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# Flight Test Evaluation of the E-Systems Differential GPS Category III Automatic Landing System

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## INTRODUCTION

The Federal Aviation Administration (FAA) has established a program to evaluate the technical feasibility of using Differential Global Positioning System (DGPS) based technology for International Civil Aviation Organization (ICAO) Category (CAT) III precision approach and landing applications. This program includes evaluation of DGPS systems developed by independent researchers/contractors onboard test aircraft provided by member airlines of the Air Transport Association.

The overall objective here at NASA Ames Research Center was to verify that the E-Systems DGPS system demonstrated the capability to meet the requirements for accuracy and integrity, as specified in the FAA CAT III Level 2 Flight Test Plan [1], over at least 91 completed CAT III approach and landings.

Specific objectives were:

1. Accuracy: Determine whether the CAT III equipment met the ICAO Annex 10 [2] Microwave Landing System (MLS) accuracy requirements for navigation sensor errors for a straight-in, Instrument Landing System (ILS) like approach for CAT III.
2. Integrity Monitor Response: Determine whether the CAT III equipment integrity monitor response had a low alarm rate and detected out of tolerance navigation sensor errors. The CAT III equipment was expected to detect all satellite signal anomalies which did occur and was not expected to generate any false alarms. In addition, a second set of more stringent alarm limits were implemented to check integrity logic and response time with the test aircraft stationary on the ground.

The E-Systems DGPS system performance was compared to Measures of Success (MOSs), as specified in the FAA CAT III Level 2 Flight Test Plan, where determination of successful performance was based on statistical hypothesis testing. For the E-Systems DGPS system to be considered successful, MOSs based on navigation sensor error must have successful performance [1].

## ACCURACY AND INTEGRITY REQUIREMENTS

The navigation sensor error is specified in terms of two parameters: Path Following Error (PFE) and Control Motion Noise (CMN). With regard to MLS, PFE is defined as that portion of the guidance system error which will result in an actual aircraft displacement from the desired flight path [2]. CMN is defined as that portion of the guidance system error which, when coupled to the autopilot, results in control surface, wheel and column motion, and possibly attitude angle change, but does not cause aircraft displacement from the desired flight path [2].

The integrity under normal operating conditions is specified in terms of false alarms, missed alarms and time to alarm. A maximum of one false alarm is allowed and there can be no missed alarms. In addition, any alarm condition must be acknowledged in two seconds or less.

The integrity under artificial alarm limits is specified in terms of false alarms, missed alarms and time to alarm. A maximum of one false alarm is allowed and there can be no missed alarms. Any alarm condition must be acknowledged in two seconds or less.

The specific accuracy requirements for MOS 1 and MOS 2 as well as the specific integrity requirements for MOS 6 and MOS 7 are described in detail in the FAA CAT III Level 2 Flight Test Plan.

## FLIGHT TEST FACILITIES

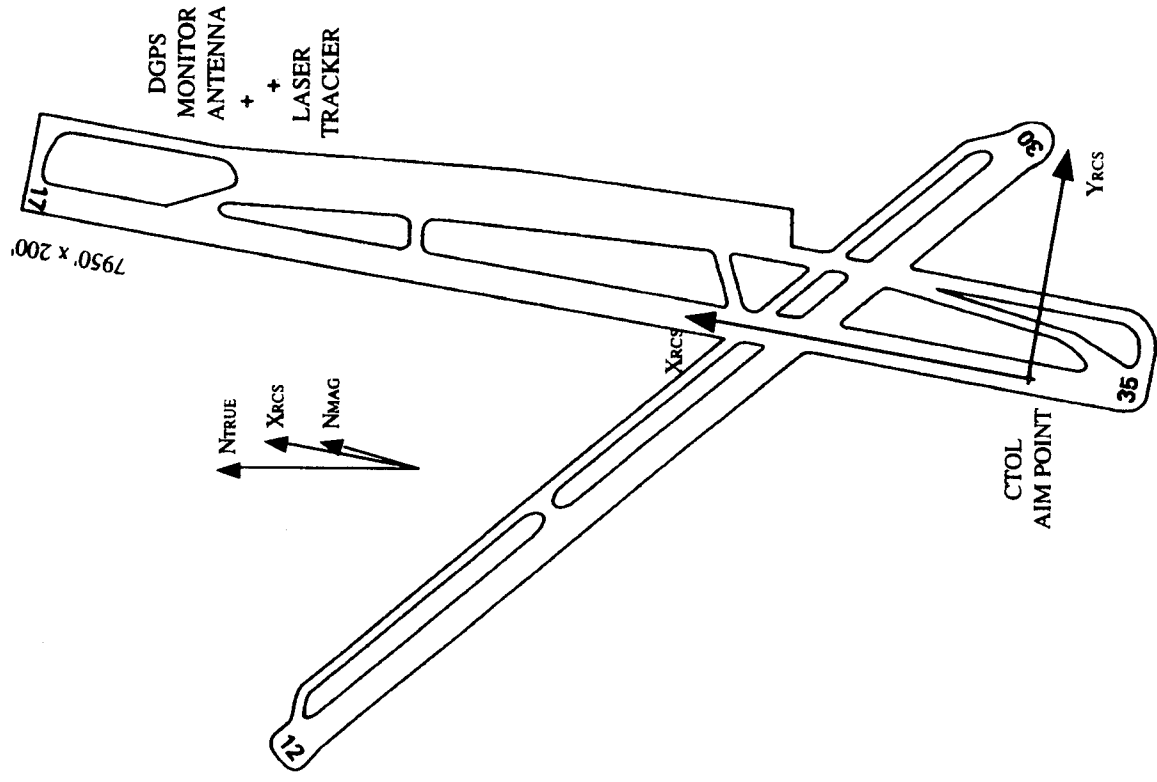
All test flights were conducted at NASA Ames Research Center's Crows Landing Flight Facility, located in the San Joaquin Valley approximately 45 miles East of NASA Ames Research Center. The NASA test facility at Crows Landing includes a Nike X-band monopulse radar tracker and a precision NiYag laser tracker. The laser tracker provides precise aircraft range, azimuth and elevation and is used to provide the GPS time-tagged truth reference data by tracking a laser retro-reflector mounted on the test aircraft.

The stated laser tracker range accuracy is nominally  $\pm 1$  ft ( $1\sigma$ ) out to 30,000 ft; azimuth and elevation accuracy are nominally  $\pm 0.2$  mrad ( $1\sigma$ ). These values equate to an estimated position error of  $\pm 0.230$  m along-track,  $\pm 0.489$  m laterally and  $\pm 0.448$  m vertically at the 100 ft Height Above Threshold (HAT) position along the 3 degree approach path (2230 m from the laser tracker). However, experience with the laser tracker during this and other approach and landing flight tests has demonstrated accuracies which are consistently better than shown above.

The laser tracker was calibrated immediately prior to the start of the series of approaches during each test flight. In addition, the laser tracker was checked after each approach by tracking a static laser retro-reflector mounted at a survey point located approximately underneath the 100 ft HAT position along the 3 degree approach path (See Figure 1).

In the laser truth reference data post-processing, laser range, azimuth and elevation data were wild-pointed and smoothed with a zero phase-shift, low-pass digital filter. The static laser check data were then used to identify laser range, azimuth and elevation biases as a function of time. The laser truth reference data were corrected for refraction errors, and finally converted to the rectangular Runway Coordinate System (RCS).

Figure 2 shows a laser truth reference position error of  $\pm 0.033$  m ( $1\sigma$ ) laterally and  $\pm 0.048$  m ( $1\sigma$ ) vertically at the static laser retro-reflector position (2420 m from the laser tracker) for a three minute laser track of the static laser retro-reflector on the next to last day of the flight test. This data is the result of the above mentioned post-processing steps and is characteristic of static laser checks of this and other approach and landing flight tests conducted at the Crows Landing Flight Facility.



LASER CALIBRATION +  
CHECK POINT

Figure 1 Crows Landing Flight Facility

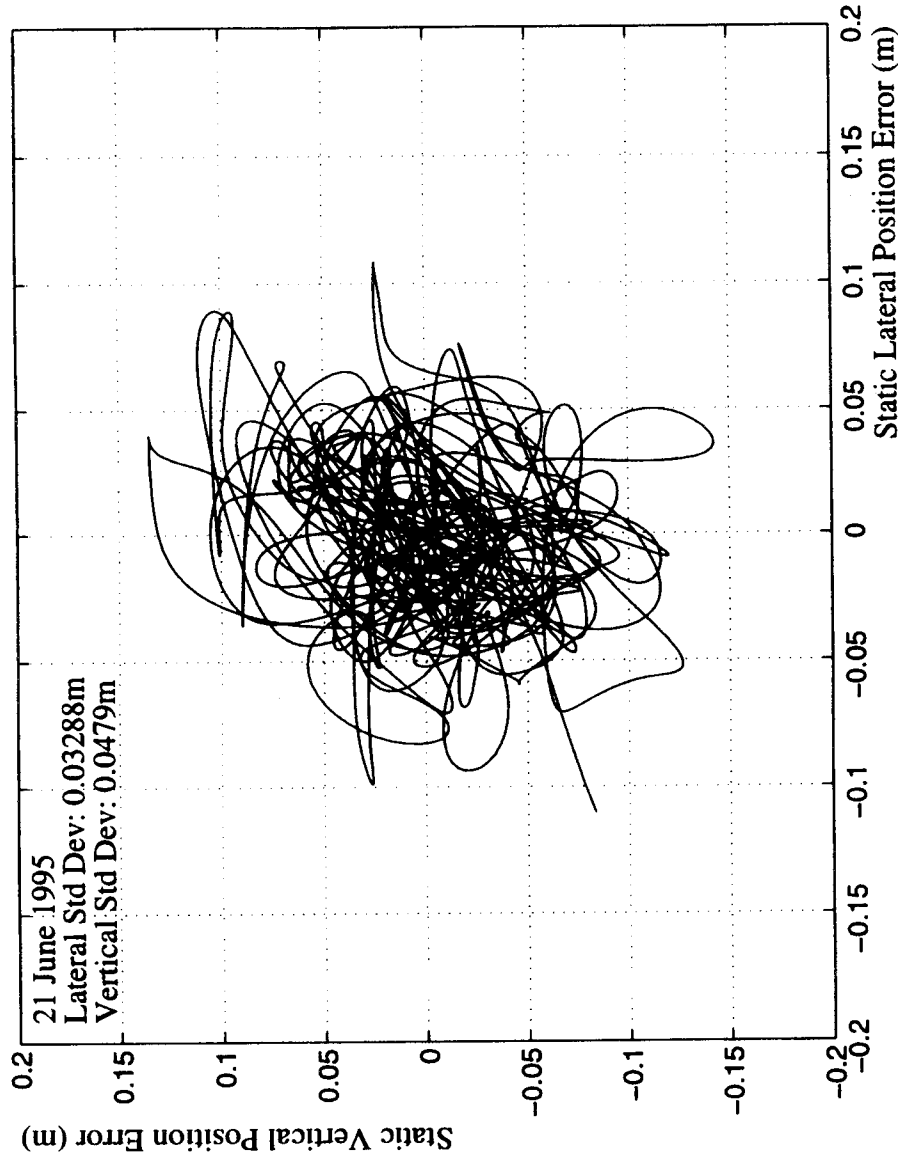


Figure 2 Smoothed And Bias Corrected  
 Static Laser Tracker Calibration Check Position Error  
 CTOL Laser Calibration Check Target (Range: 2420 Meters)

## FLIGHT TEST DESCRIPTION

The flight test consisted of standard 3 degree glide path straight-in approaches terminating with landings to Runway 35 at the Crows Landing Flight Facility (See Figure 3). Each approach was started at the Initial Approach Fix (IAF) located seven nautical miles out along the runway centerline with the test aircraft established on speed, on course, on glide path, configured for landing with all data collection equipment operational.

Laser tracking data were recorded from the time the test aircraft crossed the Final Approach Fix (FAF), located five and a quarter nautical miles out along the runway centerline, through landing and one half nautical mile past the aim point during roll-out.



At the completion of the touch and go, the test aircraft was flown back to the IAF (via the test pattern depicted in Figure 4), to set up for another approach.

Most of the approaches evaluated, from the FAF to the 200 ft HAT position, were accomplished with the guidance coupled to the autopilot. Upon passing the 200 ft HAT position, the autopilot was disengaged, and the pilot assumed control of the aircraft and landed. The remaining approaches were manually flown from the IAF through landing. All test flights were flown in day Visual Meteorological Conditions (VMC).

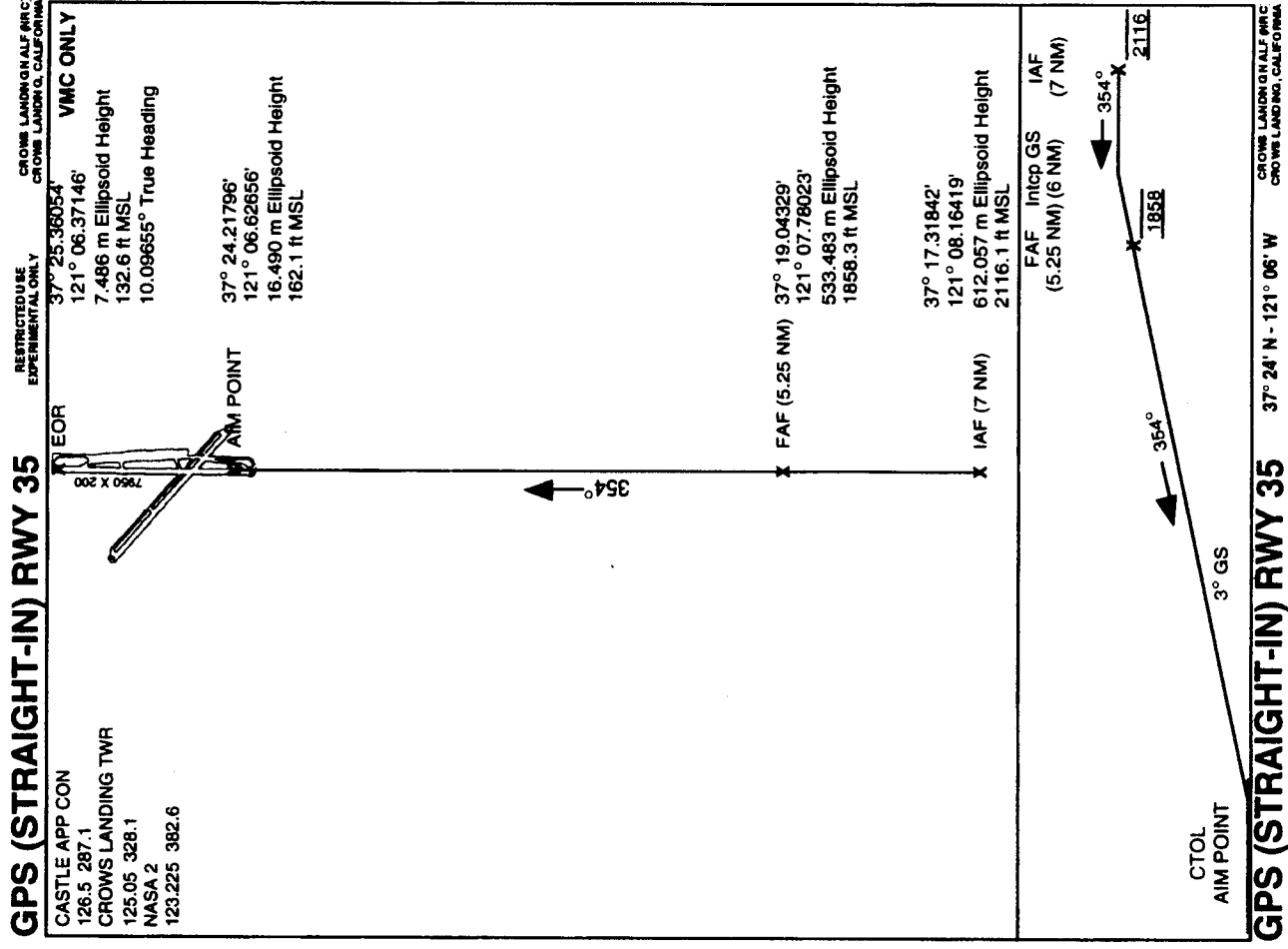


Figure 3 Crows Landing Flight Facility Runway 35 Approach

After the test aircraft initiated the touch and go or takeoff, the laser tracker was used to track the static laser retro-reflector, located on the runway centerline approximately 1600 ft prior to the Runway 35 Threshold (See Figure 1), to perform the laser tracker calibration check as discussed in the previous section. At the completion of the laser track of the static laser retro-reflector, the laser tracker re-acquired the test aircraft on its turn from base to final.

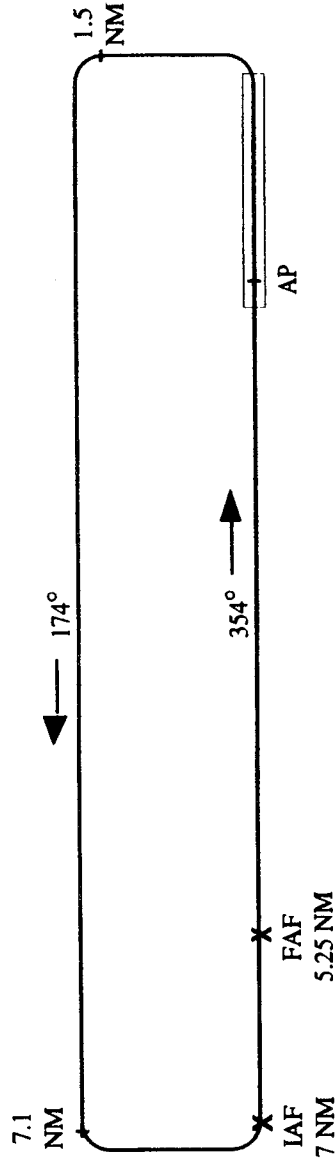


Figure 4 Crows Landing Flight Facility Runway 35 Flight Test Pattern

## FLIGHT TEST RESULTS

All of the 100 approaches and landings evaluated were accomplished at the Crows Landing Flight Facility between 16 and 23 June 1995. Refer to Table 1 for a summary of all of the approaches and stationary trials accomplished and to Table 2 for a summary of all of the invalid approaches and stationary trials. Using the laser tracker as ground truth reference, navigation sensor error was measured and evaluated for all of the approaches and landings. For the E-Systems DGPS system to be considered successful, MOSSs based on navigation sensor error must achieve successful performance. Refer to the FAA CAT III Level 2 Flight Test Plan for a complete discussion of the individual MOSSs as well as the data processing procedures for each of the different MOSSs.

Table 1 Summary of Approaches and Stationary Trials

DATE	FLIGHT NUMBER	APPROACHES	VALID	STATIONARY TRIALS	VALID
16-Jun-95	ES5167	7	4	0	0
19-Jun-95	ES5170	17	14	2	2
20-Jun-95	ES5171	31	31	2	2
21-Jun-95	ES5172	30	27	2	1
23-Jun-95	ES5174	25	24	5	5
<b>TOTAL</b>		<b>110</b>	<b>100</b>	<b>11</b>	<b>10</b>

Table 2 Invalid Approaches and Stationary Trials

TRIAL	REASON INVALID
ES516701	Invalid Laser Check Data
ES516703	34 False Vertical Alarms With Cockpit Flags
ES516707	173 False Vertical Alarms With Cockpit Flags, Failed Lateral & Vertical PFE & CMN Criteria
ES517017	486 False Lateral Alarms, 193 False Vertical Alarms, Both With Cockpit Flags
ES517018	298 False Lateral Alarms, 208 False Vertical Alarms, Both With Cockpit Flags
ES517019	523 False Lateral Alarms, 226 False Vertical Alarms, Both With Cockpit Flags
ES517201	Aircraft Stationary Trial Data File Unavailable
ES517204	Late Laser Tracker Lock-On (630 ft HAT)
ES517207	Possible Invalid Laser Truth Data
ES517227	Invalid Laser Truth Data
ES517423	Hardware/Software Problem Forced A 360° Turn At The IAF Prior To Initiating The Approach

Note that between 19 and 23 June 1995, the airborne data collected did not contain valid yaw, pitch or roll angle information. In fact, zeros replaced the valid data. Therefore, the transformation of the laser truth data from the laser retro-reflector position, located at the top of the vertical stabilizer, to the navigation reference point (NRP) position did not take into account the attitude of the aircraft. The lack of this data is most evident in the lateral and vertical NRP unfiltered position difference plots shown in Appendix B.

The lateral bias was due primarily to the fact that the aircraft was flying a nominal true heading of approximately 10.0965 degrees while the airborne data file was recording zero degrees for the yaw angle. This had the apparent effect of rotating the laser retro-reflector located at the top of the vertical stabilizer to a negative  $Y_{RCS}$  position with respect to the NRP position. The lateral bias was reduced somewhat due to the crab angle required to maintain runway heading. The winds were predominately out of the Northwest during the flight test, which caused the laser retro-reflector to rotate to a positive  $Y_{RCS}$  position with respect to the no-wind laser retro-reflector position. However, the laser retro-reflector remained at a somewhat reduced negative  $Y_{RCS}$  position with respect to the NRP position.

The vertical bias throughout the approach and especially in the landing portion of the approach was due primarily to the positive pitch attitude required to maintain the 3 degree glide path and later flare the aircraft, both of which in turn caused the laser retro-reflector located at the top of the vertical stabilizer to rotate to a positive  $Z_{RCS}$  position with respect to the NRP position. The  $Z_{RCS}$  bias remained relatively constant throughout the flare maneuver until the main landing gear contacted the runway. As the nose gear rotated down after main gear touchdown, the  $Z_{RCS}$  bias decreased, until nose gear touchdown, where the positive pitch attitude carried throughout the flare decreased to approximately zero degrees, matching that of the invalid pitch angle data, resulting in the near elimination of the  $Z_{RCS}$  bias.

#### Vertical Navigation Sensor Error

Evaluation of the vertical navigation sensor error, MOS 1, was based on passing the difference between the laser tracker truth reference and the vertical navigation sensor

error (both referenced to the NRP) through the vertical PFE and CMN ICAO Annex 10 filters for MLS evaluation. The vertical PFE and CMN filter outputs were compared to the 95 percent thresholds from the 700 ft HAT position to the 50 ft HAT position. Estimation statistics were evaluated on the ensemble data from the 1500 ft HAT position through landing and the subsequent landing roll-out to further characterize the flight test results. Refer to Appendix A for all MOS 1 statistics and plots as required by the FAA CAT III Level 2 Flight Test Plan.

Of the 100 approaches and landings evaluated, two failed to pass MOS 1 specifications, resulting in the success of MOS 1. These two approaches and landings failed due to violating the vertical CMN 95 percent threshold, which was a result of the DGPS position solution intermittently switching between two different kinematic carrier phase ambiguity fixes approximately 0.5 m apart. The switching was due to the DGPS system trying to intermittently use a low altitude satellite in the solution, which caused the large position difference.

### **Lateral Navigation Sensor Error**

Evaluation of the lateral navigation sensor error, MOS 2, was based on passing the difference between the laser tracker truth reference and the lateral navigation sensor error (both referenced to the NRP) through the lateral PFE and CMN ICAO Annex 10 filters for MLS evaluation. The lateral PFE and CMN filter outputs were compared to the 95 percent thresholds from the 200 ft HAT position through landing and the subsequent touch and go or landing roll-out. Estimation statistics were evaluated on the ensemble data from the 1500 ft HAT position through landing and the subsequent landing roll-out to further characterize the flight test results. Refer to Appendix A for all MOS 2 statistics and plots as required by the FAA CAT III Level 2 Flight Test Plan.

