Accelerometer input axis angular acceleration sensitivity

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This paper appears in: **Position Location and Navigat Symposium, IEEE 2000**
Meeting Date: 03/13/2000 -03/16/2000
Publication Date: 2000
Location: San Diego, CA , USA
On page(s): 449-456
References Cited: 2
Number of Pages: 534

Abstract:
The Lockheed Missiles and Space Division contracted Honeywell in 1991 to develop an instrumentation packag for the US Navy Trident system reentry bodies. The reen inertial measurement unit (RIMU) is the result of this wo RIMU is a strapdown system consisting of three Honeyw GC1320 Ring Laser Gyros (RLG) and three Bell XI accelerometers as the inertial sensors. The Honeywell RI has performed reliably and accurately on several Trident flights. The Trident missile employs a pyrotechnic deployment mechanism to impart an attitude stabilizing angular velocity to the reentry body (RB) to assure a proper atmosphere reentry angle. A linear velocity increment is also imparted to push the RB away from the bus. Since it cannot be measured by the bus mounted booster IMU, this incremental deployment velocity is modeled in the Trident guidance computation. Hence, a requirement on RIMU is the accurate measurement of th deployment velocity increment. The measurement is to b accomplished with the accelerometer exposed to the full

angular dynamics environment because of RIMU's strapdown system mechanization. The sensitivity of this accelerometer is discussed, and confirmed by spin tests the laboratory. A theory of the error mechanism was hypothesized. While there was no effort to physically prc the hypothesis, this sensitivity was calibrated by post flic reprocessing of spin test data archived for the RIMU unit already flown. Flight data were reprocessed with compensation for this sensitivity. Effective improvement the down range impact miss was accomplished in all RIM units flown. This paper presents: (1) discussion of the process of RIMU flight data analysis, (2) anomalous deployment velocity measurements observed in flight te: (3) investigative study leading to the discovery of the ne sensitivity, (4) a hypothesis of the error mechanism, anc (5) post flight calibration and flight data reprocessing

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