



Evaluation of the *IKE 304*TM Rapid Data Capture Device

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Introduction

The IKE 304 is a rapid data capture device that can be used for mobile mapping and damage assessment. The system integrates a WAAS GPS receiver, Laser rangefinder, and a digital camera. The system is ruggedized and is waterproof. The system is simple to use once the operator becomes familiar with the unit. The data collection software is a customized version of ArcPad (ESRI) and the output files are shapefiles. The GPS data can be post-processed but that feature was not evaluated in this test. Figure 1 shows the device.



Figure 1. IKE 304 Data Capture Device

Results

Table 1 shows the accuracy of the IKE device under different canopy conditions. On the Powell GPS course, which has a dense old growth Cedar/Spruce canopy, positions could only be obtained on 5 of the 10 different stations. Some other GPS receivers have difficulty as well on that course but usually positions could be obtained even if they were

not very accurate. On the Powell course 10 different station positions were recorded and averaged to obtain the results shown in the table below. On the Lubrecht course 7 stations positions recorded and were averaged and at the MTDC location 10 positions were averaged at the same station.

Accuracy of Position

	MTDC Open Sky	Lubrecht Intermediate Canopy	Powell Course Dense Canopy
GPS with WAAS	1.744 meters	N/A	N/A
Indirect measure -WAAS	4.692 meters	N/A	N/A
GPS - Autonomous	4.382 meters	13.416 meters	19.698 meters *

Table 1. Accuracy of IKE 304 device under different canopy conditions. Value shown indicates the distance away of the logged position from the true position 95% of the time.

* Only 5 of the 10 station positions could be obtained directly on the Powell course

Initially the magnetic declination for Missoula, 14.95 degrees east, was entered into the IKE with the wrong sign. Once that error was discovered the values for the indirect readings were corrected and listed in the table above. Table 2 below shows the distance from the IKE to the target and the approximate direction. The table also shows the error of the IKE calculated GPS position for the Target.

The data post-processing software was not evaluated for the data collected. It is estimated that the GPS Autonomous data could be processed and would come close to the values achieved with WAAS collected values.

Indirect measurement with WAAS of target using IKE (open sky)

Distance of IKE From Target Point	Difference in Latitude (m)	Difference in Longitude (m)	Total Error (m)
10m SE	1.223	-2.085	2.417
10m South	0.382	1.729	1.771
5m South	-0.628	-2.952	2.667
7m SE	1.645	-0.945	1.897
8m SSW	3.219	-1.6371	3.611
5m WSW	1.332	-1.564	2.054
7m ESE	-1.364	1.077	1.738
4m East	0.542	-0.172	0.569
11m to E	1.183	0.637	1.343
6m N	-0.020	1.411	1.411

Table 2. This table shows the 95% error in meters of 10 replications of a target that was pinpointed by the IKE and the approximate distance and direction that IKE was from the target.

Accuracy of the Laser Range finder

IKE Laser Rangefinder Check			
Distance From Object (Measured)	Comments- Target properties	Distance Recorded on IKE	Distance Recorded with Tru-Pulse rangefinder
8.4m (Inside)	Black Object Reflective Obj.	9.9m	8.6m
4.8m (Inside)		4.4m	4.9m
18.6m (Inside)	Reflective Obj. White Wall Black Object Aluminum	18.2m	18.6m
		18.7m	18.7m
		19.3m	18.6m
		19.0m	18.6m
40.3m (Inside)	Military OD	40.9m	40.4m
8.7m (outside)	Refective Aluminum White Paint	8.3m	8.6m
		9.1m	8.8m
		8.8m	8.6m

Table 3. Difference in distance recorded by the IKE Rangefinder compared to actual measured distance and the Tru-Pulse Rangefinder both inside a building and outdoors .

The rangefinder errors are not large especially if the device was used for general locations. If the device is to be used for projects that require higher accuracy, one must be careful of the target used to obtain GPS coordinates.

Camera

The camera is a 1.3 megapixel camera. When shooting into the shade it produces dark pictures and the display is hard to see in the sunlight.



Figure 2. Photo of offset target at open MTDC site.



Figure 2. Dark photo from Powell GPS course.

Summary

The IKE is a combination of 3 tools together in one device and using them together to obtain spatial data without actually occupying the exact position. It should have uses for doing inventory and GIS work. When one uses the IKE to determine target coordinates however, care must be taken to provide the correct magnetic declination for the area and that the rangefinder is properly pointed at the target or some large errors could occur. The GPS receiver used in this unit did not perform as well under canopy as many other GPS units.

When the revised version of this paper was published, a newer version of the IKE, the 305, is available and it has a 3.2 megapixel camera. This will improve the quality of the picture taken.

Specifications

Device specifications are available at the Survey-Lab website:

<http://www.surveylab.co.nz/~downloads/ike304%20product%20information.pdf>

The unit has the following:

- Digital Camera
- Compass
- Inclinometer
- Tripod Mount
- Data Capture Application
- LED Indicators
- User Port
- Laser Distance Meter
- GPS Receiver
- Ruggedised Casing
- Removable SD Card
- WiFi 802.11b
- Bluetooth
- Sound Recorder
- Configurable Hardware Buttons
- Connector for External GPS Antenna