

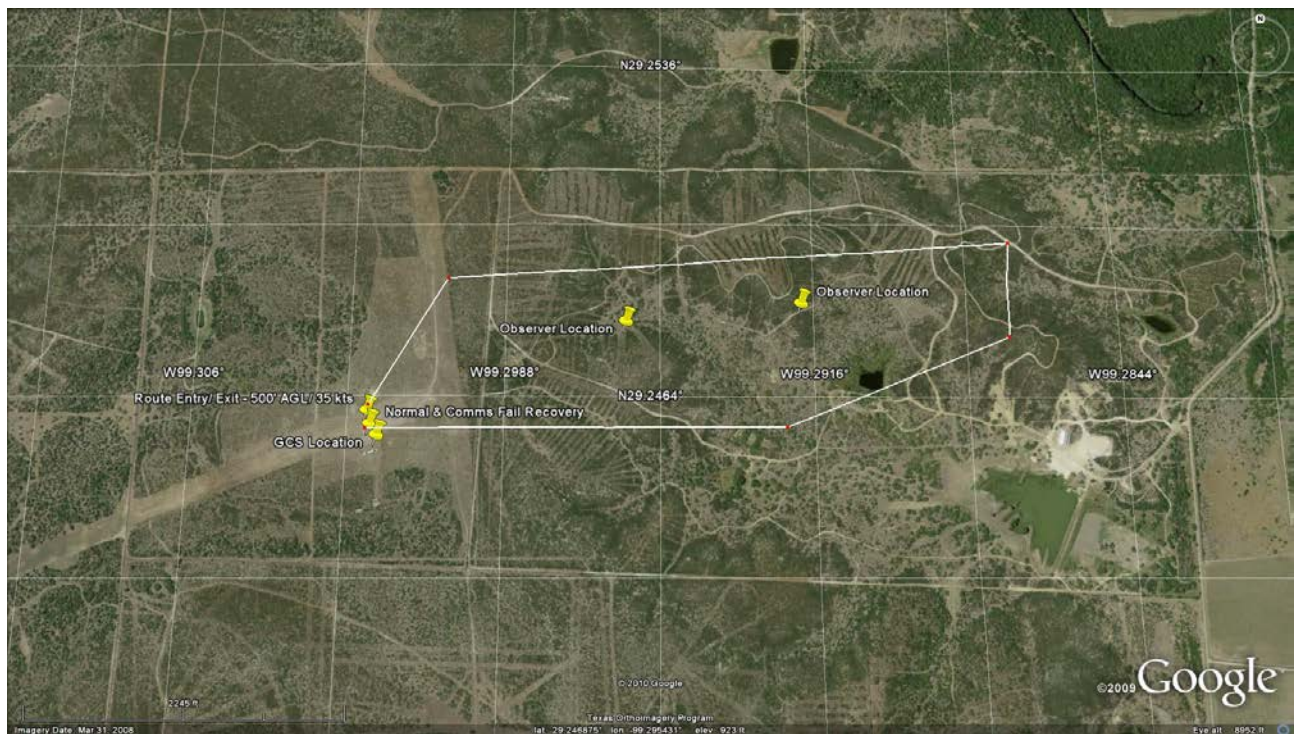
## **HONDO TEST AREA DATA-LINK COMMUNICATION PROCEDURES**

The map below depicts a typical BUSTER flight test mission in the Hondo test area. The area is approximately 15 miles southwest of the Hondo, TX airport. (NOTE: the class E airspace shown on the current VFR Sectional Chart shows the airspace previously used by the USAF T-2 "Firefly" which was based at the Hondo airfield and used for initial pilot screening. The USAF has discontinued use of Hondo Airfield as an auxiliary field).

The test map consists of a GCS location and a clockwise route consisting of 6 way-points, the last of which is the normal and com failure recovery point. The map also indicates the location of two ground observers within the flight pattern flown by the BUSTER UAV. The maximum separation between the UAV and GCS operator (waypoint 3 at the northeast corner of the flight track) is less than one statute mile. Geographic coordinates of the waypoints and observer locations are listed at the end of this attachment.

