DATA ITEM DESCRIPTION

Form Approved
OMB No. 0704-0188
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1 TITLE	2. IDENTIFICATION NUMBER
Range Safety Data for Remotely Piloted Vehicles (RSDRPV)	DI-SAFT-80179

3 DESCRIPTION/PURPOSE

The RSDRPV package provides the general information on the vehicle's flight characteristics and trajectory and discusses malfunction effects. It is the medium through which in-flight safety approval is obtained from the launch range. This data item meets the requirements of ADR 127-1, Chap 2.

4 APPROVAL DATE (YYMMDD)	5. OFFICE OF PRIMARY RESPONSIBILITY (OPR)	6a. DTIC REQUIRED	6b GIDEP REQUIRED
860612	F/AFSC-AD		

7 APPLICATION/INTERRELATIONSHIP

7.1 This data item description contains the format and content preparation instructions for the data product generated by the specific and discrete task requirement for this data included in the contract.

7.2 This data item is applicable to all drone and remotely piloted vehicle contracts issued at Armament Division or programs which plan to conduct testing using the Eglin Test Range.

8 APPROVAL LIMITATION	9a. APPLICABLE FORMS	9b. AMSC NUMBER
		F3868

10 PREPARATION INSTRUCTIONS

10.1 Contract. This data item is generated by the contract which contains a specific and discrete work task to develop this data product.

10.2 RSDRPV Package. The RSDRPV package shall contain technical information on the test plan, vehicle performance, and trajectory. Where applicable, previously furnished documentation shall be referenced throughout the package. The RSDRPV shall contain a table of contents and glossary and shall include the following information:

10.2.1 Introduction. The nature and mission of the program and scope and purpose of this submittal.

10.2.2 General Vehicle Data. Includes the following as applicable: scaled diagram, failure information, tracking equipment, sequence of events, destruct action effects, and velocity vector turning data.

10.2.2.1 Physical Characteristics.

10.2.2.1.1 A scaled diagram of the general arrangement and dimensions of the vehicle.

10.2.2.1.2 Vehicle weight and center of gravity (c.g.) versus time of flight.

10.2.2.1.3 Sequence and time of events such as motor ignition, burnout, separation of boosters or stages, jettisoning of components, starting or ending of control modes, initiation of recovery devices, etc.

7. APPLICATION/INTERRELATIONSHIP (CONT'D)

7.3 This data item supersedes DI-S-30636.

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10. PREPARATION INSTRUCTIONS (CONT'D)

10.2.2.1.4 A brief, general discussion of the typical failures which may occur during flight, an estimate of the probability of occurrence for each type of failure, and the expected vehicle behavior for these failures. Any other pertinent information related to vehicle stability characteristics or peculiarities, and structural or G-limits shall be provided.

10.2.2.1.5 List tracking equipment in the vehicle which can be used for range safety purposes, such as a radar transponder or telemetry transmitter, and the section where each piece of equipment is located.

10.2.2.1.6 Results of astructural analysis shall be includedtogether with any supporting test data. This will assure that an adequate structural integrity margin will be maintained through aircraft takeoff, carriage, flight, launch, and landing conditions as required by MIL-A-8591.

10.2.2.2 Aerodynamic Characteristics.

10.2.2.2.1 A complete set of trimmed pitch aero coefficients C_N (or C_L) and C_A (or C_D) in digital form as a function of critical parameters such as Mach, trimmed angle of attack, and control surface deflection(s). If the vehicle employs a skid to turn control system, this data shall be given for a minimum of two suitable roll angles (a cruciform configuration shall use the "+" and "x" orientation). A roll to steer vehicle may use some useful combination of angle of attack and sideslip angle. Data shall be presented about (at least) the reference c.g. and one other typical c.g.

10.2.2.2.2 A supplemental set of untrimmed aero data shall include pitch polar plots of C_N (or C_L) vs C_M and axial (drag) polar plots of C_N vs C_A (C_L vs C_D) at the reference c.g. Data shall be plotted for two roll angles on a skid to turn system ("+" and "x" for cruciform) with angle of attack and control surface deflection as parameters. Also present zero lift axial (drag) coefficient C_{A_O} (C_{D_O}) vs Mach for sea level, gliding flight condition plus separate plots of base pressure and skin friction correction vs Mach and altitude. Present an analagous set of trimmed aero data plots at the same conditions showing plots of C_N (C_L) vs trim angle of attack, C_N vs C_A (C_L vs C_D), plus separate plots of trim angle of attack vs trim control surface deflection. Background information shall contain definitions of reference length and area, aero reference location (reference c.g.), an illustration of vehicle's systems, sign convention, control surface deflection, (c.g.), an illustration of vehicle's systems, sign convention, control surface deflection, etc.