All 100 of the approaches and landings passed MOS 2 specifications, resulting in the success of MOS 2.

### **Integrity Under Normal Operation**

Evaluation of the integrity under normal operation, MOS 6, was based on determining the number of missed integrity alarms and false integrity alarms along an approach and landing as well as the time to alarm. The navigation sensor error was compared to ILS CAT III monitor limits for position errors. The true alarm state was determined by the ground truth reference provided by the laser tracker. Estimation statistics were not evaluated due the fact that few or no integrity alarms were expected.

All 100 of the approaches and landings passed MOS 6 specifications, resulting in the success of MOS 6. One approach and landing did have 20 consecutive false lateral integrity alarms upon touchdown, which were considered a single false integrity alarm. These integrity alarms were labeled as false since they occurred even though the DGPS solution was within tolerance throughout the alarm period.

There were no integrity alarms during any of the 100 approaches and landings evaluated. In addition, there were no vertical or lateral missed integrity alarms.

## **Integrity Under Artificial Alarm Limits**

In order to evaluate the integrity under artificial alarm limits, the artificial integrity alarm limits were set to values that varied as a function of the geometry of the satellites used while the test aircraft was stationary on the ground. These values ranged from 0.001 m to a maximum of 0.996 m vertically and from 0.001 m to a maximum of 2.640 m laterally. After a period of approximately five minutes in which the DGPS system resolved the carrier phase ambiguities, integrity alarms were generated by artificially degrading the pseudorange and carrier phase measurements of one of the five satellites being used. These artificial integrity alarms were recorded throughout the remainder of the stationary trial whenever the NRP solution exceeded that of the variable artificial integrity alarm limit.

Since the variable artificial integrity alarm limits were not recorded, evaluation of the integrity under artificial alarm limits, MOS 7, was based on determining whether the first artificial integrity alarm that occurred after the carrier phase ambiguities were resolved occurred at a position difference less than the maximum variable artificial integrity alarm limit value of 0.996 m vertically and 2.640 m laterally. The navigation sensor error was compared to the ground truth reference provided by the laser tracker. Since the airborne data collected did not contain valid yaw, pitch or roll angle information, nominal values for the test aircraft stationary at the CTOL aim point were used. Therefore, the transformation of the laser truth data from the laser retro-reflector position, located at the top of the vertical stabilizer, to the NRP position did take into account a nominal attitude of the aircraft at the CTOL aim point. Lateral and vertical NRP positions and position differences at the time of the first artificial integrity alarm for the stationary trials can be seen in Appendix A.

All ten of the stationary trials had artificial integrity alarms that occurred at a point where the NRP position difference was less than the maximum variable artificial integrity alarm limit value of 0.996 m vertically and 2.640 m laterally, resulting in the success of MOS 7.

Since the variable artificial integrity alarm limits were not recorded, it was not possible to determine whether there were any vertical or lateral missed or false integrity alarms, or if all alarm conditions were acknowledged in under two seconds. In addition, it was not possible to compute the estimation statistics for the time to alarm for the ensemble stationary trial data. The above mentioned results not obtained were all required by the FAA CAT III Level 2 Flight Test Plan.

## **SUMMARY OF RESULTS**

Refer to Table 3 for a summary of all of the requirements compared to the actual performance, as well as a Pass or Fail score for each of the MOSs evaluated. Refer to Table 4 for a summary of the unsuccessful approaches. Refer to Appendix A for all ensemble statistics and plots as required by the FAA CAT III Level 2 Flight Test Plan. Refer to Appendix B for all of the statistics and plots for each individual approach and landing or stationary trial as required by the FAA CAT III Level 2 Flight Test Plan.

Table 3 Summary of Performance vs. MOS

MOS #	Description	Performance	Req'd	Pass/Fail
1	Vertical Navigation Sensor Error: PFE and CMN	98 successful/100	91/100	Pass
2	Lateral Navigation Sensor Error: PFE and CMN	100 successful/100	91/100	Pass
6	Integrity Under Normal Operation Vertical: Time-To-Alarm Always $\leq 2$ Seconds Number of Missed Alarms Lateral: Time-To-Alarm Always $\leq 2$ Seconds Number of Missed Alarms Number of Vertical and Lateral False Alarms	Yes 0  Yes 0 1	Yes 0  Yes 0 $\leq 1$	Pass Pass  Pass Pass Pass
7	Integrity Under Artificial Alarm Limits Vertical: Time-To-Alarm Always $\leq 2$ Seconds Number of Missed Alarms Alarm Occurred @ NRP $\leq 0.996$ m Zrcs Pos Diff Lateral: Time-To-Alarm Always $\leq 2$ Seconds Number of Missed Alarms Alarm Occurred @ NRP $\leq 2.640$ m Yrcs Pos Diff Number of Vertical and Lateral False Alarms	Unknown Unknown 10 successful/10	Yes 0 10/10  Yes 0 10/10 $\leq 1$	Pass

Table 4 Unsuccessful Approaches

TRIAL	REASON UNSUCCESSFUL
ES517110	Failed Vertical CMN Criteria
ES517218	Failed Vertical CMN Criteria

## CONCLUSIONS

With respect to MOS 1, the E-Systems DGPS system met the requirements for a successful approach and landing, based on the navigation sensor error requirements, 98 out of 100 approaches and landings. With respect to MOS 2, the E-Systems DGPS system met the requirements for a successful approach and landing, based on the navigation sensor error requirements, for all 100 approaches and landings. These were accomplished without aircraft attitude data for 96 out of the 100 approaches and landings evaluated. With respect to MOS 6, the E-Systems DGPS system met the requirements for a successful approach and landing, based on the integrity under normal operations requirements, for all 100 approaches and landings. With respect to MOS 7, the E-Systems DGPS system met the requirements for a successful stationary trial, based on the modified integrity under artificial alarm limits requirements, for all ten stationary trials.

## LIST OF REFERENCES

1. O'Donnell, P. and Braff, R.  
"Category (CAT) IIIb Level 2 Flight Test Plan for the Global Positioning System (GPS)"  
The MITRE Corporation, May 1994
2. International Civil Aviation Organization  
"International Standards, Recommended Practices and Procedures for Air Navigation Services, Aeronautical Telecommunication"  
Annex 10, Convention on International Civil Aviation, Volume 1, April 1985

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**APPENDIX A**

**NAVIGATION SENSOR ERROR RESULTS**

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TEST AIRCRAFT: IAI\_WESTWIND

\*\*\*\*\*  
\* VERTICAL PFE AND CMN PERFORMANCE FOR MOS 1 \*  
\*\*\*\*\*

SUCCESSFUL APPROACHES: 98  
VALID APPROACHES: 100

\$\$\$\$\$\$\$\$\$\$\$\$\$\$  
\$ PASS MOS 1 \$  
\$\$\$\$\$\$\$\$\$\$\$\$\$\$

\*\*\*\*\*  
UNFILTERED VERTICAL ERROR ESTIMATION STATISTICS  
\*\*\*\*\*

LOCATION	u +2SIG(m)	2RMS(m)	95P(m)	2SIGUCL(m)
1500FT HAT	3.372	3.732	2.970	1.981
1400FT HAT	3.489	3.660	2.734	2.530
1300FT HAT	3.093	3.255	2.598	1.967
1200FT HAT	3.057	3.107	2.393	2.151
1100FT HAT	2.956	3.056	2.373	1.903
1000FT HAT	2.682	2.929	2.149	1.312
900FT HAT	2.614	3.033	2.236	1.016
800FT HAT	2.276	2.716	2.014	0.699
700FT HAT	2.161	2.548	1.964	0.657
600FT HAT	1.916	2.273	1.748	0.505
500FT HAT	1.600	1.970	1.503	0.307
400FT HAT	1.434	1.748	1.389	0.256
300FT HAT	1.177	1.423	1.111	0.177
200FT HAT	0.950	1.070	0.827	0.149
100FT HAT	0.629	0.578	0.507	0.132
50FT HAT	0.410	0.389	0.326	0.101
AIM POINT	1.002	1.197	0.857	0.135
AP+0.05NM	1.119	1.347	0.958	0.163
AP+0.10NM	1.241	1.348	0.993	0.286
AP+0.15NM	1.201	1.074	0.967	0.631
AP+0.20NM	0.764	0.763	0.777	0.393
AP+0.25NM	0.464	0.419	0.360	0.081
AP+0.30NM	0.311	0.317	0.236	0.022
AP+0.35NM	0.369	0.363	0.330	0.035
AP+0.40NM	0.512	0.473	0.379	0.088
AP+0.45NM	0.565	0.558	0.688	0.225
AP+0.50NM	1.384	1.246	1.355	0.854

\*\*\*\*\*  
 VERT PATH FOLLOWING ERROR ESTIMATION STATISTICS  
 \*\*\*\*\*

LOCATION	u +2SIG (m)	2RMS (m)	95P (m)	2SIGUCL (m)
1500FT HAT	3.296	3.709	2.811	1.793
1400FT HAT	3.392	3.639	2.750	2.224
1300FT HAT	3.076	3.275	2.530	1.875
1200FT HAT	3.005	3.130	2.600	1.920
1100FT HAT	2.914	3.017	2.437	1.841
1000FT HAT	2.583	2.865	2.234	1.157
900FT HAT	2.524	3.013	2.122	0.857
800FT HAT	2.260	2.691	1.989	0.693
700FT HAT	2.067	2.489	1.880	0.557
600FT HAT	1.850	2.273	1.697	0.414
500FT HAT	1.616	1.999	1.469	0.307
400FT HAT	1.428	1.775	1.376	0.235
300FT HAT	1.183	1.473	1.082	0.161
200FT HAT	0.965	1.089	0.847	0.152
100FT HAT	0.662	0.638	0.583	0.121
50FT HAT	0.349	0.329	0.310	0.071
AIM POINT	0.895	1.043	0.723	0.117
AP+0.05NM	1.001	1.263	0.895	0.109
AP+0.10NM	1.103	1.340	0.913	0.154
AP+0.15NM	1.259	1.176	0.975	0.494
AP+0.20NM	0.916	0.842	0.858	0.453
AP+0.25NM	0.592	0.537	0.585	0.178
AP+0.30NM	0.351	0.368	0.275	0.026
AP+0.35NM	0.330	0.345	0.294	0.023
AP+0.40NM	0.407	0.391	0.340	0.047
AP+0.45NM	0.443	0.398	0.290	0.082
AP+0.50NM	0.771	0.696	0.788	0.342

\*\*\*\*\*  
 VERT CONTROL MOTION NOISE ESTIMATION STATISTICS  
 \*\*\*\*\*

LOCATION	u +2SIG(m)	2RMS(m)	95P(m)	2SIGUCL(m)
1500FT HAT	1.151	1.097	0.780	0.801
1400FT HAT	0.738	0.705	0.702	0.331
1300FT HAT	0.651	0.613	0.659	0.248
1200FT HAT	0.672	0.620	0.537	0.247
1100FT HAT	0.618	0.595	0.526	0.237
1000FT HAT	0.602	0.573	0.535	0.219
900FT HAT	0.524	0.519	0.476	0.182
800FT HAT	0.608	0.598	0.496	0.241
700FT HAT	0.489	0.480	0.479	0.155
600FT HAT	0.432	0.402	0.391	0.105
500FT HAT	0.374	0.343	0.349	0.075
400FT HAT	0.300	0.273	0.267	0.047
300FT HAT	0.299	0.268	0.281	0.042
200FT HAT	0.231	0.208	0.193	0.026
100FT HAT	0.336	0.306	0.283	0.040
50FT HAT	0.397	0.358	0.297	0.059
AIM POINT	0.392	0.440	0.326	0.026
AP+0.05NM	0.455	0.417	0.303	0.070
AP+0.10NM	0.509	0.487	0.544	0.158
AP+0.15NM	0.783	0.717	0.638	0.209
AP+0.20NM	0.644	0.626	0.621	0.111
AP+0.25NM	0.543	0.505	0.585	0.094
AP+0.30NM	0.274	0.246	0.296	0.031
AP+0.35NM	0.239	0.218	0.134	0.030
AP+0.40NM	0.303	0.283	0.299	0.054
AP+0.45NM	0.507	0.453	0.652	0.117
AP+0.50NM	1.051	0.972	0.954	0.418

TEST AIRCRAFT: IAI\_WESTWIND

\*\*\*\*\*  
 \* LATERAL PFE AND CMN PERFORMANCE FOR MOS 2 \*  
 \*\*\*\*\*

SUCCESSFUL APPROACHES: 100  
 VALID APPROACHES: 100

\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$  
 \$ PASS MOS 2 \$  
 \$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$

\*\*\*\*\*  
 UNFILTERED LATERAL ERROR ESTIMATION STATISTICS  
 \*\*\*\*\*

LOCATION	u +2SIG (m)	2RMS (m)	95P (m)	2SIGUCL (m)
1500FT HAT	3.344	4.019	3.048	1.466
1400FT HAT	3.100	3.649	2.889	1.360
1300FT HAT	2.873	3.602	2.835	0.923
1200FT HAT	2.517	3.000	2.196	0.857
1100FT HAT	2.246	2.736	2.014	0.630
1000FT HAT	2.041	2.396	1.861	0.595
900FT HAT	1.929	2.269	1.783	0.528
800FT HAT	1.858	2.115	1.604	0.549
700FT HAT	1.793	1.949	1.584	0.594
600FT HAT	1.755	1.898	1.478	0.579
500FT HAT	1.727	1.859	1.472	0.570
400FT HAT	1.514	1.786	1.219	0.321
300FT HAT	1.536	1.790	1.338	0.345
200FT HAT	1.595	1.816	1.366	0.404
100FT HAT	1.770	2.131	1.580	0.408
50FT HAT	1.833	2.334	1.699	0.353
AIM POINT	1.933	2.636	1.675	0.291
AP+0.05NM	1.962	2.729	1.649	0.272
AP+0.10NM	1.985	2.744	1.671	0.288
AP+0.15NM	2.004	2.801	1.701	0.276
AP+0.20NM	1.978	2.777	1.646	0.264
AP+0.25NM	1.914	2.678	1.549	0.251
AP+0.30NM	1.924	2.688	1.595	0.255
AP+0.35NM	1.876	2.606	1.548	0.252
AP+0.40NM	1.917	2.522	1.575	0.344
AP+0.45NM	2.092	2.663	1.612	0.493
AP+0.50NM	2.102	2.647	1.653	0.563

\*\*\*\*\*  
 LAT PATH FOLLOWING ERROR ESTIMATION STATISTICS  
 \*\*\*\*\*

LOCATION	u +2SIG (m)	2RMS (m)	95P (m)	2SIGUCL (m)
1500FT HAT	3.466	4.190	2.884	1.542
1400FT HAT	2.922	3.578	2.689	1.046
1300FT HAT	2.904	3.645	2.804	0.938
1200FT HAT	2.531	3.171	2.356	0.719
1100FT HAT	2.186	2.848	1.876	0.456
1000FT HAT	2.025	2.500	1.823	0.487
900FT HAT	1.841	2.208	1.614	0.448
800FT HAT	1.751	2.102	1.532	0.404
700FT HAT	1.626	1.928	1.398	0.364
600FT HAT	1.649	1.858	1.366	0.446
500FT HAT	1.687	1.888	1.421	0.479
400FT HAT	1.504	1.814	1.224	0.293
300FT HAT	1.460	1.750	1.253	0.282
200FT HAT	1.474	1.732	1.251	0.310
100FT HAT	1.674	2.034	1.471	0.354
50FT HAT	1.742	2.199	1.615	0.330
AIM POINT	1.795	2.439	1.580	0.255
AP+0.05NM	1.852	2.554	1.584	0.253
AP+0.10NM	1.898	2.650	1.572	0.249
AP+0.15NM	1.923	2.706	1.559	0.246
AP+0.20NM	1.943	2.753	1.572	0.242
AP+0.25NM	1.929	2.750	1.579	0.231
AP+0.30NM	1.903	2.709	1.544	0.227
AP+0.35NM	1.900	2.684	1.518	0.237
AP+0.40NM	1.888	2.616	1.523	0.263
AP+0.45NM	1.896	2.520	1.470	0.337
AP+0.50NM	2.016	2.567	1.496	0.497

\*\*\*\*\*  
 LAT CONTROL MOTION NOISE ESTIMATION STATISTICS  
 \*\*\*\*\*

LOCATION	u +2SIG(m)	2RMS(m)	95P(m)	2SIGUCL(m)
1500FT HAT	3.807	3.599	1.003	8.583
1400FT HAT	0.780	0.745	0.818	0.370
1300FT HAT	0.702	0.685	0.785	0.316
1200FT HAT	0.705	0.631	0.575	0.226
1100FT HAT	0.588	0.530	0.533	0.168
1000FT HAT	0.583	0.525	0.518	0.164
900FT HAT	0.584	0.584	0.578	0.230
800FT HAT	0.520	0.495	0.478	0.163
700FT HAT	0.639	0.601	0.621	0.238
600FT HAT	0.589	0.577	0.581	0.224
500FT HAT	0.588	0.557	0.572	0.206
400FT HAT	0.335	0.317	0.352	0.067
300FT HAT	0.261	0.259	0.242	0.045
200FT HAT	0.317	0.300	0.294	0.060
100FT HAT	0.369	0.332	0.320	0.065
50FT HAT	0.410	0.366	0.370	0.073
AIM POINT	0.405	0.369	0.340	0.057
AP+0.05NM	0.359	0.332	0.287	0.042
AP+0.10NM	0.338	0.302	0.295	0.048
AP+0.15NM	0.343	0.307	0.367	0.051
AP+0.20NM	0.277	0.254	0.271	0.041
AP+0.25NM	0.212	0.196	0.204	0.025
AP+0.30NM	0.215	0.208	0.239	0.029
AP+0.35NM	0.268	0.242	0.237	0.036
AP+0.40NM	0.393	0.354	0.375	0.077
AP+0.45NM	0.403	0.373	0.413	0.097
AP+0.50NM	0.371	0.352	0.436	0.096



TEST AIRCRAFT: IAI\_WESTWIND

\*\*\*\*\*  
\*LAT AND VERT INTEGRITY PERFORMANCE FOR MOS 6 \*  
\*\*\*\*\*

VERTICAL TIME TO ALARM 2 SECONDS OR LESS  
NUMBER OF MISSED VERTICAL ALARMS: 0  
NUMBER OF FALSE VERTICAL ALARMS: 0

LATERAL TIME TO ALARM 2 SECONDS OR LESS  
NUMBER OF MISSED LATERAL ALARMS: 0  
NUMBER OF FALSE LATERAL ALARMS: 1

\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$  
\$ PASS MOS 6 \$  
\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$

TEST AIRCRAFT: IAI\_WESTWIND

\*\*\*\*\*  
\*LAT AND VERT ARTIFICIAL INTEG PERF FOR MOS 7 \*  
\*\*\*\*\*

VERTICAL

TIME TO ALARM 2 SECONDS OR LESS: UNKNOWN  
NUMBER OF MISSED VERTICAL ALARMS: UNKNOWN  
NUMBER OF FALSE VERTICAL ALARMS: UNKNOWN  
NUMBER OF VERTICAL ALARMS PER MIN: UNKNOWN  
ALARM OCCURRED AT NRP  $\leq$  0.996 m Zrcs POS DIFF

LATERAL

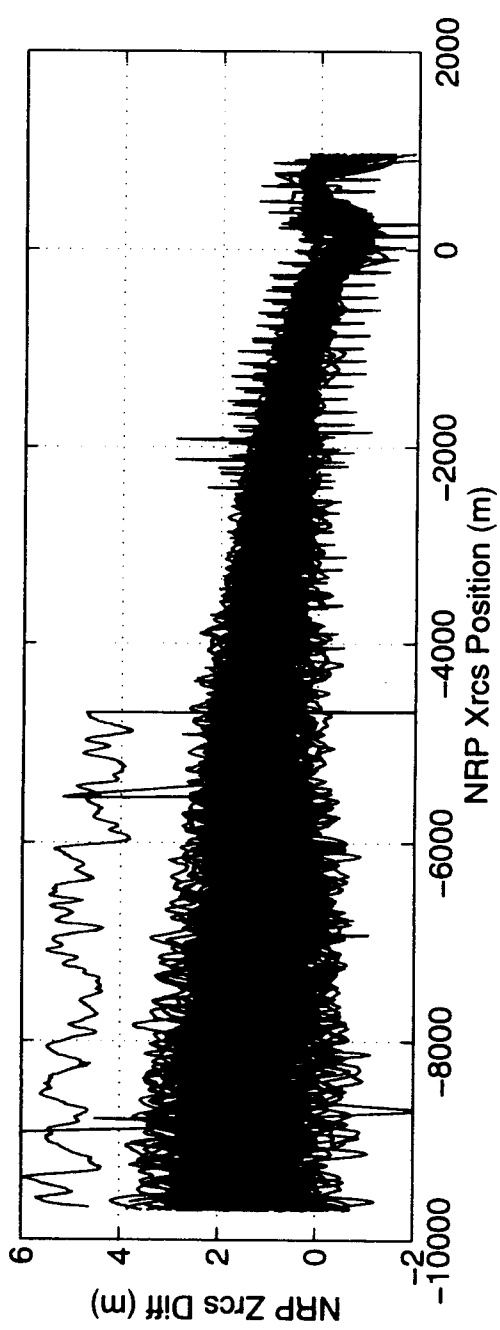
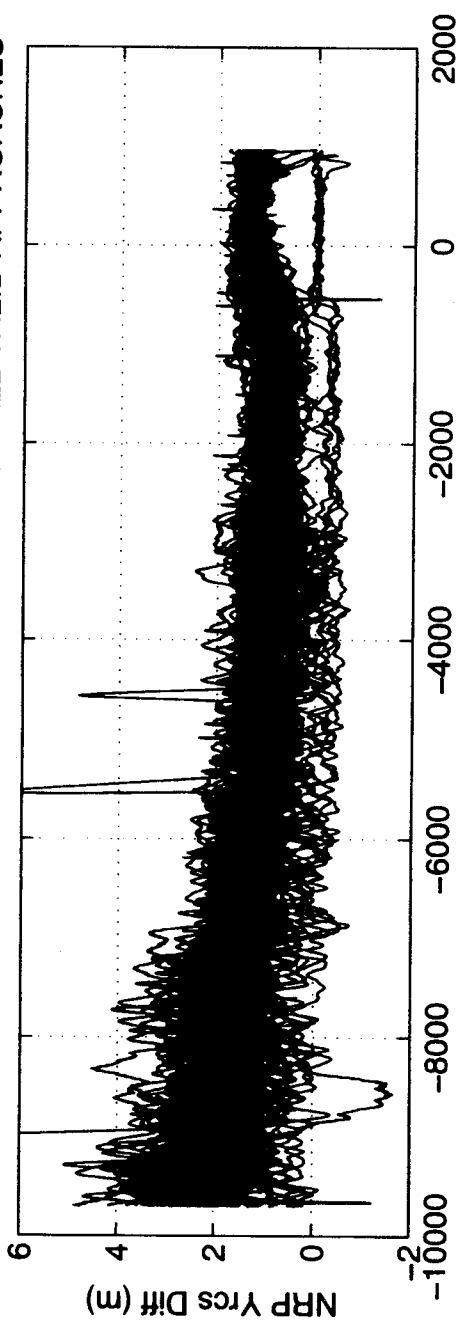
TIME TO ALARM 2 SECONDS OR LESS: UNKNOWN  
NUMBER OF MISSED LATERAL ALARMS: UNKNOWN  
NUMBER OF FALSE LATERAL ALARMS: UNKNOWN  
NUMBER OF LATERAL ALARMS PER MIN: UNKNOWN  
ALARM OCCURRED AT NRP  $\leq$  2.640 m Yrcs POS DIFF

