Aerodynamic properties of sUAS
  - **K14:** Methods for applying adjustment factors
- **Skills:**
  - **S2:** Technical data interpretation
  - **S8:** Application of adjustment factors
  - **S3:** Critical thinking and analysis
- **Resources/Materials:** sUAS performance data; adjustment factor references; calculation tools.
- **Step Notes/Cues:** Different platforms require distinct adjustment factors (e.g., fixed-wing vs. rotary-wing).

4. **Validate and Document Final Forward Drift Calculation**
   - **Sub-steps:**
     - a. Compare the computed forward drift with historical or benchmark data.
     - b. Ensure the calculated value is within a 5% error margin.
     - c. Document the final forward drift value with all adjustments.
     - d. Prepare the result for integration into the overall mission plan.
   - **References:** Historical mission data; validation procedures; Table D-4.
   - **Supporting Individual Task(s):**
     - Task 0015: *Validate and Refine Calculations.*
   - **Supported Individual Tasks:**
     - Task 0016: *Integrate Calculations into Flight Plan.*
   - **Safety Factors/Hazard(s):**
     - Insufficient validation could allow errors to affect mission planning.
   - **Environmental:** Operational planning environment with validation tools.
   - **Knowledges/Know about...:**
     - **K10:** Validation methodologies
     - **K5:** Documentation standards
     - **K15:** Expected forward drift ranges
   - **Skills:**
     - **S4:** Attention to detail
     - **S11:** Data validation
     - **S9:** Technical documentation
   - **Resources/Materials:** Validation tools; documentation templates; digital planning systems.
   - **Step Notes/Cues:** Compare results with previous missions for consistency.

Task 0014: Determine Optimal Release Point

Conditions

Given calculated drift distances, dispersion ellipse dimensions, target area parameters, and access to digital mapping tools in an operational planning environment.

Standards

Determine the optimal release point that ensures accurate target coverage by integrating all drift and dispersion data, and accommodate operational constraints.

Performance Steps

1. Gather All Calculated Parameters

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- **Sub-steps:**
  - a. Retrieve the previously calculated total drift distance.
  - b. Verify dispersion ellipse dimensions.
  - c. Review target area coordinates and boundaries.
  - d. Document all relevant parameters.
- **References:** Mission planning documents; previous calculation results; Table D-4.
- **Supporting Individual Task(s):**
  - Task 0011: *Calculate Total Drift Distance.*
- **Supported Individual Tasks:**
  - Task 0016: *Integrate Calculations into Flight Plan.*
- **Safety Factors/Hazard(s):**
  - Incomplete data collection may lead to an incorrect release point.
- **Environmental:** Operational planning environment with digital mapping tools.
- **Knowledges/Know about…:**
  - **K16:** Relationship between drift, dispersion, and release point
  - **K17:** Target area characteristics
  - **K18:** Mission objectives and constraints
- **Skills:**
  - **S10:** Organized data retrieval
  - **S12:** Spatial analysis
  - **S6:** Systematic calculation methodology
- **Resources/Materials:** Digital mapping software; compiled calculation reports; mission planning sys
- **Step Notes/Cues:** Confirm all prior calculations are finalized before proceeding.
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2. **Calculate Release Point Coordinates**
   - **Sub-steps:**
     - a. Identify the centroid or priority points within the target area.
     - b. Apply reverse vector calculations using the total drift.
     - c. Determine preliminary release point coordinates.
     - d. Document the preliminary coordinates.
   - **References:** Geospatial planning guides; vector calculation methodologies.
   - **Supporting Individual Task(s):**
     - Task 0004: *Determine Target Area Parameters.*
   - **Supported Individual Tasks:**
     - Task 0016: *Integrate Calculations into Flight Plan.*
   - **Safety Factors/Hazard(s):**
     - Incorrect vector calculations may result in missing the target area.
   - **Environmental:** Operational planning environment with geospatial mapping tools.
   - **Knowledges/Know about…:**
     - **K12:** Vector physics principles

