



BRIGHAM YOUNG UNIVERSITY
AUVSI CAPSTONE TEAM (TEAM 45)

UGV Drop Mechanism Concept Test Procedures and Results

ID	Rev.	Date	Description	Author	Checked By
GV-005	0.1	10-26-2018	Initial creation proceedures listed	Jacob Willis	Andrew Torgesen

1 Introduction

This document describes the procedures used to test each of the UGV concepts. Some of the tests were unnecessary for selecting between concepts, so they will not be performed until subsystem engineering.

2 Test Procedures and Results

2.1 Drop mechanism mass

Procedure

Weigh all mechanisms related to landing the UGV using a scale, and sum with weights given on datasheets.

Results

Concept	Result
Parachute	.026 kg
Parachute w/ control	.124 kg
Skycrane	.160 kg
Glider	.08 kg

2.2 Weight mechanism can support

Procedure

Calculated based on maximum load ratings of mechanism components.

Result

Concept	Result
Parachute	4 kg
Parachute w/ control	4 kg
Skycrane	3 kg
Glider	1 kg

2.3 Aircraft internal volume consumed

Procedure

The volume of all of the UGV drop mechanisms, and the volume needed for the UGV if the mechanism requires it be inside the aircraft is measured.

Result

Concept	Result
Parachute	462 cm ²
Parachute w/ control	462 cm ²
Skycrane	92 cm ²
Glider	864 cm ²

2.4 Mounting distance from aircraft CG

Procedure

The distance between the center of gravity of the UGV and drop mechanism is measured and normalized by the chord length of the aircraft.

Result

Concept	Result
Parachute	Not Tested
Parachute w/ control	Not Tested
Skycrane	Not Tested
Glider	Not Tested

2.5 Stowed drop mechanism drag

Procedure

A preliminary estimate of this is made using the area of the mechanism that is exposed outside of the airframe. An accurate measurement of the mechanism drag is done by using a wind tunnel to measure the difference in drag between the airframe without the mechanism and the airframe with the mechanism.

Result

Concept	Result
Parachute	.278 N
Parachute w/ control	.278
Skycrane	.315 N
Glider	.245 N

2.6 Maximum landing velocity

Procedure

A preliminary estimate of this is made using calculations to determine the speed

Result

Concept	Result
Parachute (48 in)	2.7 m/s
Parachute (30 in)	4.8 m/s
Parachute w/ control	4.8 m/s
Skycrane	Not Tested
Glider	1.9 m/s

2.7 UGV Landing distance from target

Procedure

A preliminary estimate of this is made by dropping a representative load with the mechanism from a height of 40 feet. The distance between where the load lands and the target is scaled to a 100 foot drop height and the standard deviation of the spread is reported. The precision of the glider was tested by dropping it from heights of 5, 6, and 7 ft and the precision was scaled to 100 ft.

Result

Concept	Result
Parachute (48 in)	2.85 ft
Parachute (30 in)	4.14 ft
Parachute w/ control	3.23 ft
Skycrane	Not Tested
Glider	28 ft

2.8 Rule violations

Procedure

A checklist of the relevant rules is checked for the concept. The number of violations for the concept is summed.

2.8.1 UGV Rules Requirements

The following outline the rules which must be followed in order to achieve any points.

- Must carry 8 oz water bottle
- Must not fly below minimum altitude
- Must land gently and without damage (subjective measure)
- Max weight of 48 oz

Result

Concept	Result
Parachute	0
Parachute w/ control	0
Skycrane	0
Glider	1