\$\$\$\$\$\$\$\$\$\$\$\$  
\$ PASS MOS 7 \$  
\$\$\$\$\$\$\$\$\$\$\$\$

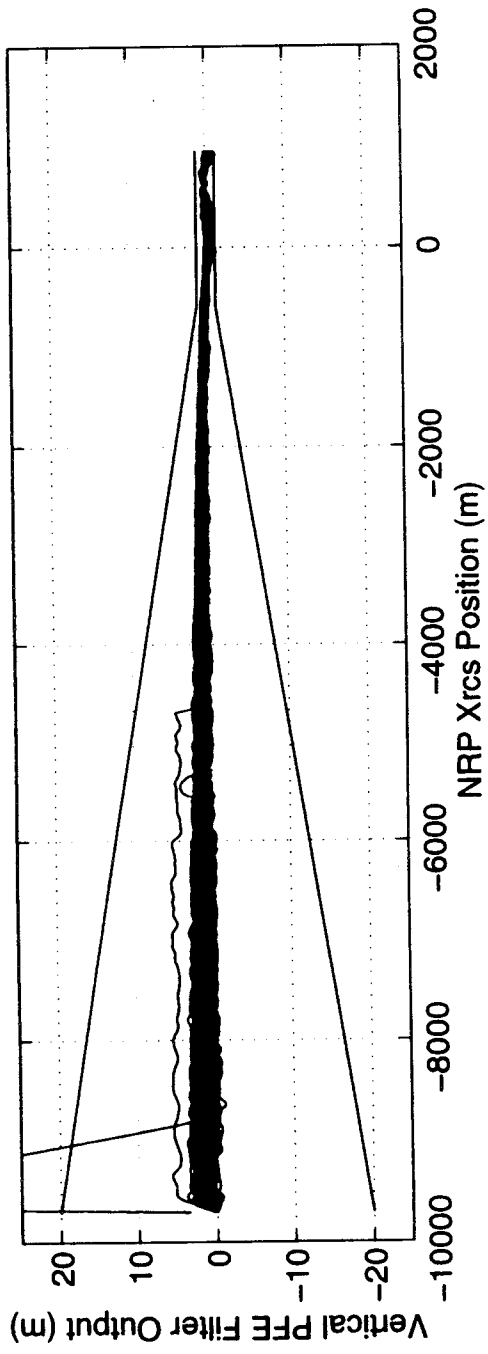
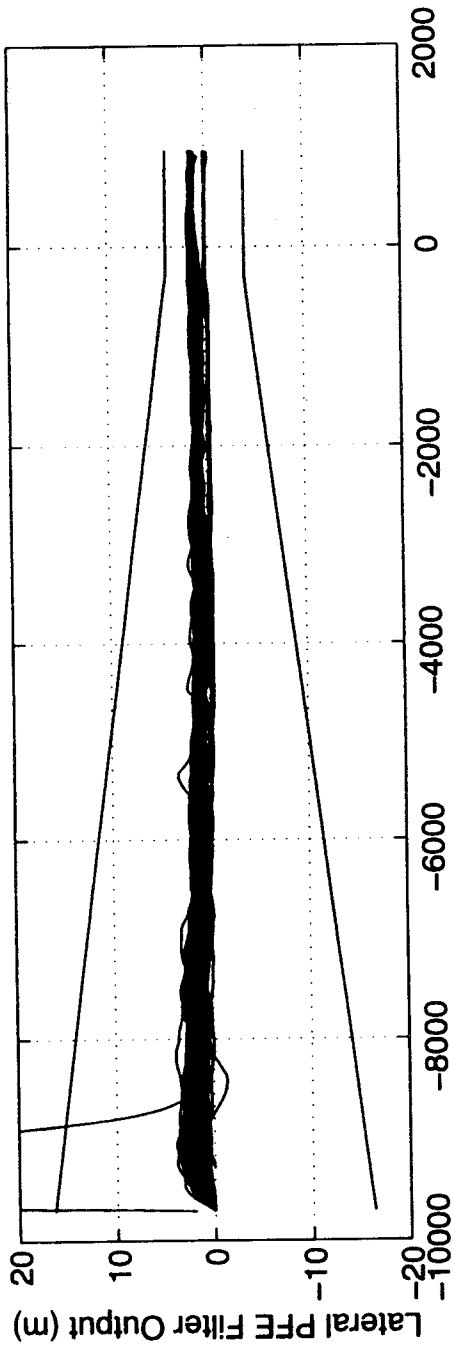
\*\*\*\*\*  
\* LATERAL AND VERTICAL NRP POSITION DATA FOR \*  
\* THE FIRST ARTIFICIAL INTEGRITY ALARM OF THE \*  
\* STATIC TRIAL AFTER THE 290 SECOND AMBIGUITY \*  
\* RESOLUTION PERIOD \*  
\*\*\*\*\*

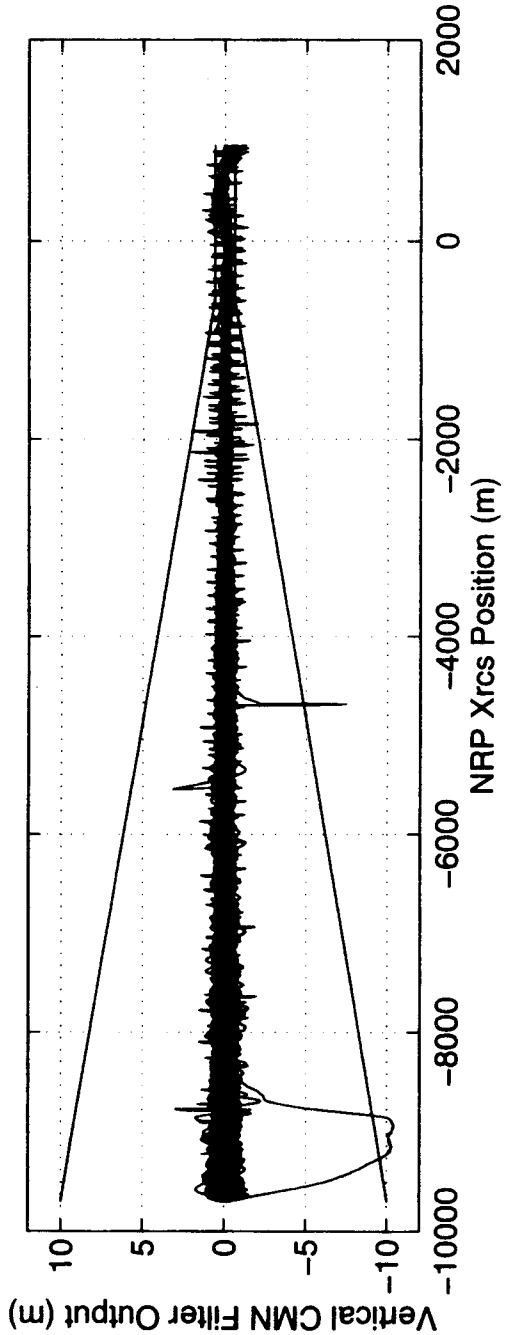
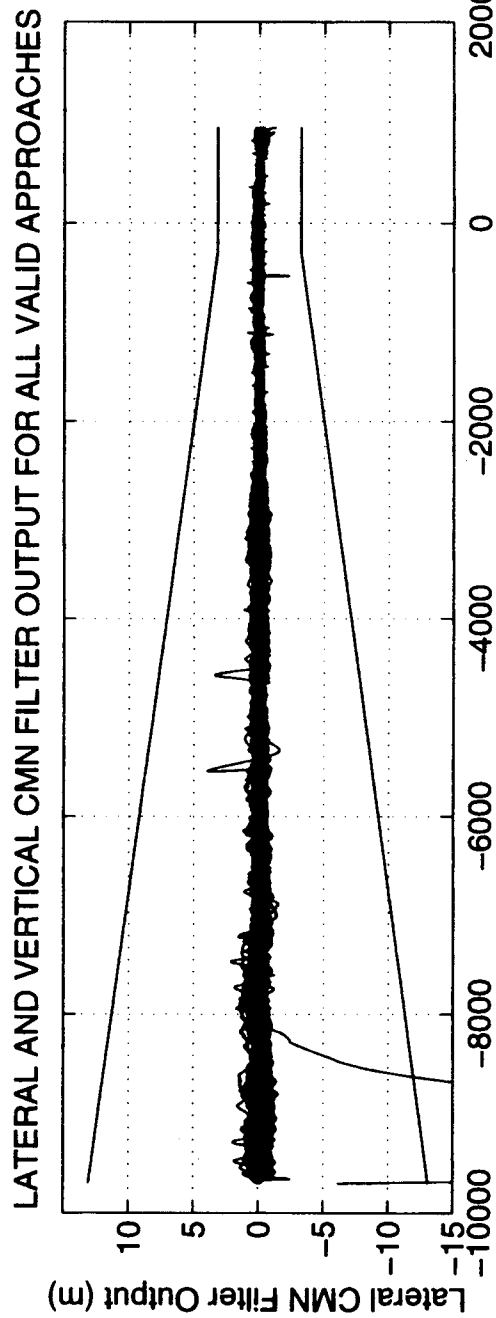
TRIAL	Yrcs (m)	Ydiff (m)	Zrcs (m)	Zdiff (m)
ES517001	0.410	0.006	-2.230	0.001
ES517013	-0.010	-0.183	-1.590	0.482
ES517101	0.220	0.106	-1.250	0.937
ES517133	0.200	-0.285	-2.290	-0.186
ES517232	-0.010	-0.260	-2.150	-0.324
ES517426	-0.130	-0.007	-2.070	-0.221
ES517427	-0.160	-0.056	-1.990	-0.205
ES517428	-0.130	-0.218	-2.170	-0.393
ES517429	0.090	0.196	-2.720	-0.777
ES517430	-0.090	-0.066	-2.170	-0.293

LATERAL AND VERTICAL UNFILTERED ERROR FOR ALL VALID APPROACHES

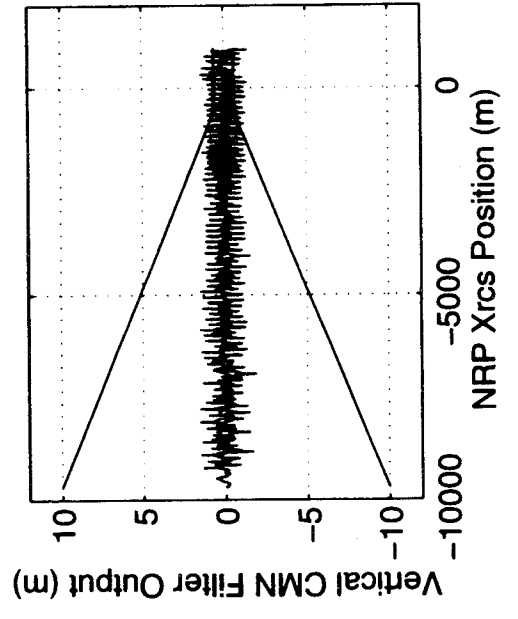
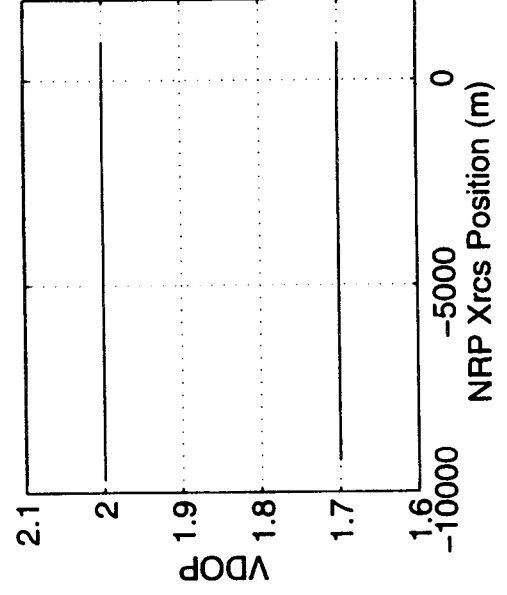
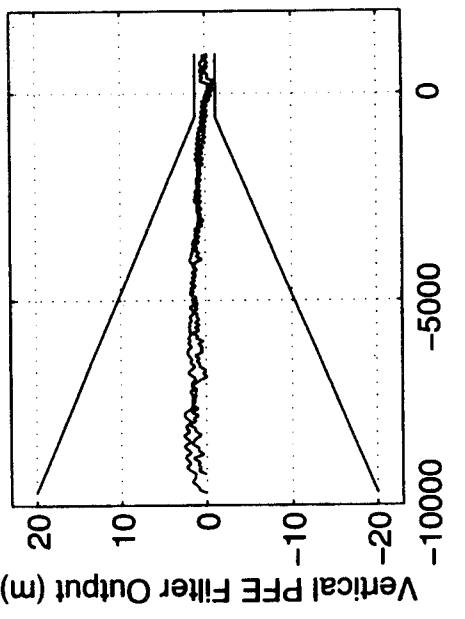
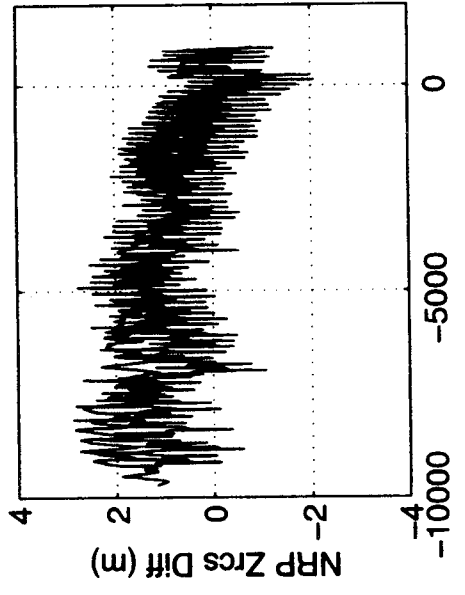


LATERAL AND VERTICAL PFE FILTER OUTPUT FOR ALL VALID APPROACHES

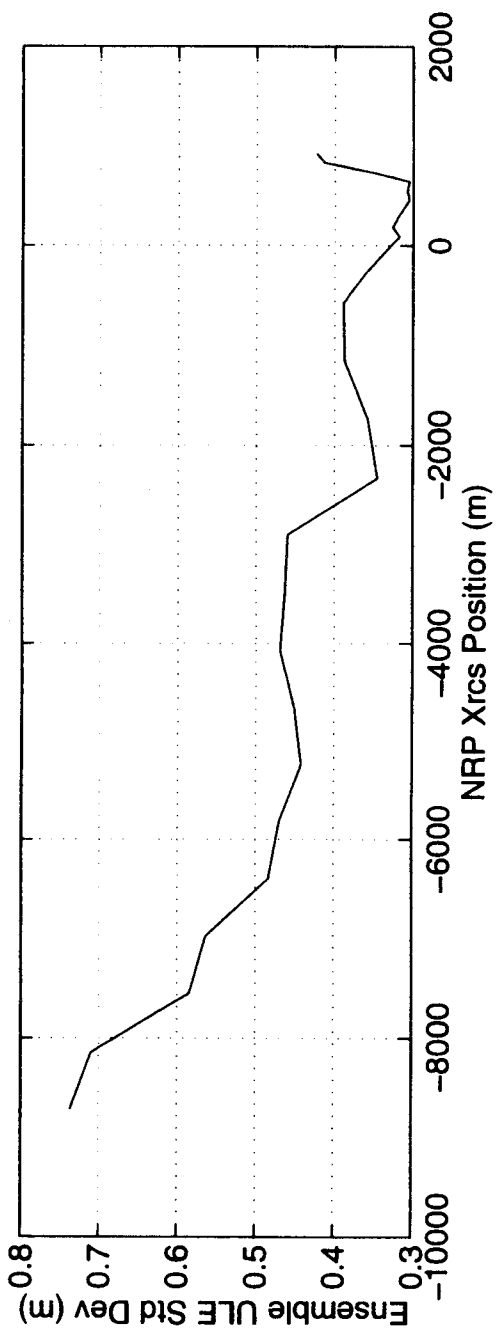
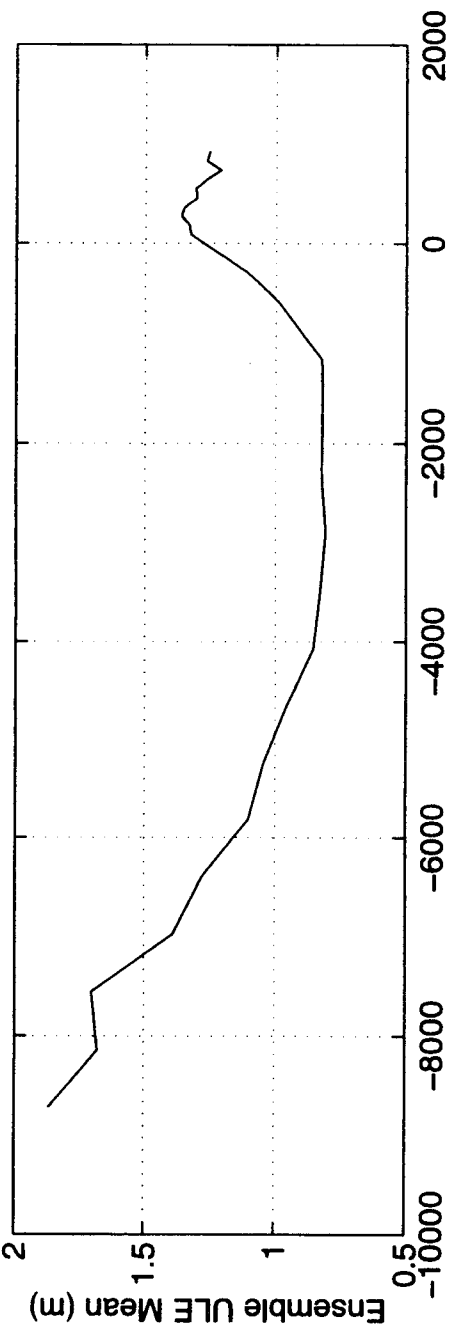




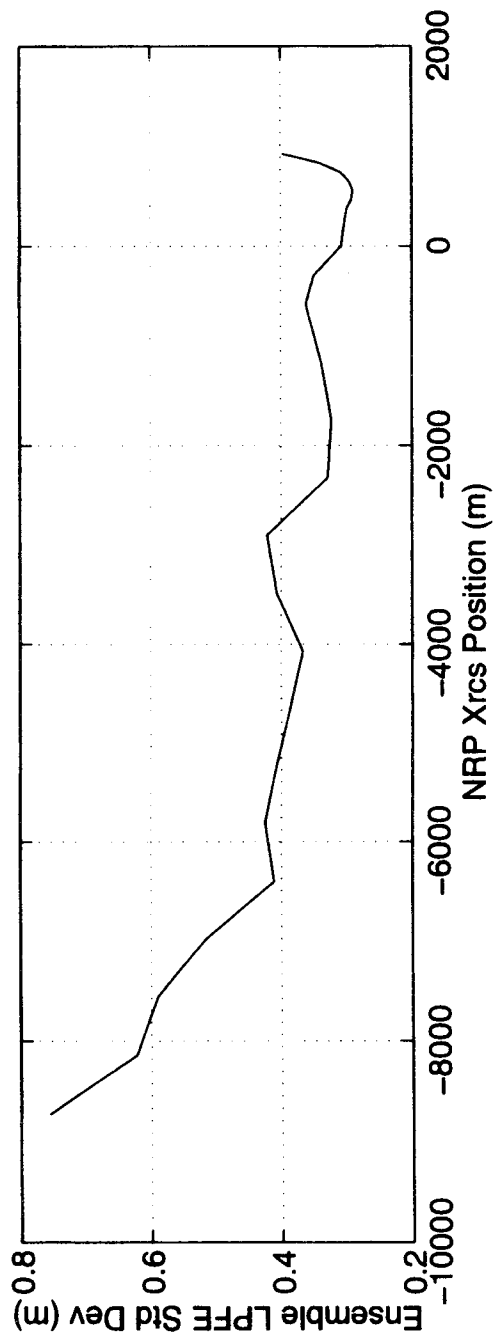
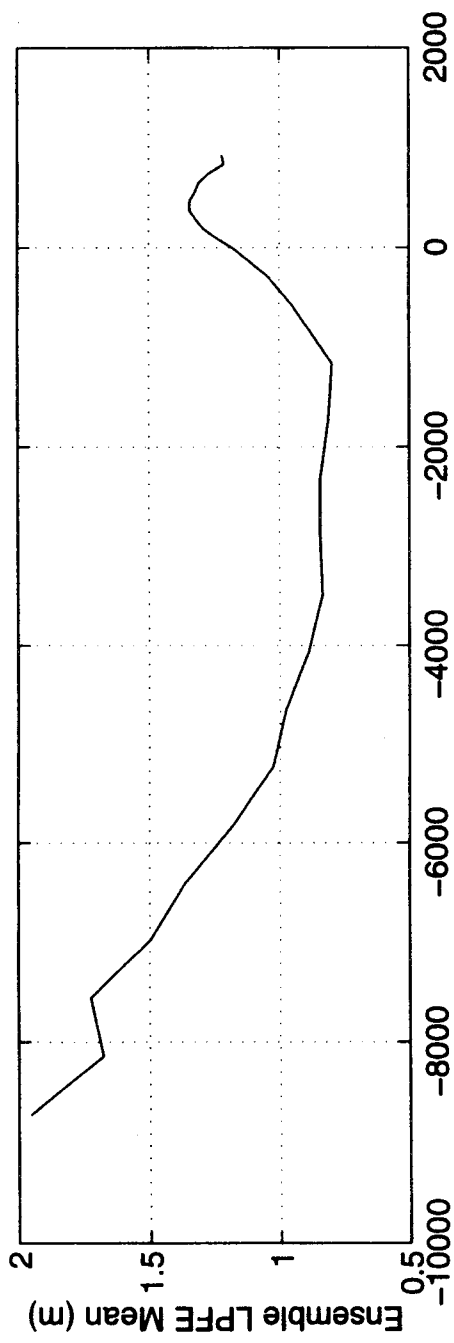
VERT DIFF, PFE & CMN FILTER OUTPUT AND VDOP FOR ALL APPROACHES FAILING MOS 1



