# A Modified Commercial Surveying Instrument For Use as a Spaceborne Rangefinder

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The current push to produce faster and cheaper missions has encouraged non-standard approaches to spaceborne instrument development. In many cases, Commercial Off The Shelf (COTS) products must be considered even for mission critical applications (some risk is inherent and appropriate in projects of this type). In this paper, we present a summary of a one such successful project. The Shuttle Radar Topography Mission (SRTM) flew on the shuttle Endeavor September 16-29, 1999 and succeeded in gathering continuous interferometric synthetic aperture radar data covering approximately 80% of the earth's land surface (between +60 deg North and +55 deg South latitudes). A deployable 60 meter mast (the longest structure ever flown in space) was used to extend an outrigger radar antenna from the shuttle's payload bay where a second antenna resided. The SRTM metrology subsystem, the Attitude and Orbit Detemination Avionics (AODA), played a vital role both in monitoring the baseline angle to better than 7 arcsec, baseline length to better than 1 mm, and shuttle position to 1 meter. The metrology data is now being combined with data from two radar instruments to generate an unprecedented near-global digital elevation model with 10 meter relative vertical accuracy at 30 meter postings (for comparison, existing global maps only provide 100 meter vertical accuracy at 1000 meter postings). The resulting data set will be available for myriad uses within the scientific, military, and commercial sectors. In order to make the necessary baseline length measurements, a precision rangefinder was required. However, the development of a space-qualified rangefinder from "scratch" was considered to be cost and schedule prohibitive. Therefore steps were taken to evaluate a number of commercially available units, resulting in the selection of a near-infrared Electronic Distance Meter (EDM). The unit selected is the Leica-Wild EDM DI2002. It operates at 850 nm on a time-of-flight principle using retro-reflector targets (corner cubes). An extensive qualification program was completed prior to flight (including structural, optical, and electrical modifications and environmental testing). In the end, a total of 6 flight-worthy units were produced, 4 of which flew successfully on SRTM. Since then, we have been approached by other projects inquiring on the possibility of re-using these instruments on other mission. An brief overview of the SRTM mission an AODA architecture will be presented (with an emphasis on the role played by the EDMs). We will discuss in detail the process used to select, modify, test, and operate these EDMs in flight as well as share the initial flight results and some lessons learned.