    - **K19:** Coordinate systems and mapping concepts
    - **K20:** Techniques for calculating release points
  - **Skills:**
    - **S12:** Spatial analysis
    - **S13:** Vector calculation
    - **S14:** Coordinate plotting
  - **Resources/Materials:** Digital mapping software; GPS coordinate tools; calculation aids.
  - **Step Notes/Cues:** Always work backward from the target area to determine the release point.
3. **Adjust for Operational Constraints**
  - **Sub-steps:**
    - a. Identify operational constraints such as airspace restrictions, terrain, and threat zones.
    - b. Evaluate the feasibility of the preliminary release point considering these constraints.
    - c. Adjust the coordinates as necessary while ensuring that target coverage is maintained.
    - d. Document any constraint-based adjustments.
  - **References:** Airspace control documents; terrain maps; threat assessments.
  - **Supporting Individual Task(s):**
    - Task 0002: *Define Mission and Target Requirements.*
  - **Safety Factors/Hazard(s):**
    - Neglecting constraints could lead to safety risks or non-compliance with operational guidelines.
  - **Environmental:** Planning environment with access to constraint data.
  - **Knowledges/Know about...:**
    - **K21:** Operational security considerations
    - **K22:** Terrain effects on sUAS operations
    - **K23:** Airspace control measures
  - **Skills:**
    - **S15:** Risk assessment
    - **S16:** Constraint analysis
    - **S17:** Adaptive planning
  - **Resources/Materials:** Terrain maps; airspace control documents; threat assessment reports.
  - **Step Notes/Cues:** Balance precision with operational practicality; adjust coordinates as needed.
4. **Validate Final Release Point**
  - **Sub-steps:**
    - a. Verify that the release point provides the required target coverage.
    - b. Ensure the release point is operationally feasible.
    - c. Consider alternative release points for contingency planning.
    - d. Document the final release point with a detailed justification.
  - **References:** Mission validation procedures; sUAS operational guidelines.
  - **Supporting Individual Task(s):**
    - Task 0015: *Validate and Refine Calculations.*
  - **Safety Factors/Hazard(s):**
    - Inadequate validation could result in a release point that fails to achieve mission objectives.
  - **Environmental:** Operational planning area with validation tools and stakeholder reviews.
  - **Knowledges/Know about...:**
    - **K24:** Mission success criteria
    - **K10:** Validation methodologies

  - **K25:** Contingency planning principles
- **Skills:**
  - **S3:** Critical thinking and analysis
  - **S18:** Strategic decision-making
  - **S19:** Contingency planning
- **Resources/Materials:** Digital simulation tools; validation checklists; planning software.
- **Step Notes/Cues:** Always document at least one contingency release point.

Reference Elements

Knowledge Elements (K#)

1. **K1:** Physics principles of aerial delivery
2. **K2:** Mathematical formulas for time calculation
3. **K3:** sUAS platform-specific performance characteristics
4. **K4:** Unit conversion standards and procedures
5. **K5:** Documentation requirements and standards
6. **K6:** Effects of temperature, pressure, and humidity on aerial delivery
7. **K7:** Environmental adjustment principles
8. **K8:** Real-time data integration methodology
9. **K9:** Expected ranges for descent time values
10. **K10:** Validation methodologies
11. **K11:** Forward drift calculation methodology
12. **K12:** Basics of vector physics
13. **K13:** Aerodynamic properties of sUAS
14. **K14:** Methods for applying adjustment factors
15. **K15:** Expected forward drift ranges
16. **K16:** Relationship between drift, dispersion, and release point
17. **K17:** Target area characteristics
18. **K18:** Mission objectives and constraints
19. **K19:** Coordinate systems and mapping concepts
20. **K20:** Techniques for calculating release points

21. **K21:** Operational security considerations
22. **K22:** Terrain effects on sUAS operations
23. **K23:** Airspace control measures
24. **K24:** Mission success criteria
25. **K25:** Contingency planning principles

Skill Elements (S#)

1. **S1:** Mathematical computation skills
2. **S2:** Technical data interpretation
3. **S3:** Critical thinking and analysis
4. **S4:** Attention to detail
5. **S5:** Formula application
6. **S6:** Systematic calculation methodology
7. **S7:** Environmental data interpretation
8. **S8:** Adjustment factor application
9. **S9:** Technical documentation
10. **S10:** Organized data retrieval
11. **S11:** Data validation
12. **S12:** Spatial analysis
13. **S13:** Vector calculation
14. **S14:** Coordinate plotting
15. **S15:** Risk assessment
16. **S16:** Constraint analysis
17. **S17:** Adaptive planning
18. **S18:** Strategic decision-making
19. **S19:** Contingency planning

References

- Tables D-1 through D-5 and related constants/formulas from *UAS_Calculations_for_leaflet_drops.pdf*
- FM 3-05.301 Appendix D

- GTA-33_01_003 Aerial Dissemination