ENSEMBLE ULE MEAN AND STANDARD DEVIATION FOR ALL VALID APPROACHES

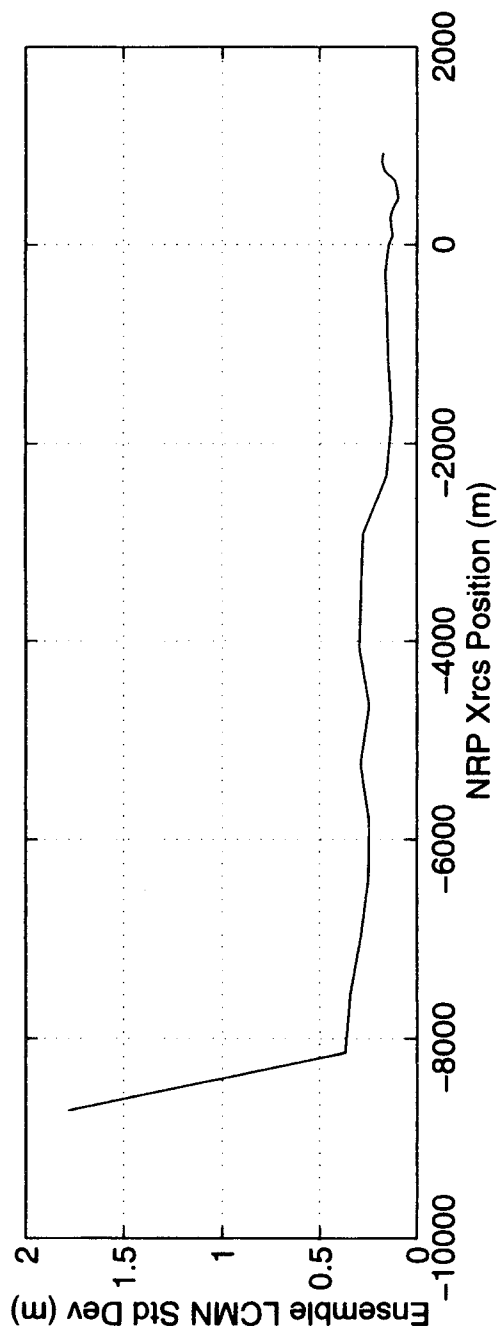
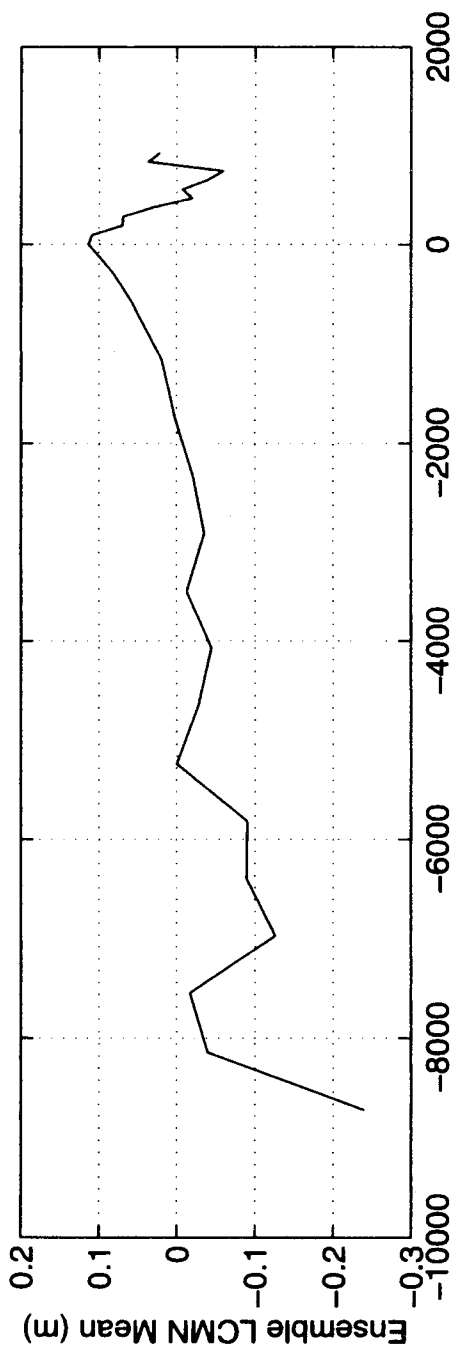


ENSEMBLE LPFE MEAN AND STANDARD DEVIATION FOR ALL VALID APPROACHES

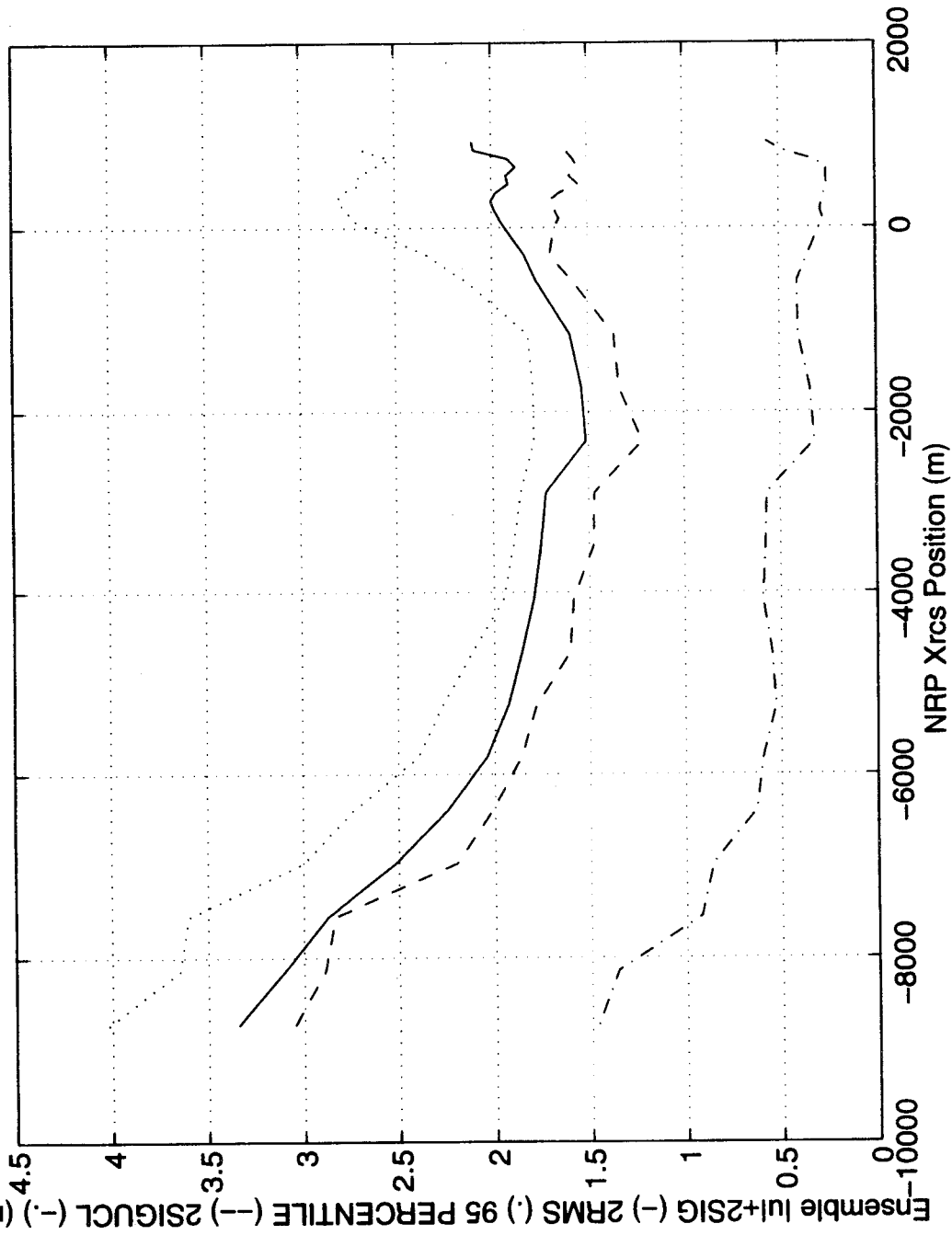




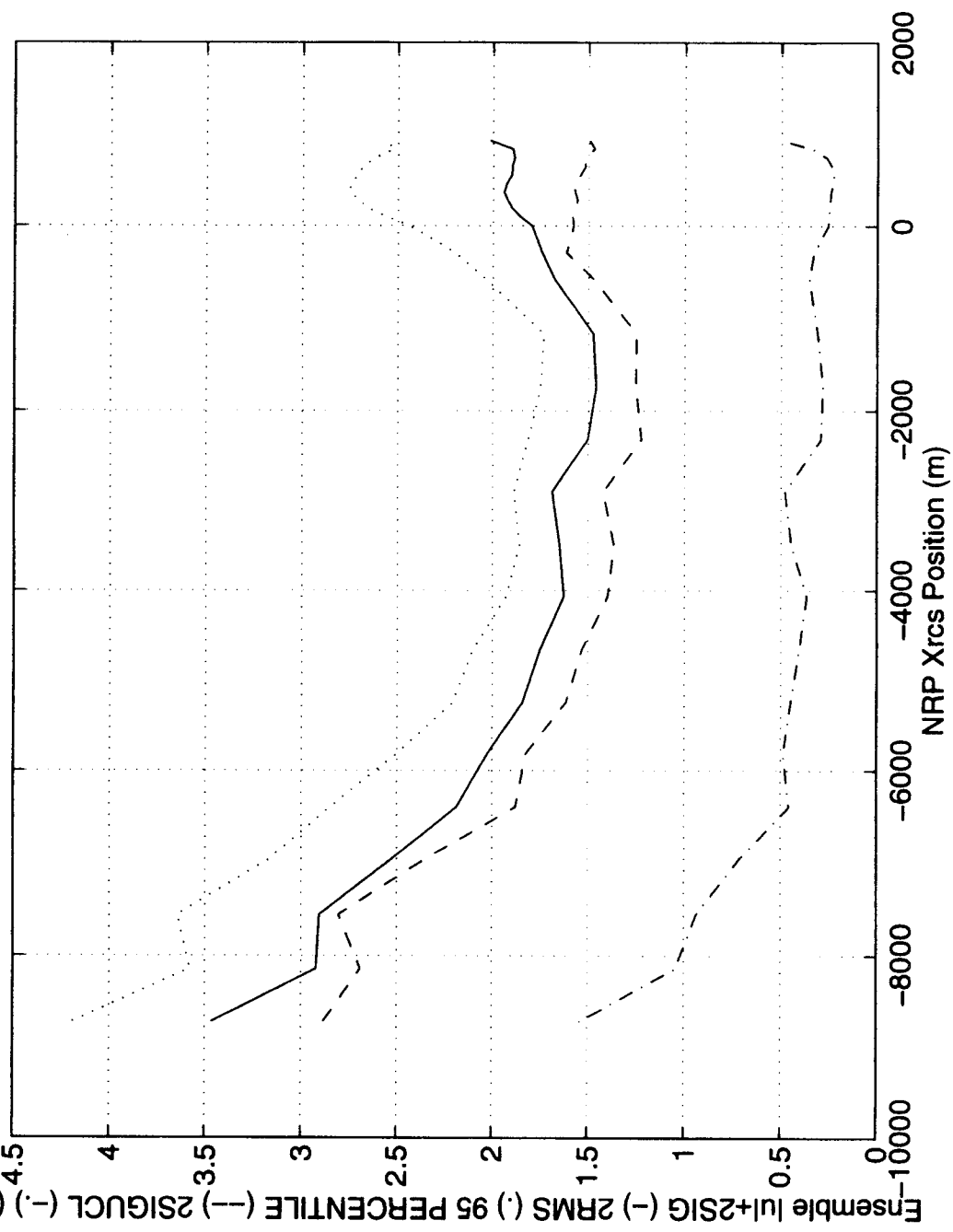
ENSEMBLE LCMN MEAN AND STANDARD DEVIATION FOR ALL VALID APPROACHES



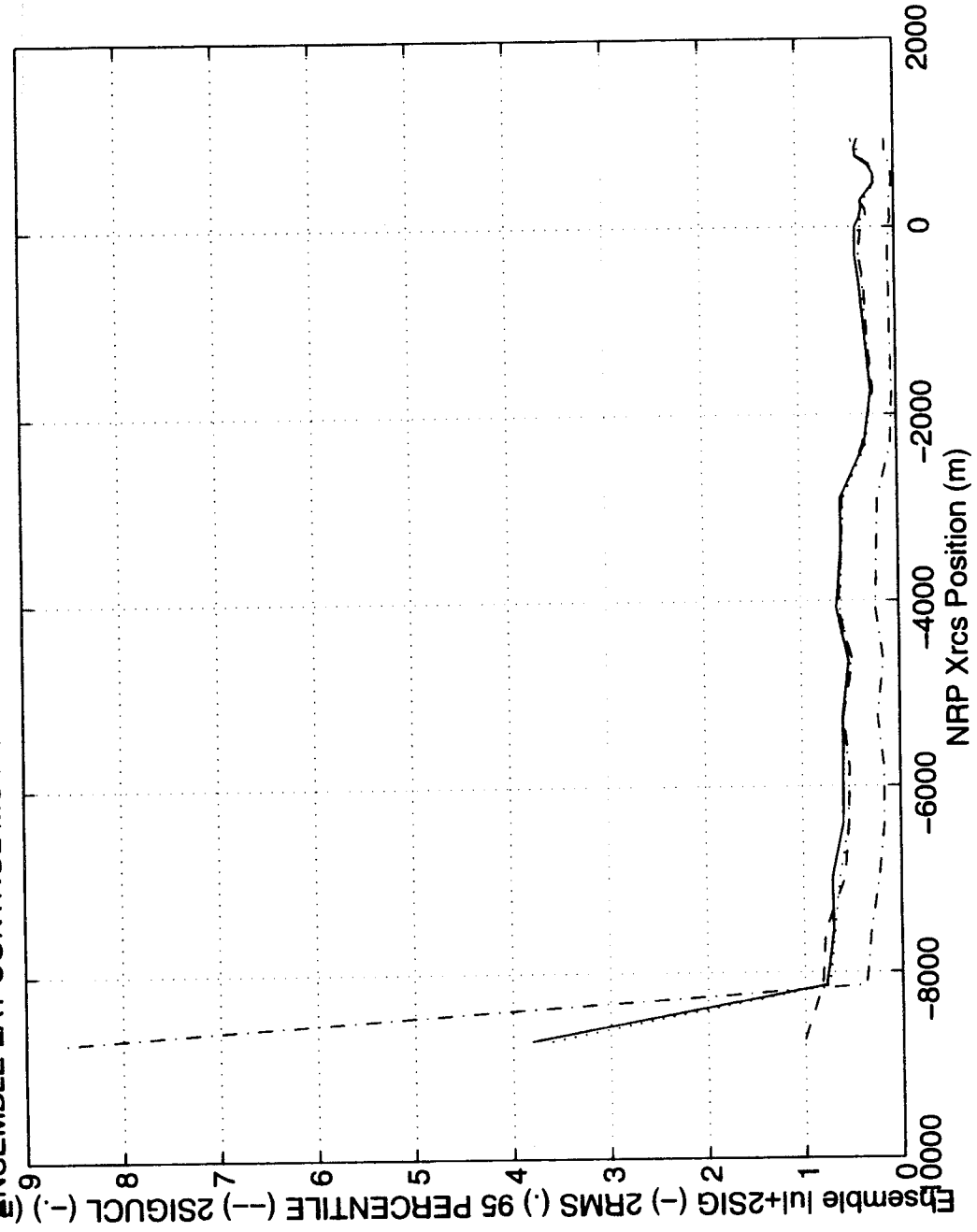
ENSEMBLE UNFILTERED LATERAL ERROR STATISTICS FOR ALL VALID APPROACHES



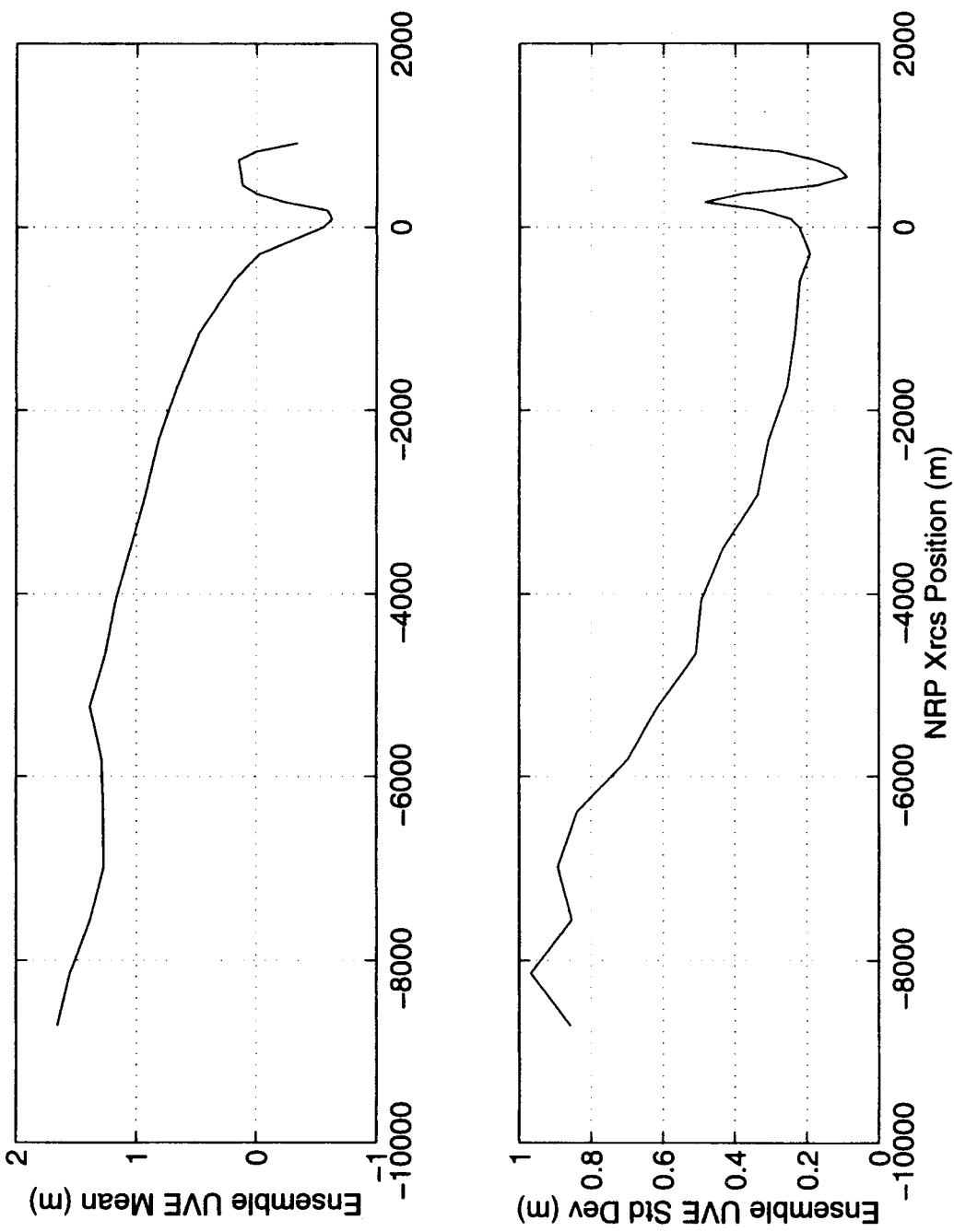
(3) ENSEMBLE LAT PATH FOLLOWING ERROR STATISTICS FOR ALL VALID APPROACHE:



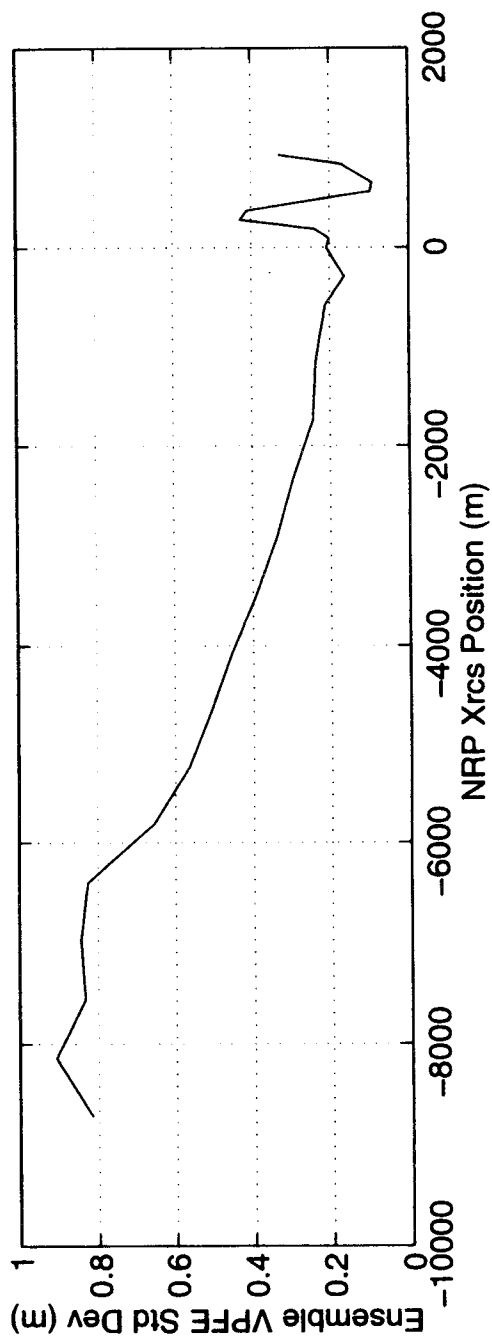
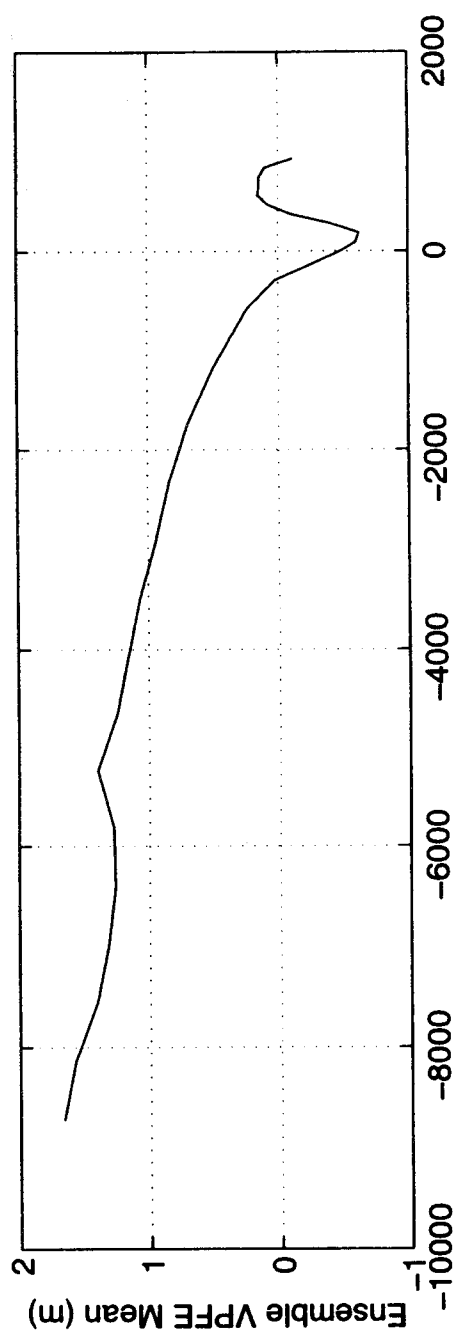
ENSEMBLE LAT CONTROL MOTION NOISE STATISTICS FOR ALL VALID APPROACHES



