Tasmania Department Of Resources and Energy

Division of Mines and Mineral Resources — Report 1990/09

Use of the Magellan GPS Nav 1000 Pro in a helicopter

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Abstract

The Division of Mines and Mineral Resources installed a portable GPS receiver in a helicopter for an eighteen-day field trip. The instrument operated satisfactorily but a number of considerations for optimum usage were determined.

INTRODUCTION

The Magellan GPS receiver is a battery-operated hand-held unit that uses signals from the U.S. Government Global Positioning System satellites to determine its position anywhere in the world. The measured position may be expressed in latitude/longitude or UTM co-ordinates, and may have an accuracy of 30 m or better. An external antenna, power supply unit and mounting cradle are also available.

In addition to the basic position measurement, the unit may have course information entered and return distance and bearing, cross-track error, velocity, and time to go information.

For this field trip the external antenna was mounted in the window above the co-pilot's seat in an Aerospatiale AS350B Squirrel owned by Helicopter Resources. The lead from the antenna ran towards the rear of the machine to maintain the minimum recommended distance between the receiver and the external power supply (through which the external antenna is connected). Plate 1 shows the final configuration, with the position of the antenna, instrument, and power lead circled.

RESULTS

The receiver had no hardware failures during the field trip. At the start of each flight, when a satellite window was available, an initial fix was obtained and the position then calculated using continuous operation. At all times the receiver was in 3D mode and set for interrupted terrain. On several occasions the receiver failed to achieve the initial fix before the flight commenced, and it was found at these times that acquisition of the initial fix whilst flying took longer, as more time was spent searching for and collecting satellite data. Subsequent fixes and satellite changes were rapid.

Much of the survey area had very rugged topography but a fix was obtained at over 98% of the survey sites. Low signal strength produced an accuracy warning at about 5% of sites but in approximately half these cases the receiver changed satellites and produced a reliable fix within 90 seconds. Repeatability was within 20 metres horizontally.

During flight the navigation and velocity functions worked as described in the receiver manuals. At 200 km/h it was found that updates were being made very 2.7 km, that is about every 48 seconds, rather than the 13 seconds expected. I attribute this to the rotor disc above the antenna interrupting the signal and lengthening the time for a fix.

RECOMMENDATIONS

(i) The external antenna should be mounted on the top of the helicopter tail fin at the rear end.

(ii) The receiver should be wired to the helicopter power supply in such a way as to allow operation when the machine is shut-down. This would allow the receiver to search for and change satellites during short times of shut-down and avoid any problems with gaining the initial fix.

(iii) The receiver should be used in 3D mode with interrupted terrain setting and in continuous operation.

(iv) When approaching the end of a course or a specified point the approach should be sufficiently slow to allow fixes to be acquired at a realistic rate.

(v) All users should be familiar with using the receiver and have an understanding of possible causes of accuracy loss, including poor satellite geometry, low signal strength and selective availability (deliberate degradation of GPS signals).

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