10.2.2.2.3 Vehicle roll rate vs time.

10.2.2.2.4 Maximum turning capability of the total velocity vector versus time of flight.

10. PREPARATION INSTRUCTIONS (CONT'D)

10.2.2.2.4.1 This data is needed to determine at any time during flight the maximum angle through which the velocity vector of a malfunctioning vehicle can turn in various time intervals. This information is then used to determine how fast a vehicle can attempt to leave the test area if a malfunction should occur. Various time intervals or delays must be considered since the delays which are built into the flight termination calculations depend upon the accuracy, sensitivity, and type of presentation associated with a particular instrumentation system as well as upon vehicle characteristics.

10.2.2.2.4.2 Both pitch and lateral turns are required. Lateral turn means the angle turned in the lateral direction by the total velocity vector, not the angle turned in the horizontal plane by the horizontal component. In beginning the various turn computations, it should be assumed that the vehicle has behaved normally up to the time of the malfunction which produces the turn. Data shall be provided for malfunction turns from a bounding group of the nominal trajectories to be flown. The turn data shall include atmospheric effects.

10.2.2.2.4.3 The information shall be presented as graphs of angle turned versus time from beginning of turn maneuver until 360° of turn has been completed. These graphs shall be presented at four second intervals or less along the trajectory from the time of launch to the point where the vehicle is no longer capable of impacting on land or exceeding the planned impact area.

10.2.2.2.4.4 The turning data can be expressed in the form of maximum pitch and lateral acceleration as an alternative method of presentation. These calculations shall assume that the vehicle is trimmed to the maximum airload that the structure can stand. Also required are the maximum turning rates that the guidance system and the autopilot can command.

10.2.2.2.4.5 A complete discussion of the methods used in calculating the turns shall be provided. This discussion shall include: all assumptions made; types of malfunctions considered; forces producing the turns; and equations used.

10.2.2.3 Propulsion Characteristics.

10.2.2.3.1 Description and designation of propulsion unit.

10.2.2.3.2 Total propellant weight.

10.2.2.3.3 Type of propellant and hazard class.

10.2.2.3.4 Thrust versus time from ignition.

10.2.2.3.5 Total burn time.

10.2.2.3.6 Total impulse.

10.2.2.3.7 Maximum possible impact range for the vehicle burning to fuel exhaustion.

10.2.2.4 Guidance Characteristics.

10. PREPARATION INSTRUCTIONS (CONT'D)

10.2.2.4.1 System description giving type of guidance, modes of operation, and theory of operation.

10.2.2.4.2 Operational frequency or band.

10.2.2.4.3 Acquisition or search procedures.

10.2.2.4.4 Maximum detection range and the target size associated with that range.

10.2.2.4.5 Sequence of events.

10.2.2.4.6 Biases including when and how they are applied.

10.2.2.4.7 Passive homing or home-on-jam capabilities.

10.2.2.5 Launch or Release Parameters. For each flight or group of similar flights the following information is required:

10.2.2.5.1 The desired launch point preferably in geodetic latitude, longitude, altitude, and launch/flight azimuth.

10.2.2.5.2 Launch elevation angle or aircraft flight path angle at launch.

10.2.2.5.3 For air launches, the type of launch aircraft to be used.

10.2.2.5.4 Launch velocity in feet or meters per second or Mach number.

10.2.2.5.5 Launch altitude in feet or meters.

10.2.2.5.6 For air launches in other than level flight, a description of how the aircraft flight path angle and the launch azimuth will be determined for vehicle launch or release.

10.2.2.6 Effects of Flight Termination action.

10.2.2.6.1 Estimates of the coefficient of drag (C_D) vs Mach number specifying reference area (A), weight (W), and volume (V) for pieces resulting from flight termination action. That piece(s) which in the absence of winds travels a maximum distance, and that major piece(s), which in the absence of winds travels a minimum distance, shall be included. If drag coefficient curves for vehicle pieces cannot be satisfactorily estimated, the subsonic and supersonic W/C_DA for each major piece may be provided instead. In either form, three-sigma tolerance limits for the drag coefficients given for the maximum distance piece shall be included. For major pieces which can possibly stabilize during free flight, drag coefficient curves should be provided for the stability angle of attack. If the stability angle of attack is other than zero degrees, a lift coefficient (C_L) vs Mach number curve shall also be provided for the stability angle. In addition, drag coefficient estimates are required for vehicle pieces of minimum W/C_DA, such as skin or fuel tank sections. All C_D and C_L vs Mach number curves shall be provided in graphical form. Include equations for these curves if available.

10. PREPARATION INSTRUCTIONS (CONT'D)

10.2.2.6.2 Estimates of incremental velocities imparted to the vehicle pieces (for which drag data are required in paragraph 10.2.2.6.1).

10.2.2.6.3 Vehicle system time delays in the destruct path. This data is needed to determine the total destruct delay that must be accounted for in the range safety destruct calculations.

10.2.3 General Launch Trajectory Data. Includes the following as applicable; launch point data, launch azimuth, impact points, flight termination conditions.

10.2.4 Unique Configuration. Any other information necessary to satisfy Range Safety caused by unique program requirements.

10.2.5 Waivers. All required and existing waivers, technical agreements, and understandings concerning in-flight Range Safety requirements.

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