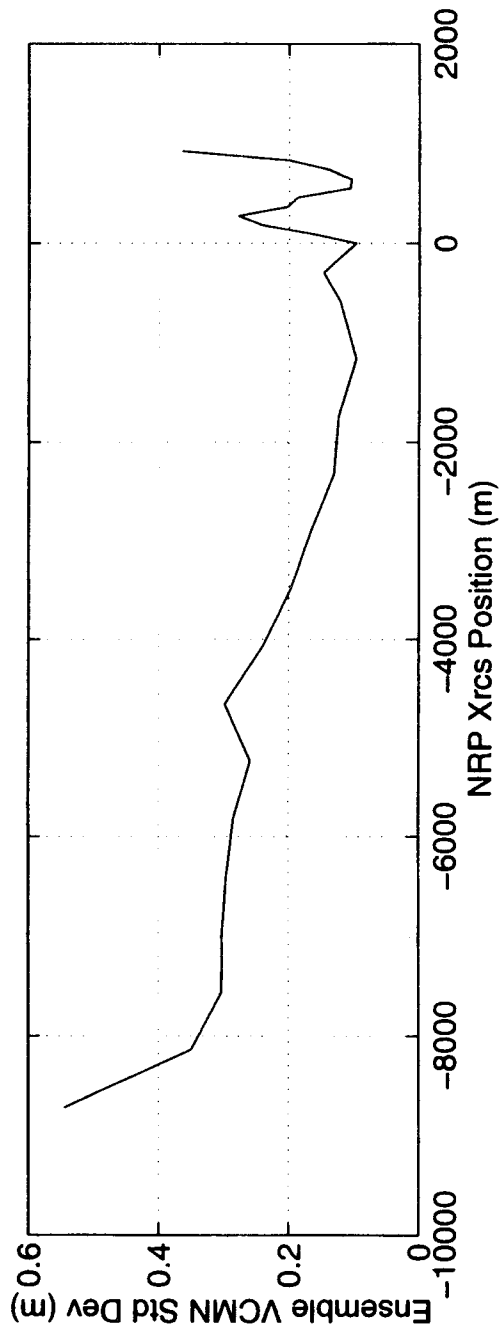
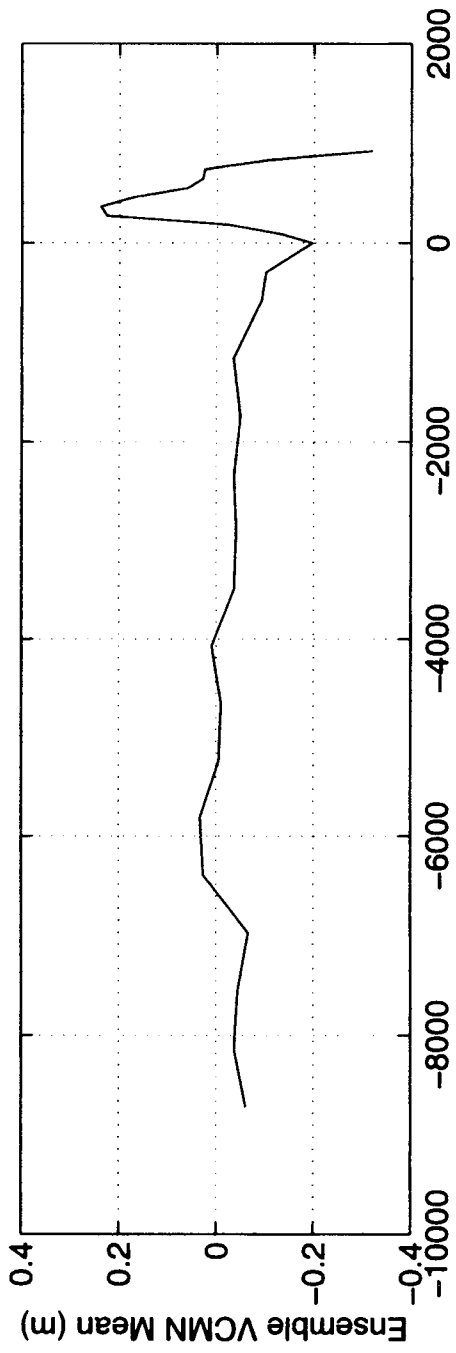
ENSEMBLE UVE MEAN AND STANDARD DEVIATION FOR ALL VALID APPROACHES



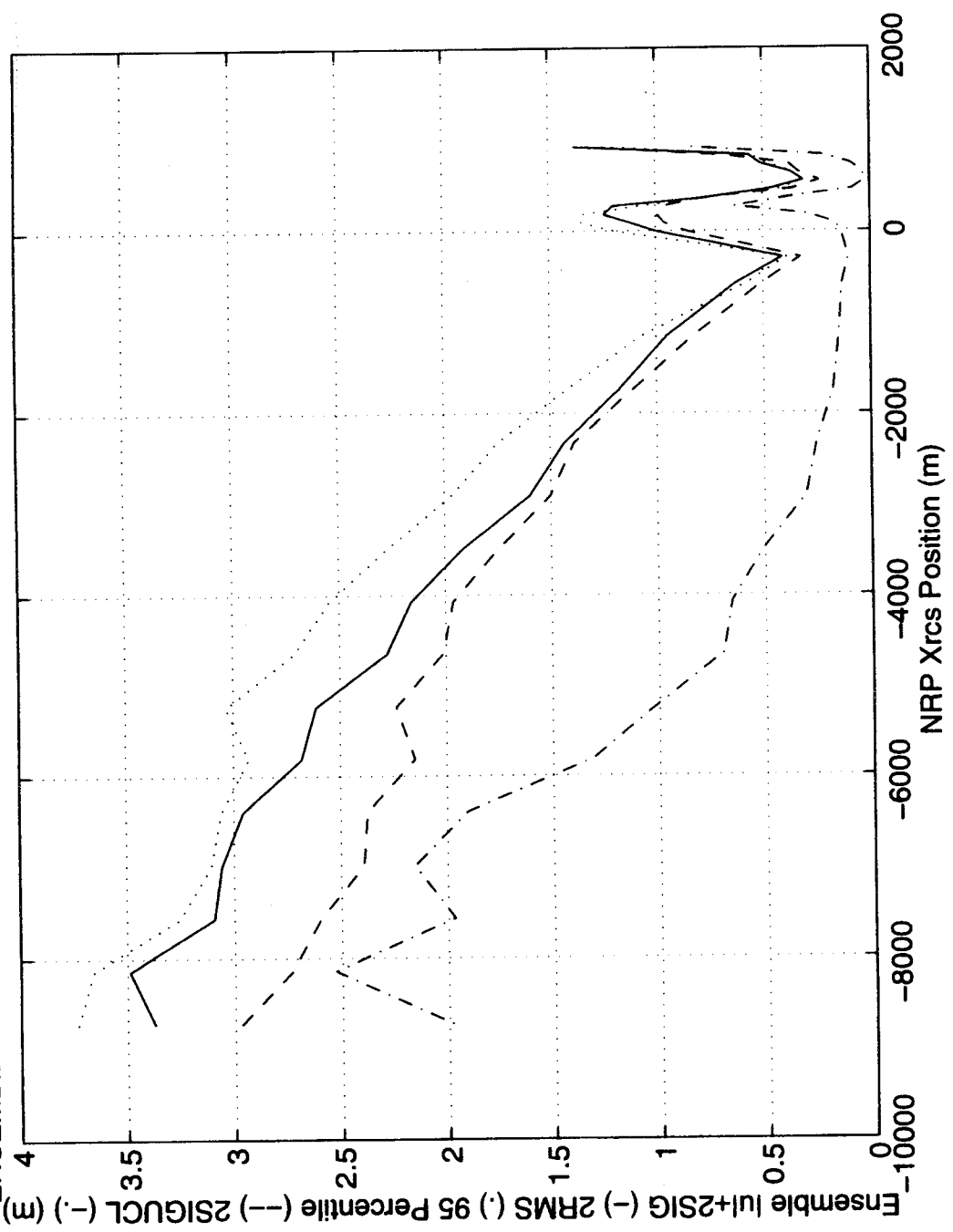
ENSEMBLE VPFE MEAN AND STANDARD DEVIATION FOR ALL VALID APPROACHES



ENSEMBLE VCMN MEAN AND STANDARD DEVIATION FOR ALL VALID APPROACHES

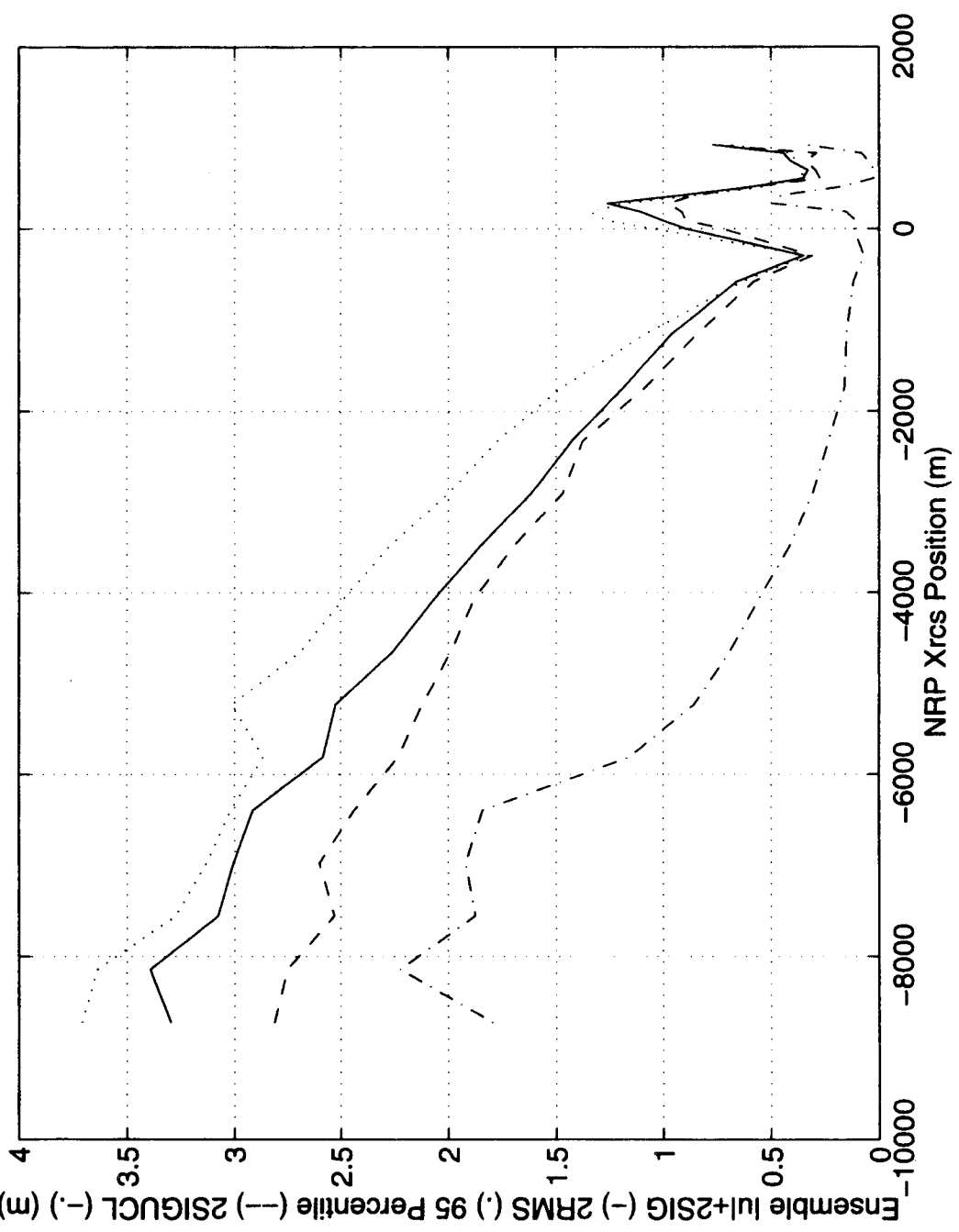


ENSEMBLE UNFILTERED VERTICAL ERROR STATISTICS FOR ALL VALID APPROACHES

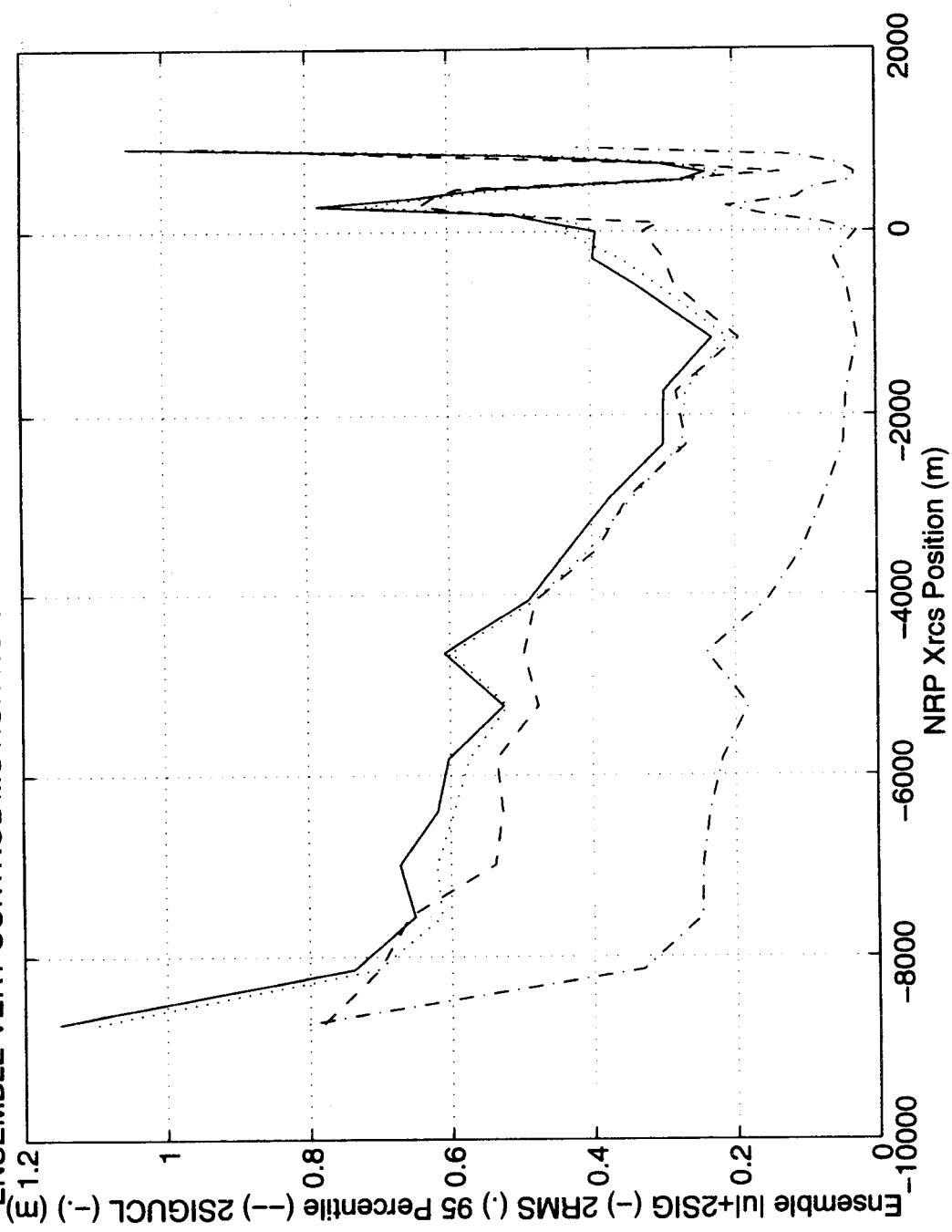




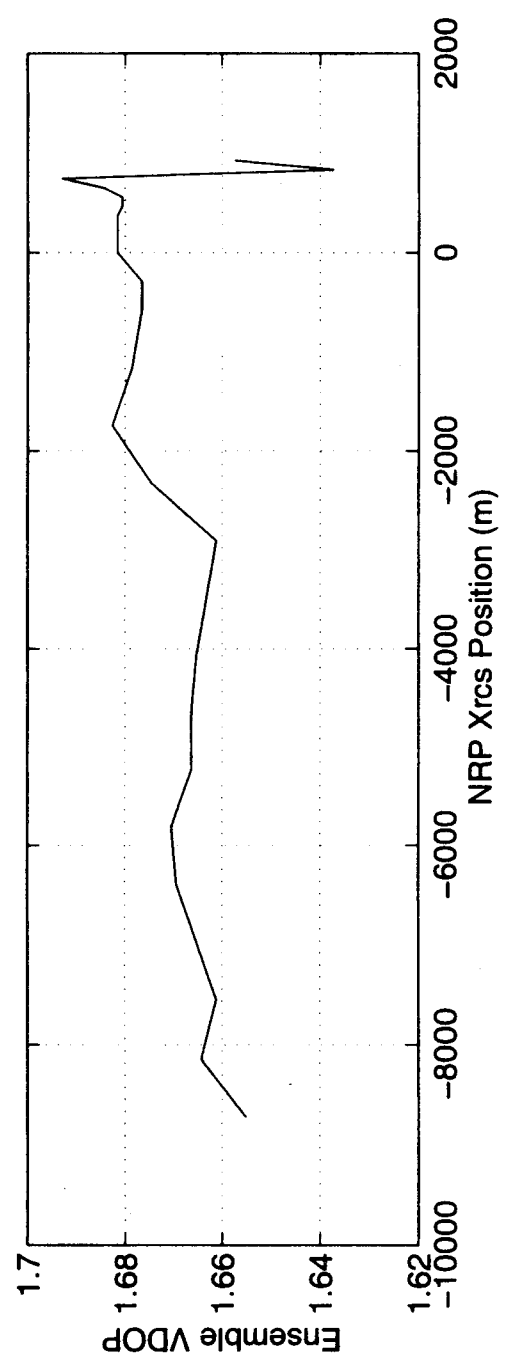
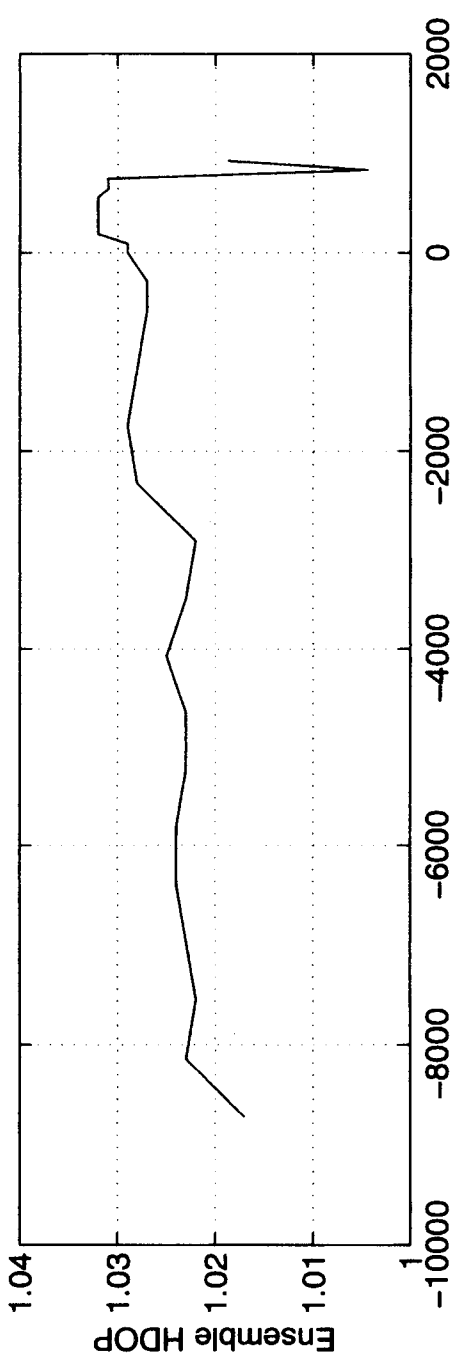
ENSEMBLE VERT PATH FOLLOWING ERROR STATISTICS FOR ALL VALID APPROACHE:



ENSEMBLE VERT CONTROL MOTION NOISE STATISTICS FOR ALL VALID APPROACHES



ENSEMBLE MEAN HDOP AND VDOP FOR ALL VALID AND SUCCESSFUL APPROACHES



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**APPENDIX B**

**INDIVIDUAL APPROACH AND LANDING OR STATIONARY  
TRIAL RESULTS**

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APPROACH #: ES516702  
START TIME: 506072.056  
STOP TIME: 506224.528

MINIMUM HDOP: 0.8  
MAXIMUM HDOP: 0.8  
AVERAGE HDOP: 0.8

MINIMUM VDOP: 3.4  
MAXIMUM VDOP: 3.5  
AVERAGE VDOP: 3.4

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

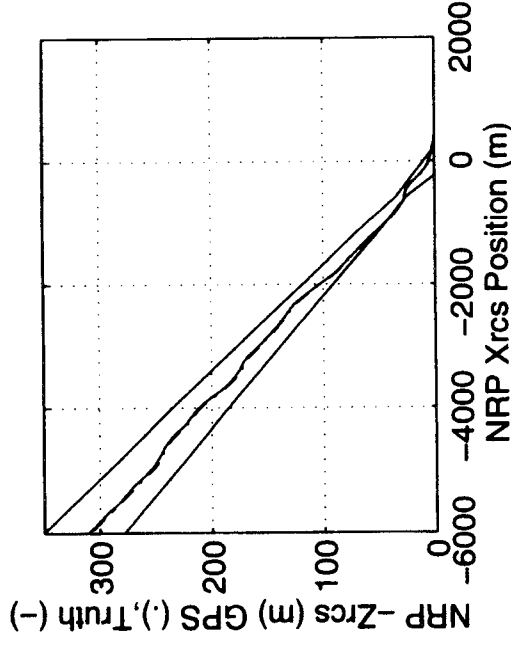
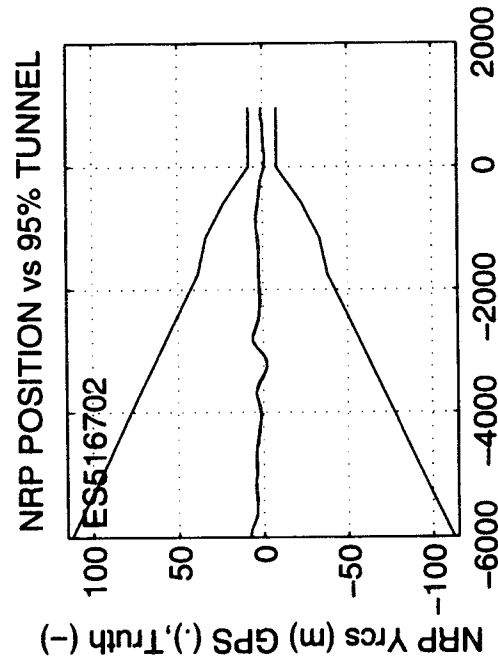
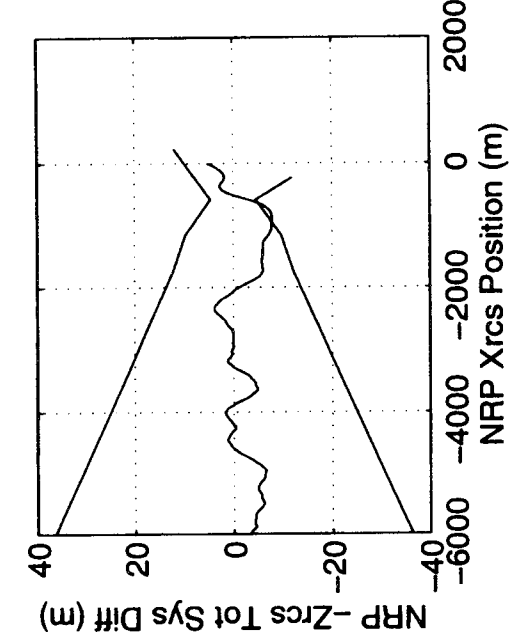
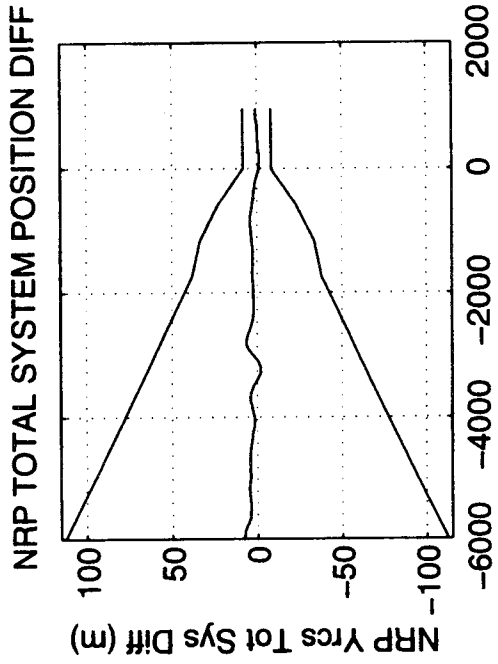
-----  
TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
-----