### **Pre-Launch Procedures:**

The BUSTER UAS is transported by truck from the Factory in Hondo and set up for launch in the test area by a crew of three: one GCS operator, one observer/launcher operator and one observer. The flight plan depicted on the map is entered into the UAV guidance system by the GCS. The UAV will not accept any flight plan without an IP (initial point to fly to) and a CF (comm. Failure point to fly to). BUSTER operators routinely enter the GCS location as the IP and the final waypoint of the route as the CF.



This transfer of route data is accomplished by data-link from the GCS to the UAV while powered up on the launcher. At this time, one observer departs for the observer position most distant from the launch point. Prior to launch, the data transfer is confirmed and system checks (engine, INS, GPS, data-link, recorder) are accomplished and the GCS operator passes the command to the launcher operator to launch the UAV.

### **Post-Launch Procedures:**

After launch the UAV will automatically climb straight ahead for five seconds and then enter a left orbit over the IP (GCS location) at a pre-set altitude (normally 200') for post-launch data-link checks and a visual check by the GCS operator. This will normally take 3-5 minutes while the launcher operator/observer deploys to the closer observer position. When the observers report in position (visually or by walkie-talkie), the GCS operator will data-link a command to the UAV to enter the programmed route of flight. At this time the UAV will proceed to the route entry/exit point at the programmed airspeed and altitude (normally 35 knots at 500') and fly northeast toward the second waypoint. (The point is called entry/exit only because the BUSTER UAS can fly the route in reverse if desired). With no further input from the GCS operator, the UAV will fly the programmed route and enter a left orbit over the last waypoint. The GCS operator can continuously monitor UAV position and status on the GCS display and by monitoring separate video (TV or IR) transmitted from the UAV sensor package.

### **Emergency or data-link failure Procedures:**

If at any time during flight the UAV senses a critical system failure (gyros, engine, flight control, generator) the UAV will immediately shut down the engine and deploy the recovery chute. If this happens, the GCS operator has no further control over the UAV and the observers will visually track the descent and report by walkie-talkie to the GCS operator.

If at any time during flight the UAV loses data-link contact with the GCS, it will initiate a turn in the shortest direction to the CF waypoint at the altitude programmed for the final leg of the flight plan but will continue normal engine and sensor operation and continue to search for the data-link signal. The UAV can be pre-programmed to make this turn immediately or after a delay of up to 30 seconds. BUSTER operators normally set this delay at 5 seconds to allow for momentary fluctuations in the data-link signal. At 35 MPH, the UAV travels less than 260' before turning toward the CF point if the signal is lost. If the signal is re-acquired, the GCS operator can re-direct the UAV to continue the route from any of the programmed way-points. If the signal is not re-acquired the UAV will return to the CF waypoint and orbit until fuel exhaustion or for a preset time. BUSTER operators normally set 5 minutes as the orbit time at the CF waypoint before the UAV will shut down the engine and deploy the recovery chute.

The GCS operator can take manual control of the UAV at any time in flight and over-ride the programmed route. During this mode of flight the same link failure process will apply. After 5 seconds the UAV will turn in the shortest direction toward the CF waypoint while searching for the signal. If the signal is re-established, the operator can continue to fly manually or return the UAV to the programmed route of flight from any waypoint. If the link is not re-established the UAV will return to the CF point as above.

### **COORDINATES FOR DEPICTED MISSION**

GCS location and programmed IP:	29°14' 43.9" N 99° 18' 06.6" W
Route entry/exit waypoint 1:	29°14' 46.1" N 99° 18' 07.0" W
Waypoint 2:	29°14' 55.6" N 99° 18' 00.6" W
Waypoint 3:	29°14' 58.7" N 99° 17' 13.0" W
Waypoint 4;	29°14' 51.3" N 99° 17' 12.0" W
Waypoint 5:	29°14' 44.5" N 99° 17' 31.9" W
Waypoint 6 and programmed CF:	29°14' 44.4" N 99° 18' 06.8" W
Observer:	29°14' 52.8" N 99° 17' 45.9" W
Observer:	29°14' 53.2" N 99° 17' 31.3" W