NRP Xrcs MEAN DIFFERENCE (m): 0.314  
NRP Yrcs MEAN DIFFERENCE (m): -0.102  
NRP Zrcs MEAN DIFFERENCE (m): 0.238  
  
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.717  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.317  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.432  
  
NRP Xrcs 2-RMS DIFFERENCE (m): 0.954  
NRP Yrcs 2-RMS DIFFERENCE (m): 0.377  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.643

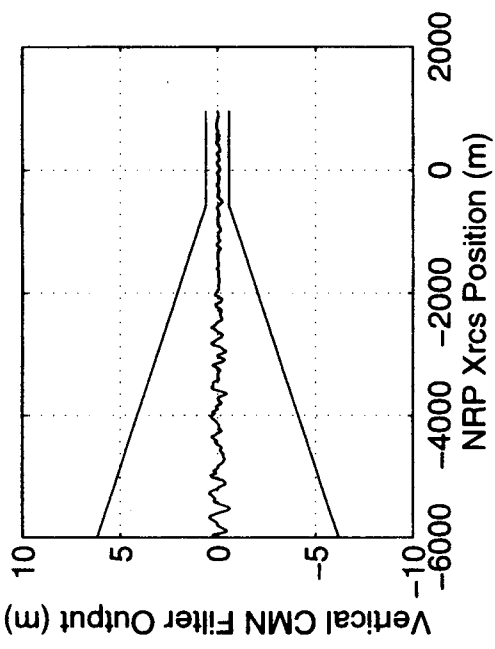
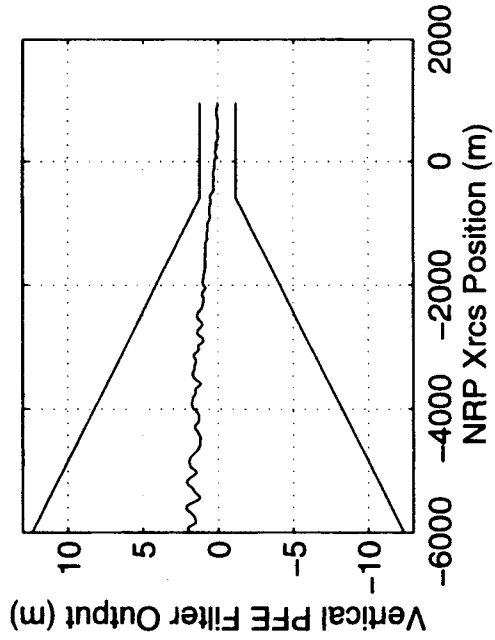
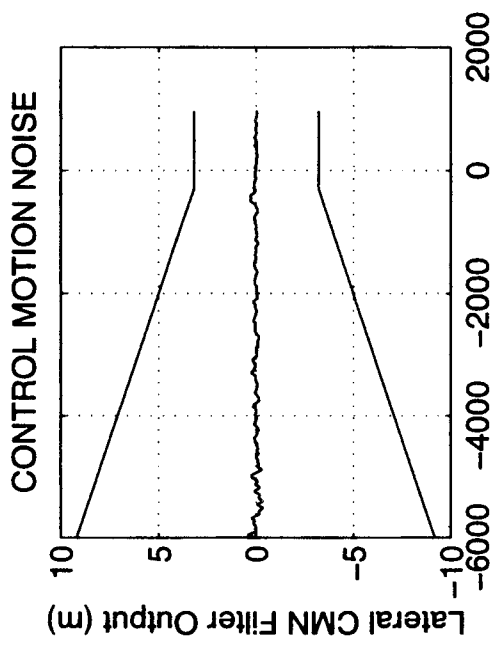
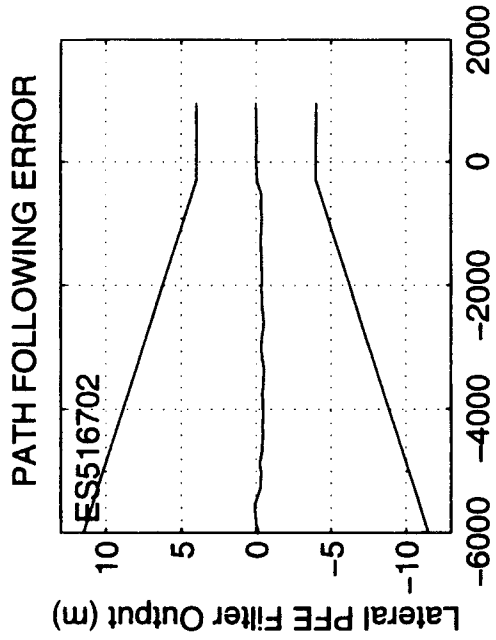
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----

LGRP Xrcs POSITION (m): 464.355  
LGRP Yrcs POSITION (m): -0.301

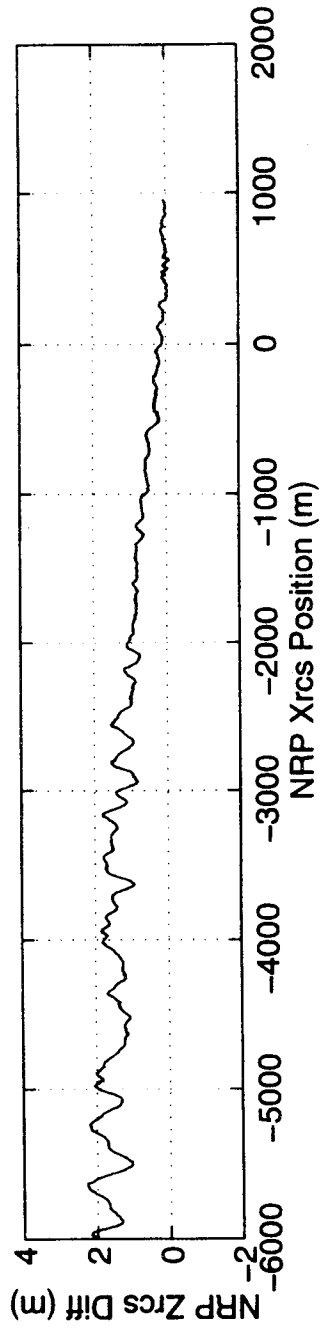
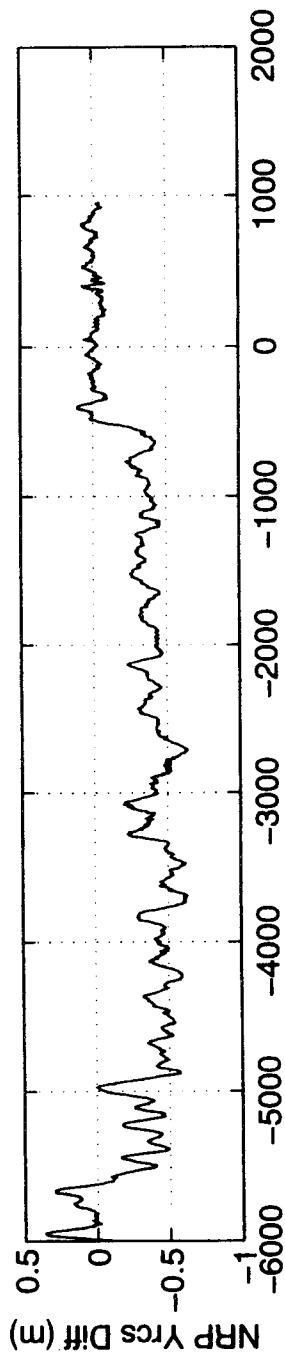
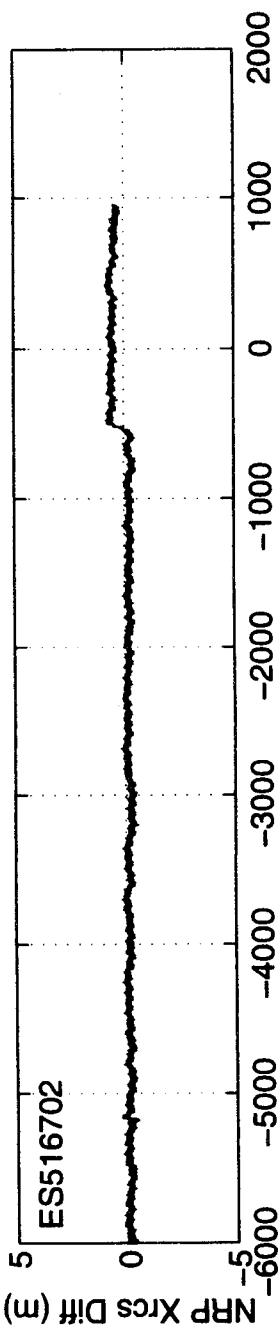
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NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES516704  
START TIME: 507851.781  
STOP TIME: 507994.847

MINIMUM HDOP: 0.6  
MAXIMUM HDOP: 0.8  
AVERAGE HDOP: 0.7

MINIMUM VDOP: 1.6  
MAXIMUM VDOP: 2.6  
AVERAGE VDOP: 2.5

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

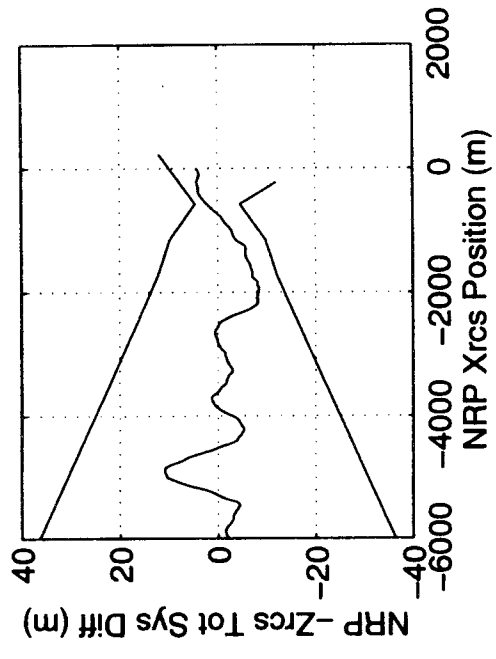
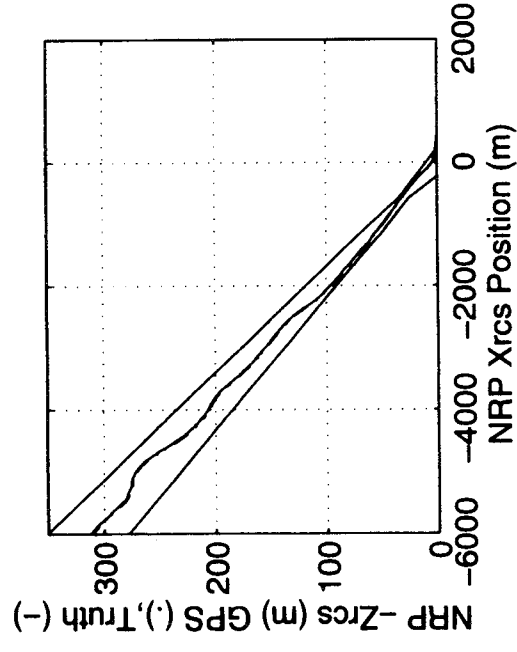
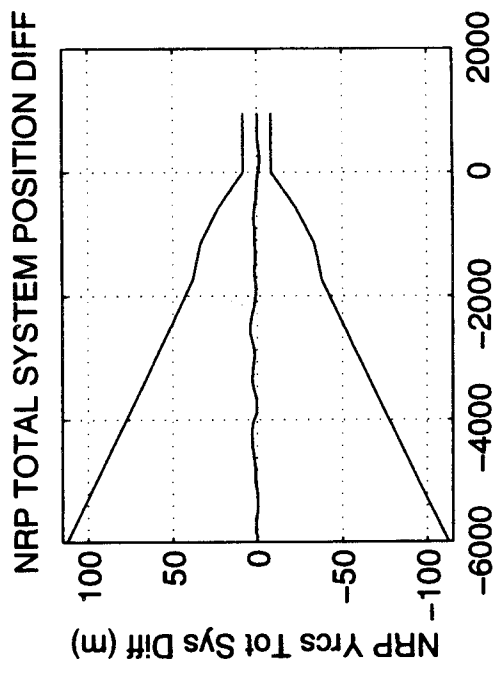
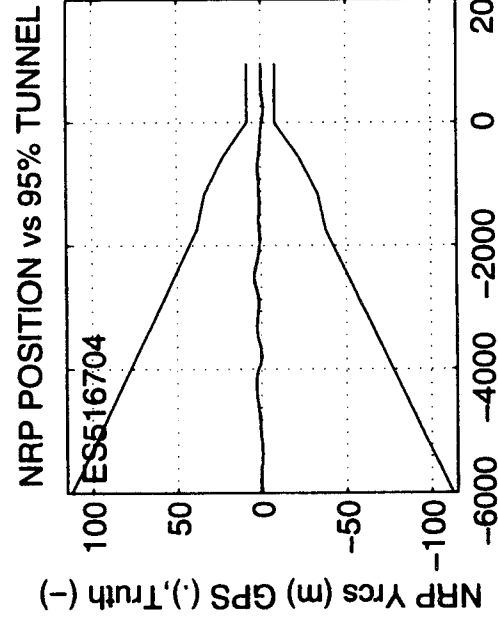
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.463  
NRP Yrcs MEAN DIFFERENCE (m): -0.006  
NRP Zrcs MEAN DIFFERENCE (m): 0.229

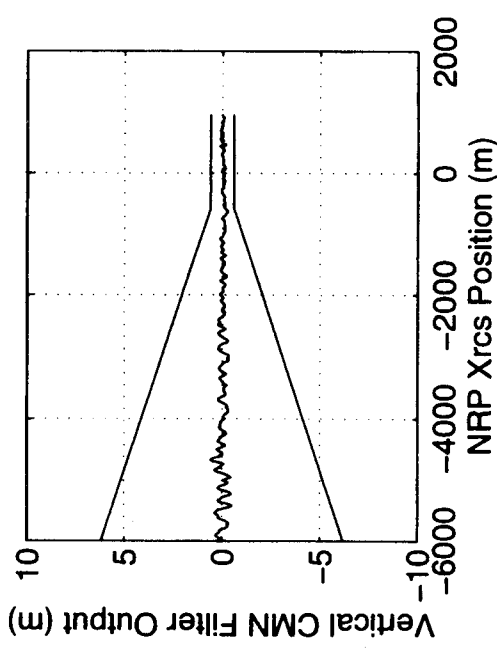
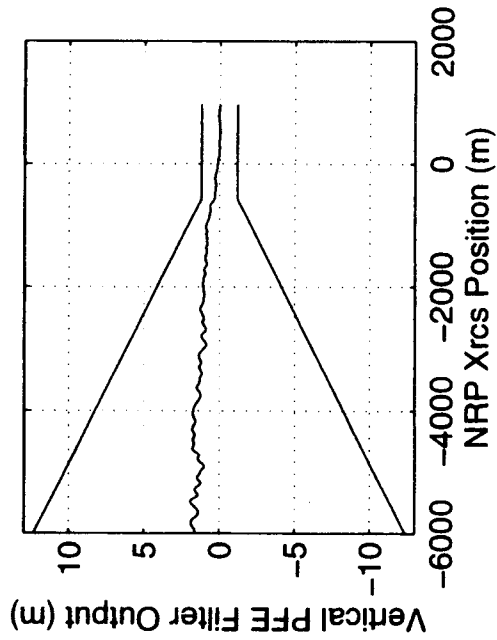
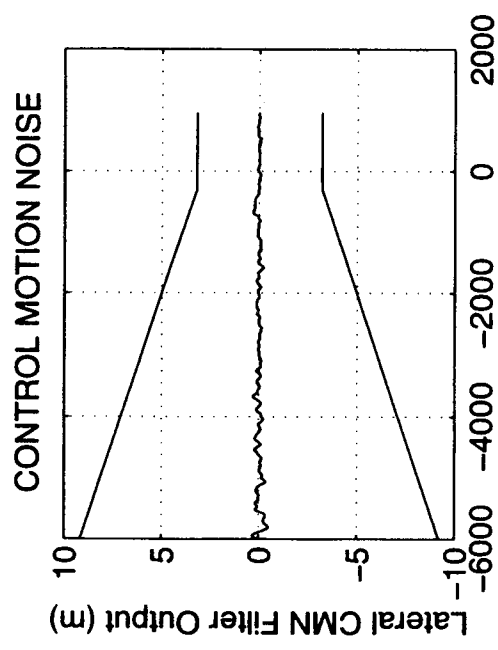
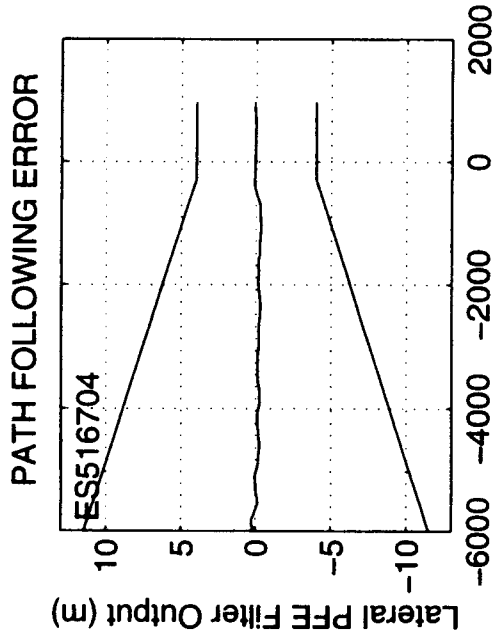
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.674  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.297  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.550

NRP Xrcs 2-RMS DIFFERENCE (m): 1.145  
NRP Yrcs 2-RMS DIFFERENCE (m): 0.297  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.716

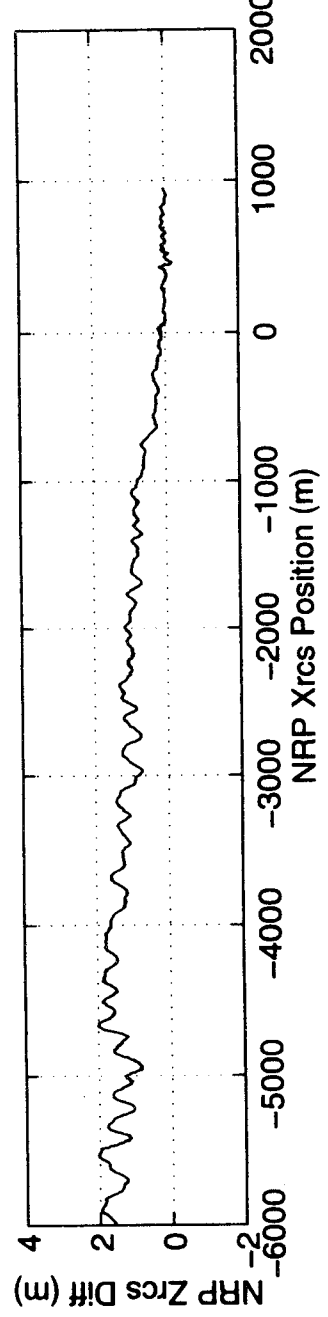
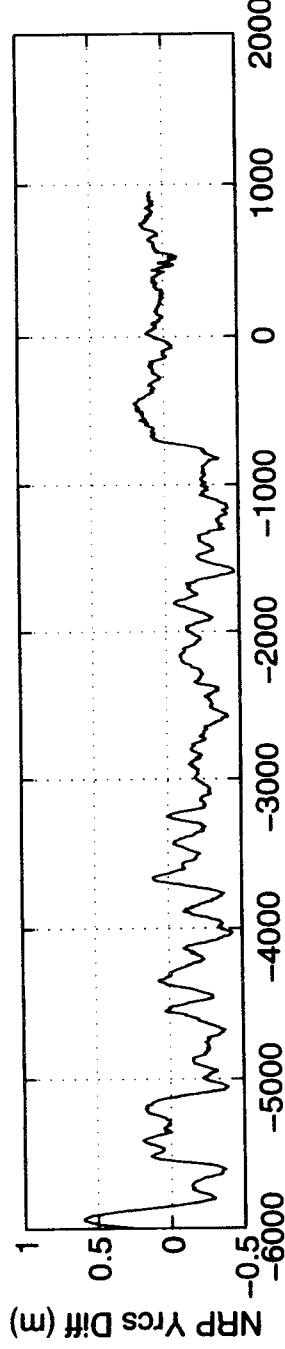
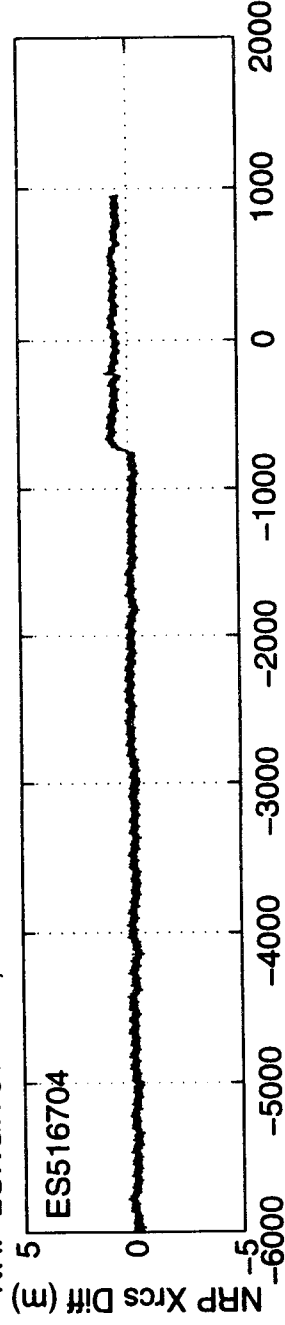
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 430.568  
LGRP Yrcs POSITION (m): -0.860





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES516705  
START TIME: 508412.462  
STOP TIME: 508567.264

MINIMUM HDOP: 0.6  
MAXIMUM HDOP: 0.6  
AVERAGE HDOP: 0.6

MINIMUM VDOP: 1.5  
MAXIMUM VDOP: 1.5  
AVERAGE VDOP: 1.5

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
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\*\*\*\*\*  
\* VALID APPROACH \*  
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\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

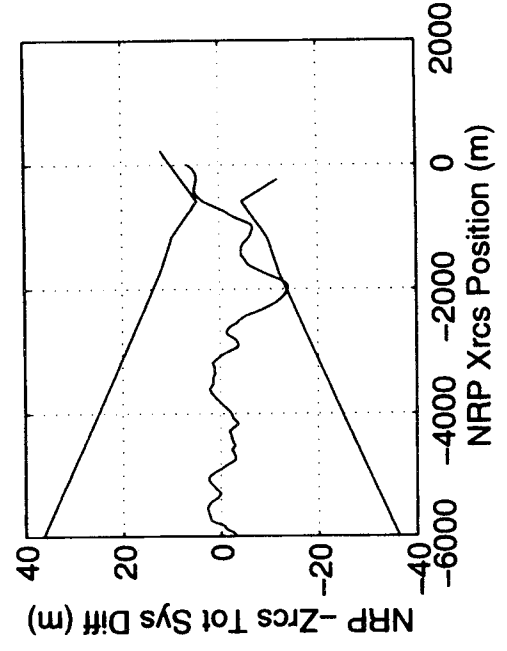
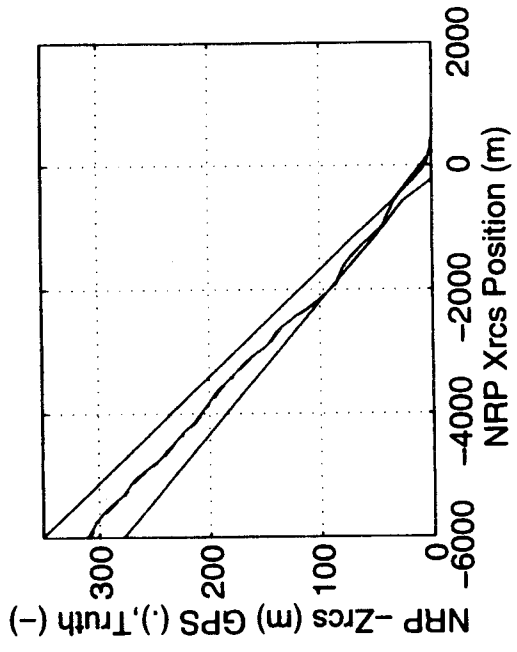
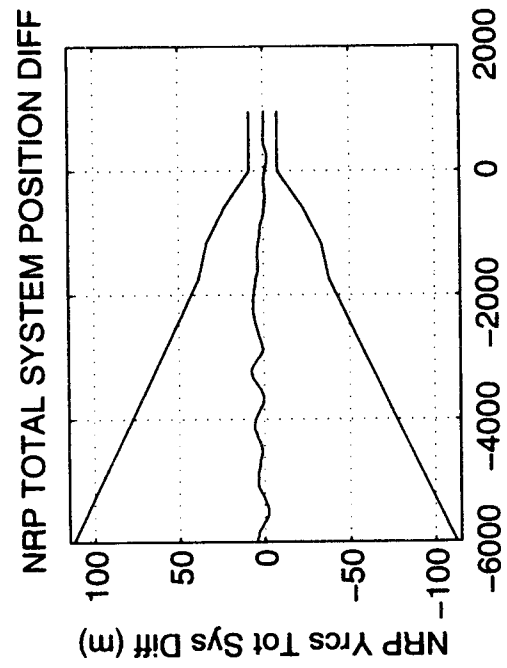
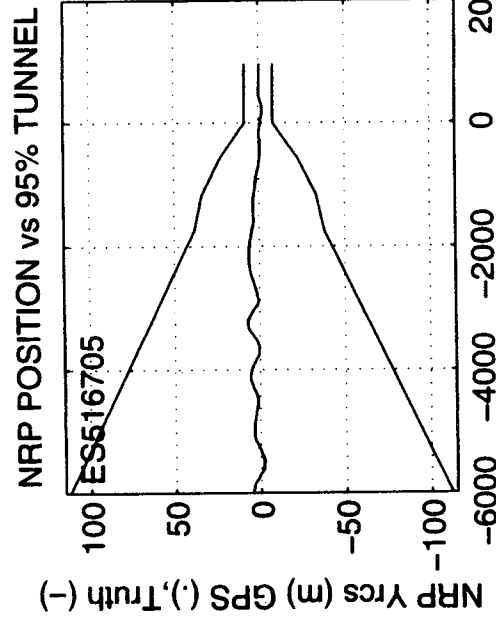
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.492  
NRP Yrcs MEAN DIFFERENCE (m): -0.014  
NRP Zrcs MEAN DIFFERENCE (m): 0.169

NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.632  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.216  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.468

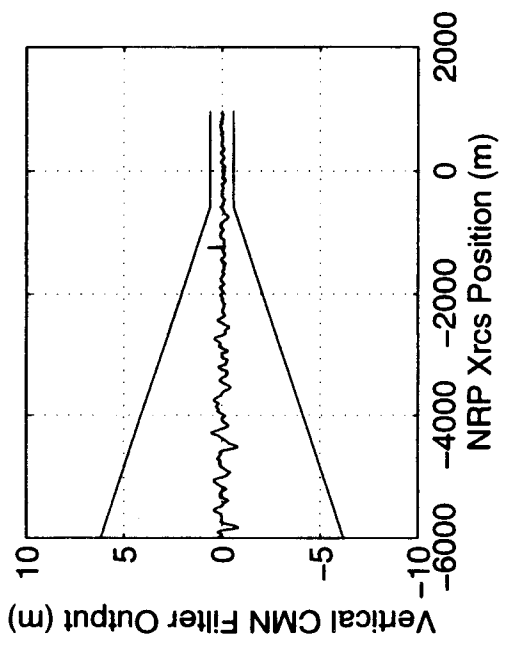
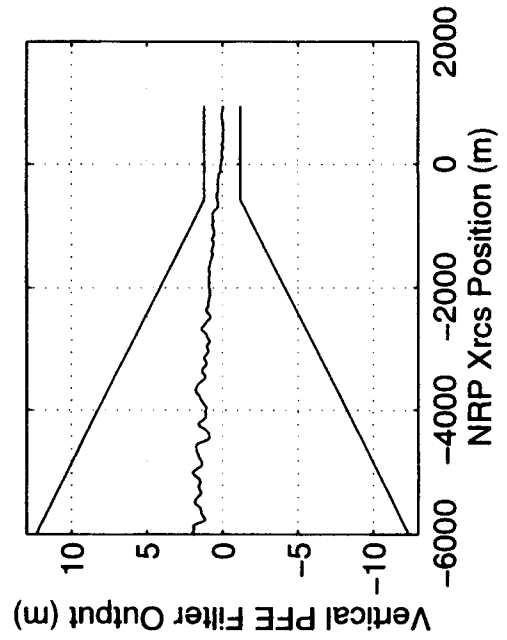
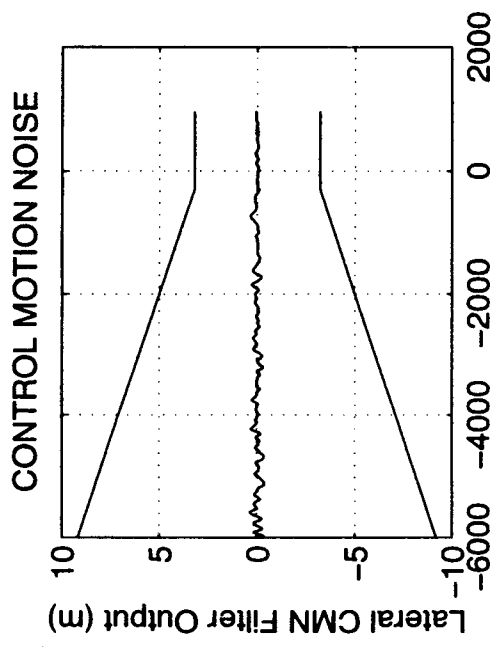
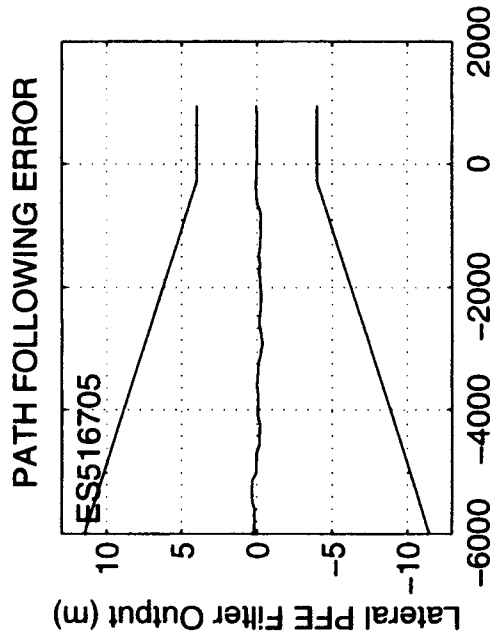
NRP Xrcs 2-RMS DIFFERENCE (m): 1.169  
NRP Yrcs 2-RMS DIFFERENCE (m): 0.218  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.578

-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

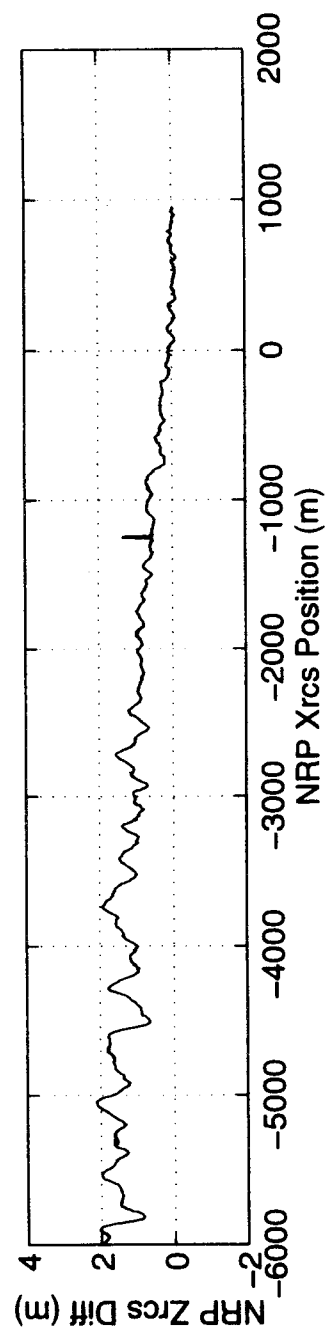
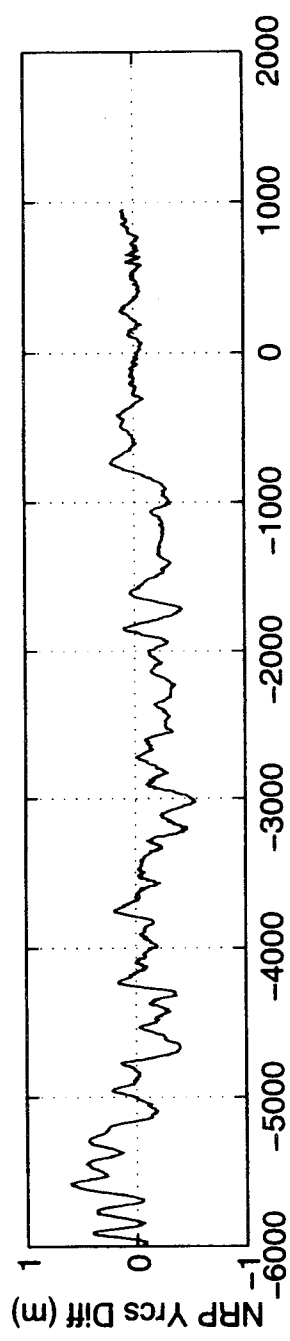
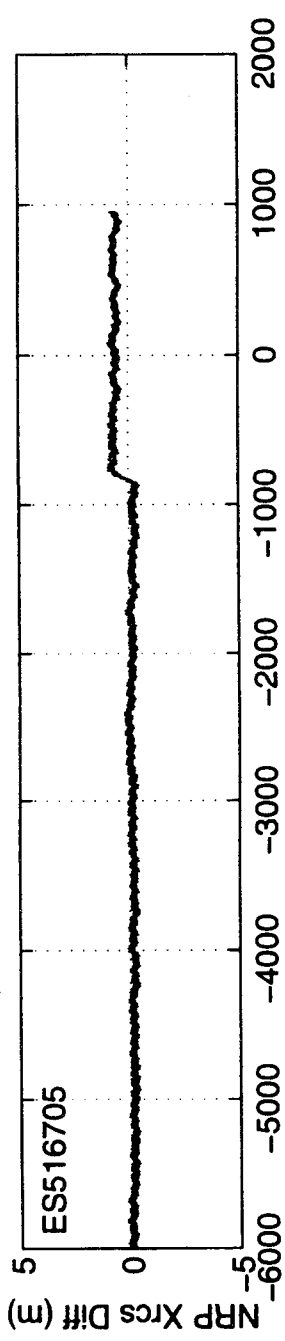
LGRP Xrcs POSITION (m): 645.039  
LGRP Yrcs POSITION (m): -0.596







NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES516706  
START TIME: 508965.924  
STOP TIME: 509106.990

MINIMUM HDOP: 0.6  
MAXIMUM HDOP: 0.6  
AVERAGE HDOP: 0.6

MINIMUM VDOP: 1.4  
MAXIMUM VDOP: 1.4  
AVERAGE VDOP: 1.4

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

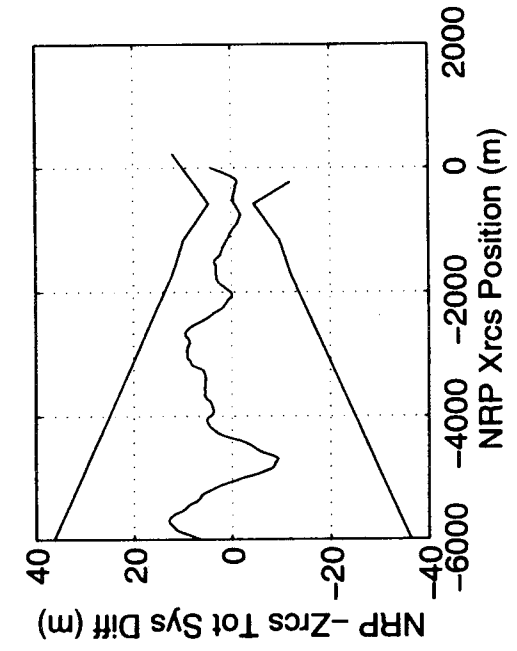
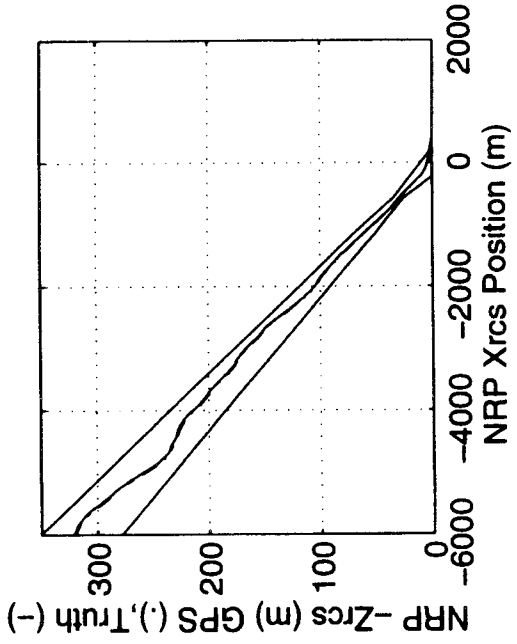
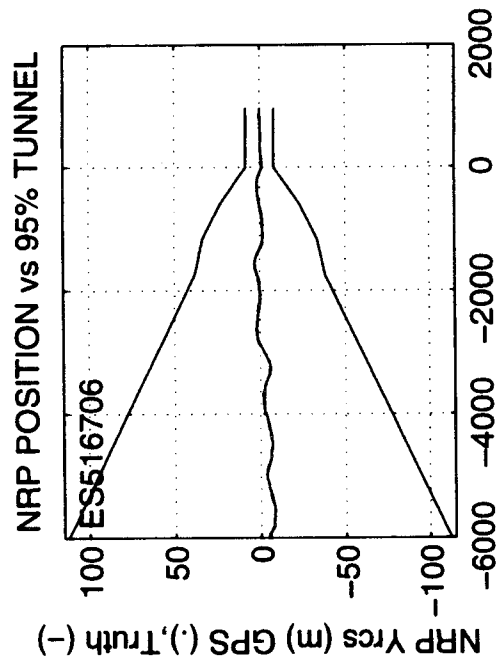
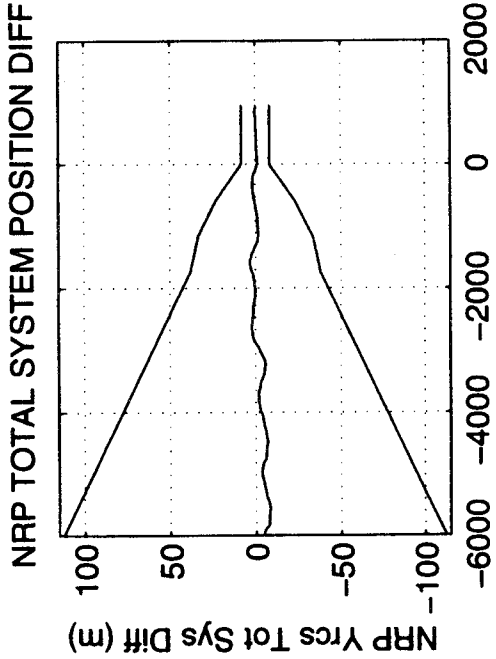
\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

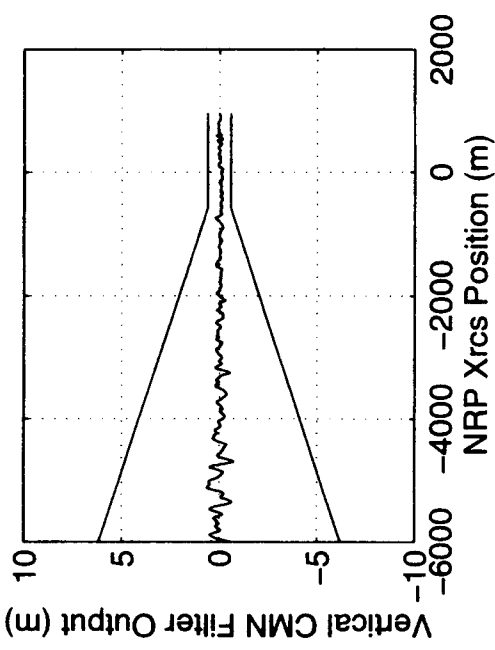
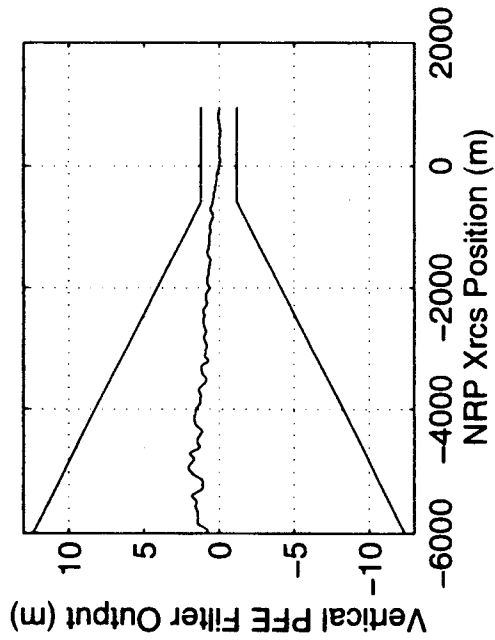
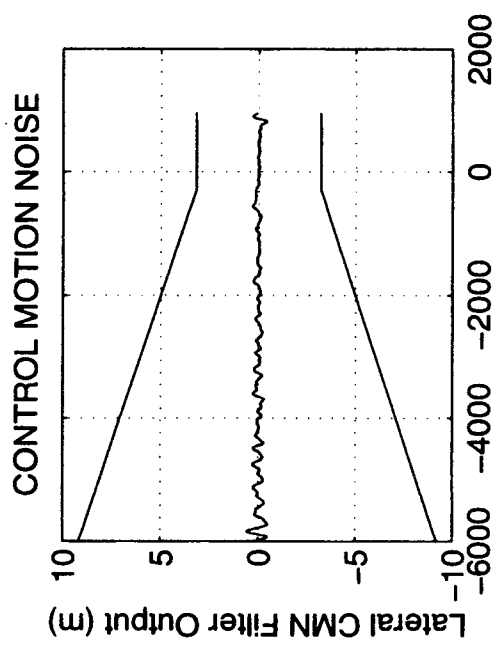
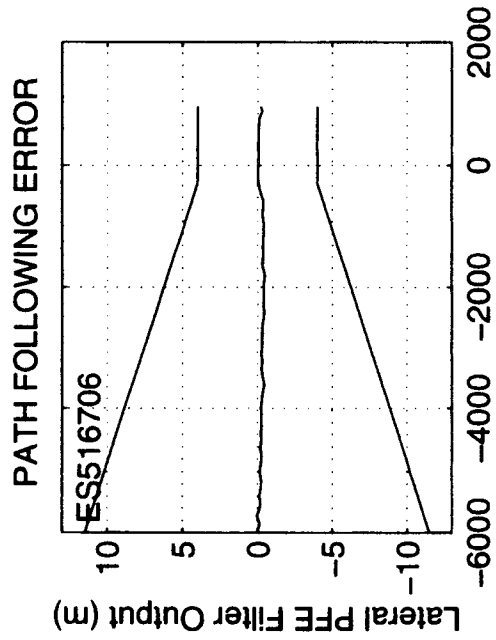
\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
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TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
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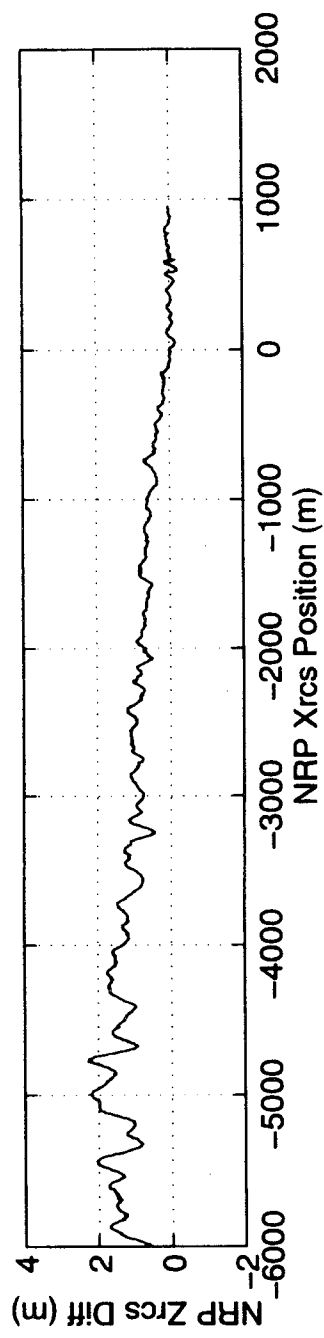
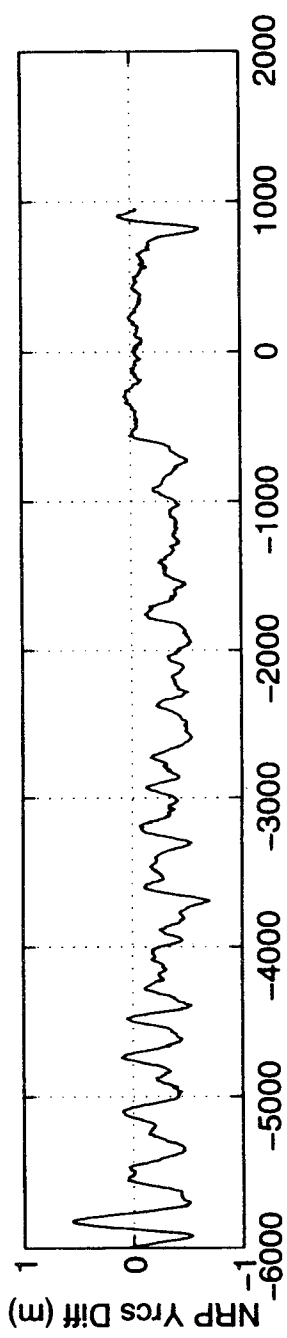
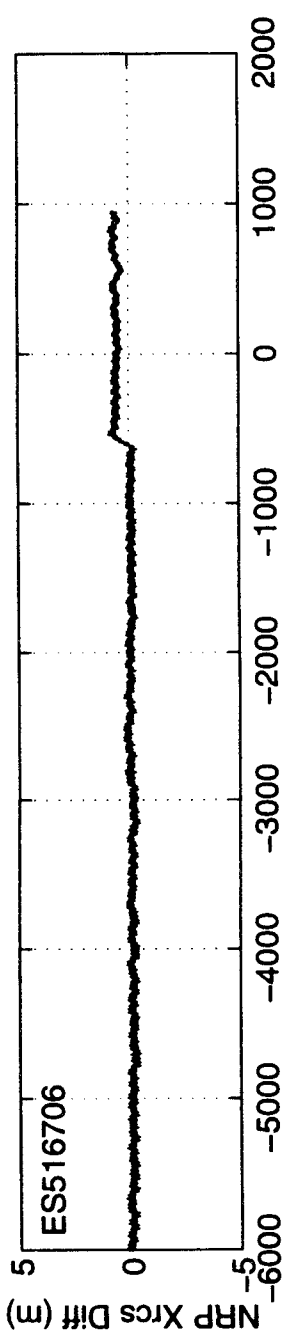
NRP Xrcs MEAN DIFFERENCE (m): 0.414  
NRP Yrcs MEAN DIFFERENCE (m): -0.148  
NRP Zrcs MEAN DIFFERENCE (m): 0.163  
  
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.628  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.328  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.461  
  
NRP Xrcs 2-RMS DIFFERENCE (m): 1.039  
NRP Yrcs 2-RMS DIFFERENCE (m): 0.442  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.564

-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----  
LGRP Xrcs POSITION (m): 569.789  
LGRP Yrcs POSITION (m): -0.266





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517001  
START TIME: 145581.187  
STOP TIME: 145875.330

MINIMUM HDOP: 0.6  
MAXIMUM HDOP: 0.6  
AVERAGE HDOP: 0.6

MINIMUM VDOP: 1.9  
MAXIMUM VDOP: 2.0  
AVERAGE VDOP: 2.0

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
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\*\*\*\*\*  
\* VALID STATIC TRIAL \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL STATIC TRIAL \*  
\*\*\*\*\*

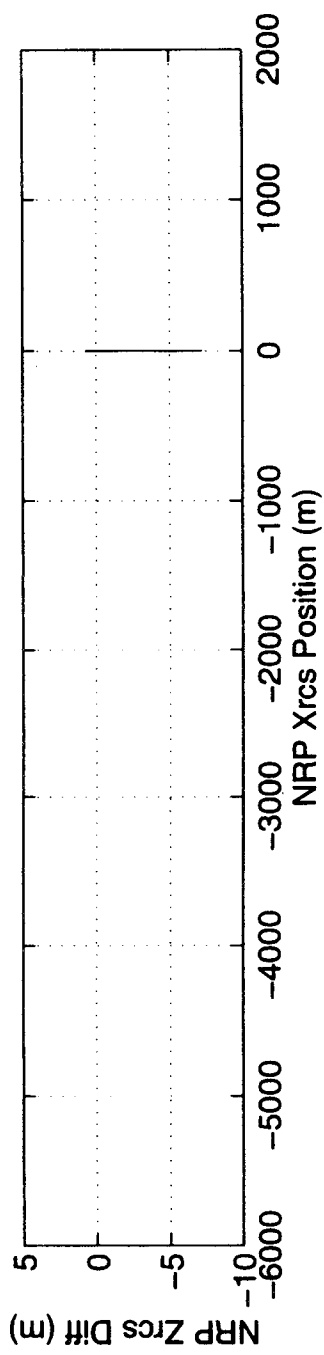
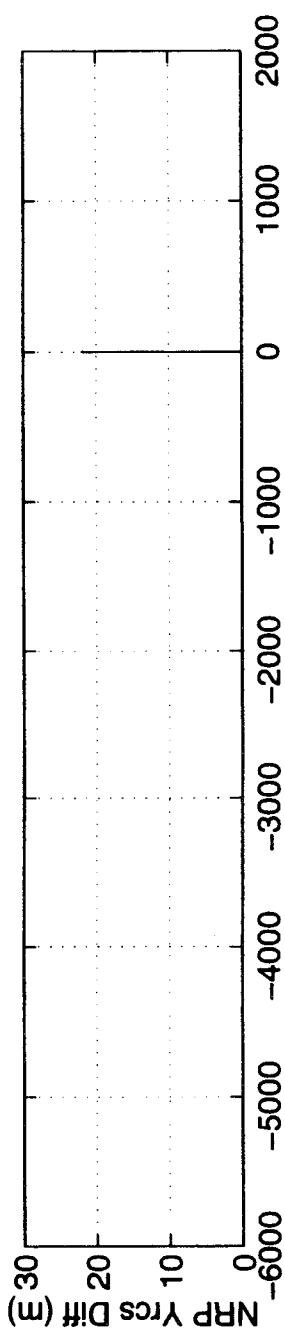
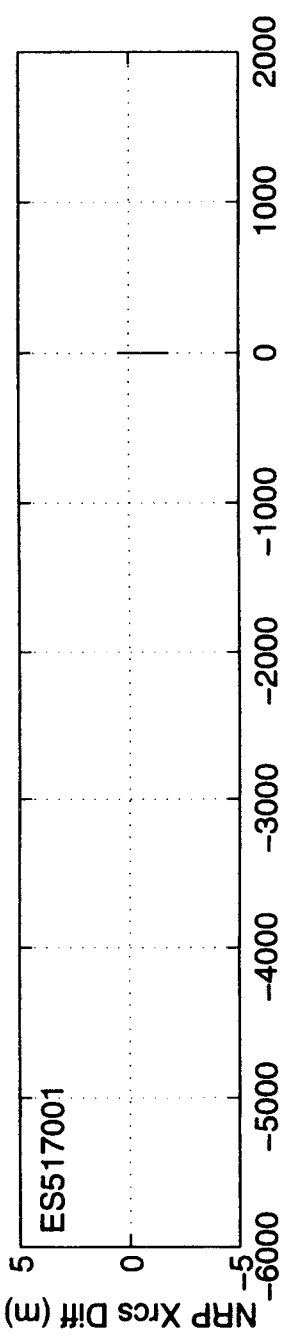
TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

-----  
NRP Xrcs MEAN DIFFERENCE (m): -0.250  
NRP Yrcs MEAN DIFFERENCE (m): 5.435  
NRP Zrcs MEAN DIFFERENCE (m): -1.377

NRP Xrcs 2-SIGMA DIFFERENCE (m): 1.044  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 13.227  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 4.572

NRP Xrcs 2-RMS DIFFERENCE (m): 1.158  
NRP Yrcs 2-RMS DIFFERENCE (m): 17.120  
NRP Zrcs 2-RMS DIFFERENCE (m): 5.337

NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES





APPROACH #: ES517002  
START TIME: 146565.319  
STOP TIME: 146725.056

MINIMUM HDOP: 0.9  
MAXIMUM HDOP: 0.9  
AVERAGE HDOP: 0.9

MINIMUM VDOP: 1.4  
MAXIMUM VDOP: 1.5  
AVERAGE VDOP: 1.5

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

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TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
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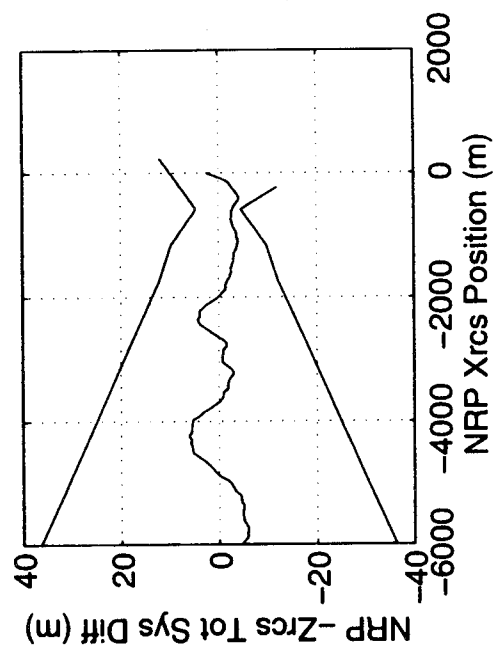
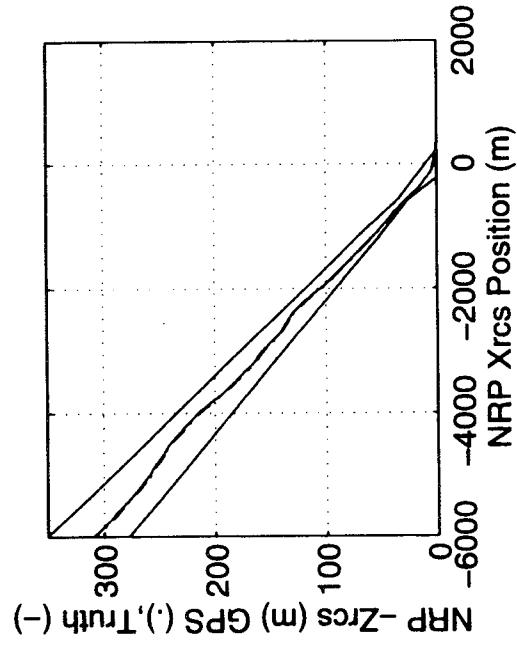
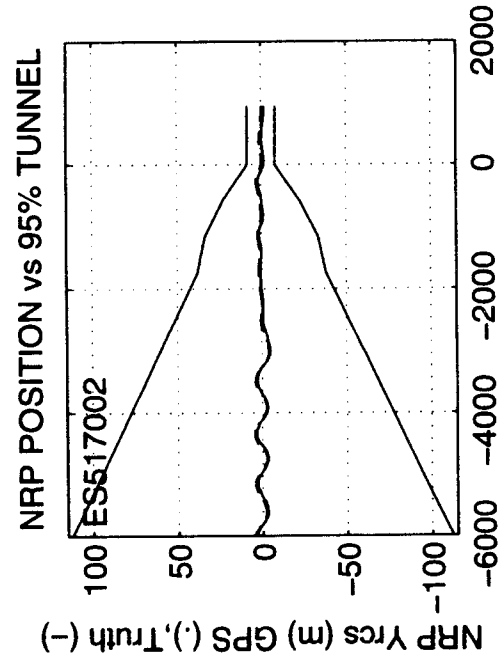
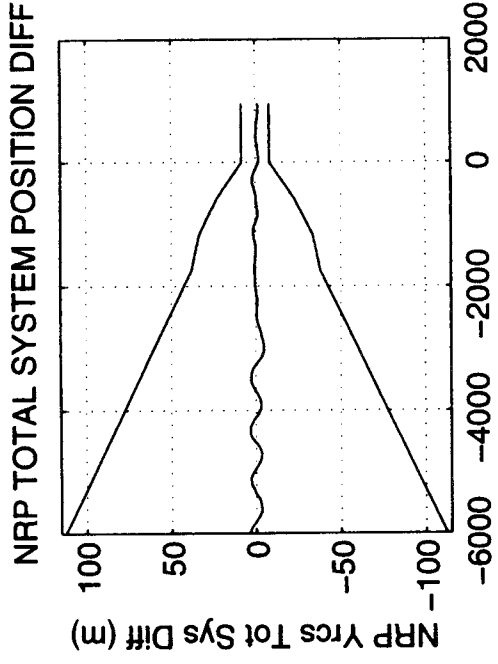
NRP Xrcs MEAN DIFFERENCE (m): 0.527  
NRP Yrcs MEAN DIFFERENCE (m): 1.221  
NRP Zrcs MEAN DIFFERENCE (m): 0.034

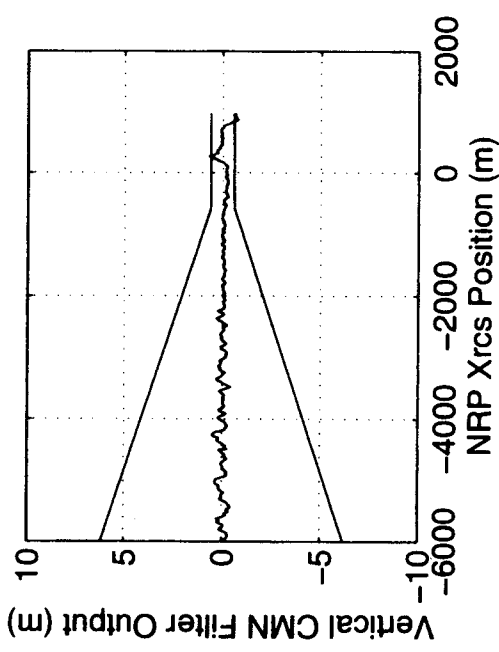
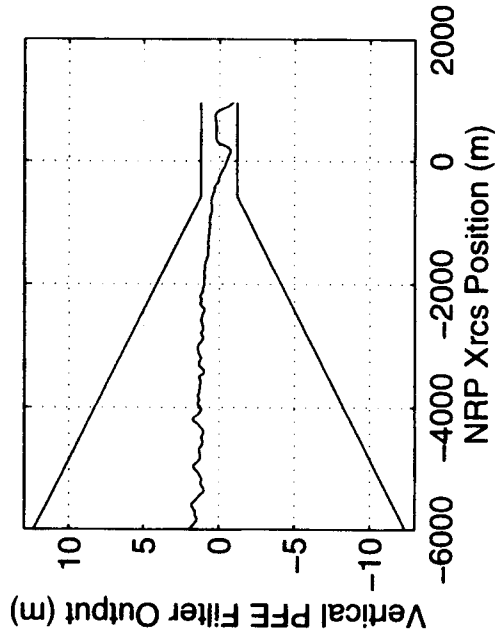
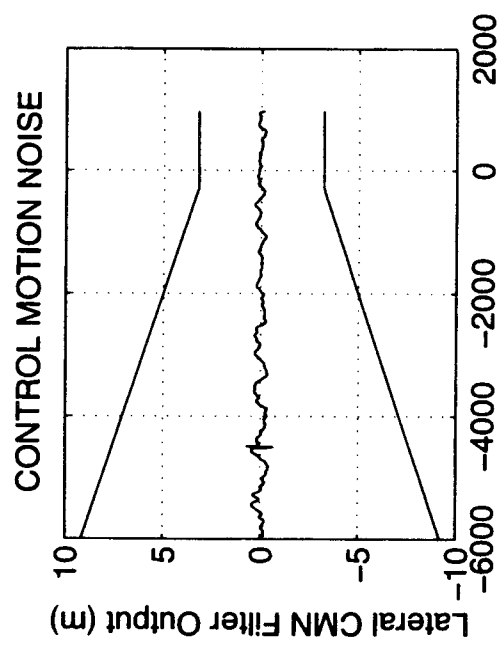
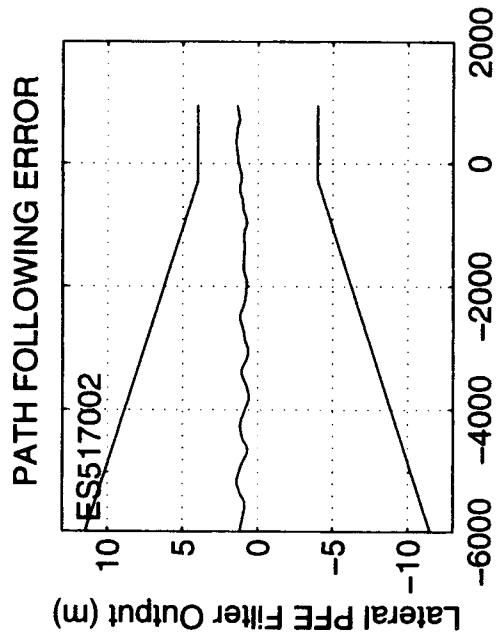
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.827  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.459  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.932

NRP Xrcs 2-RMS DIFFERENCE (m): 1.339  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.485  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.934

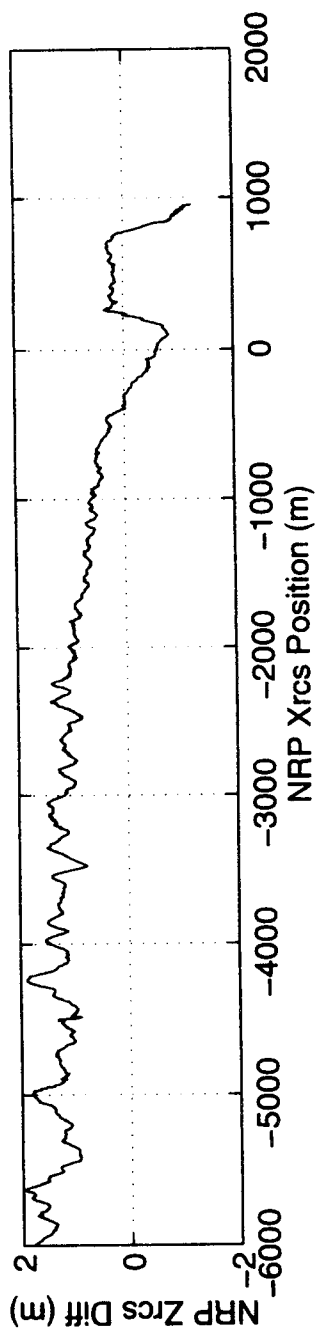
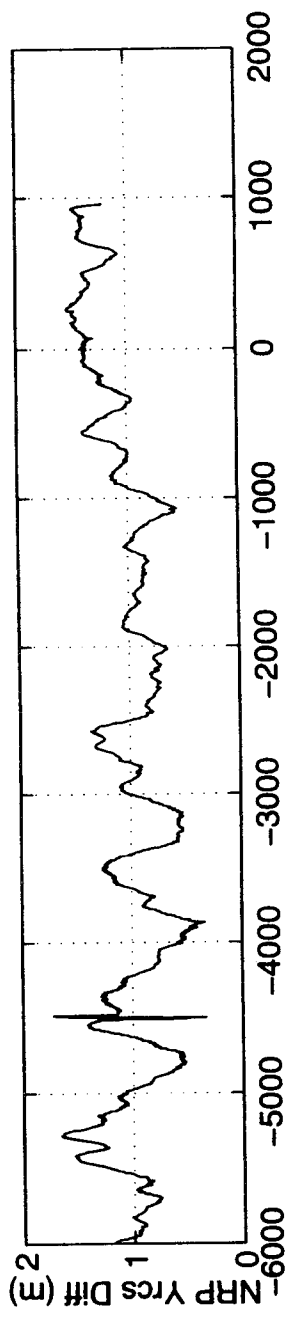
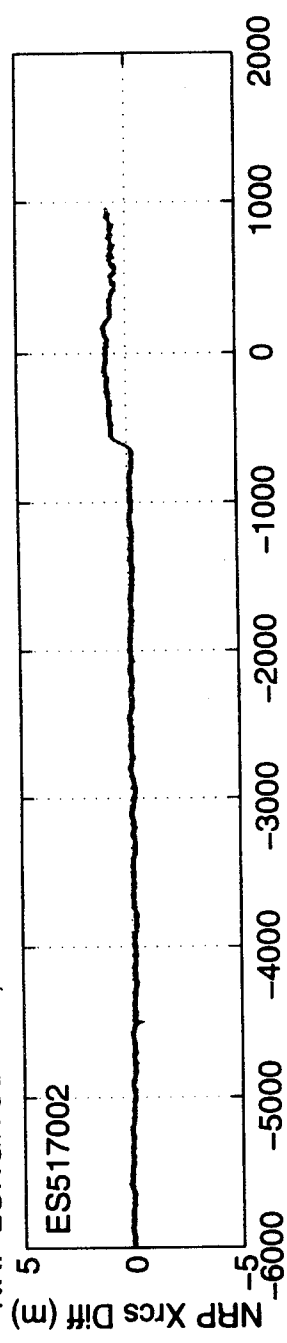
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----

LGRP Xrcs POSITION (m): 217.527  
LGRP Yrcs POSITION (m): -0.748





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517003  
START TIME: 147234.594  
STOP TIME: 147395.462

MINIMUM HDOP: 0.7  
MAXIMUM HDOP: 1.2  
AVERAGE HDOP: 1.1

MINIMUM VDOP: 1.2  
MAXIMUM VDOP: 1.9  
AVERAGE VDOP: 1.8

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 9  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

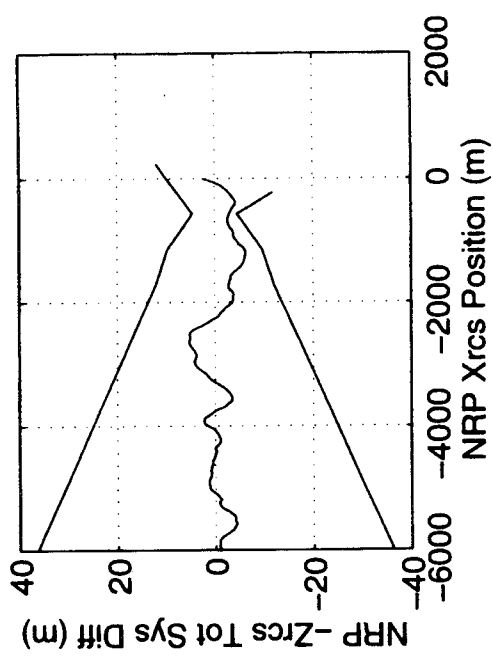
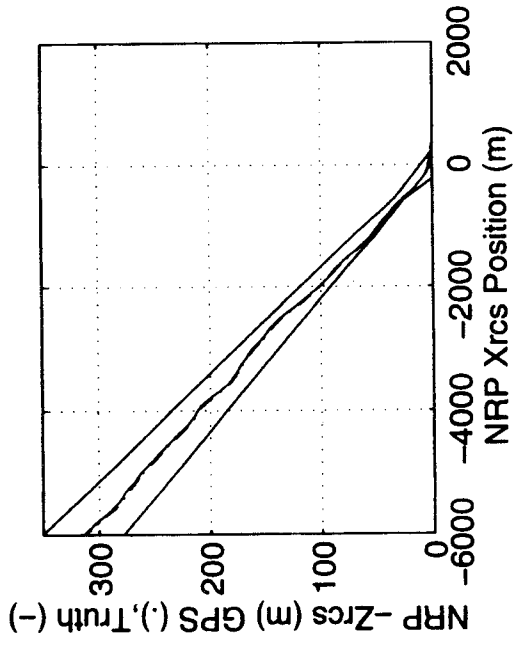
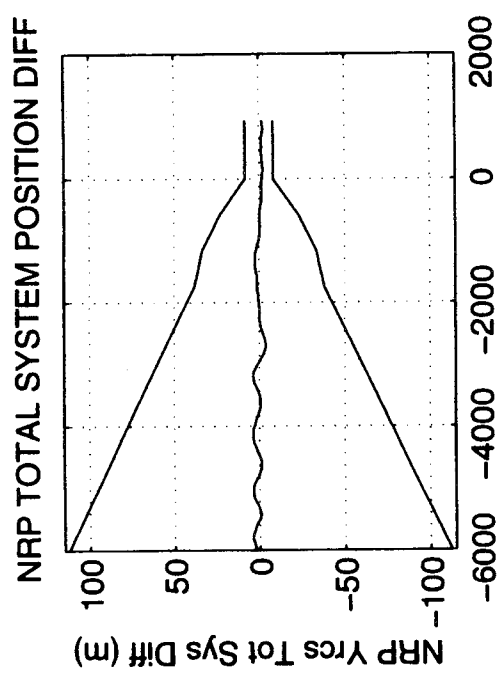
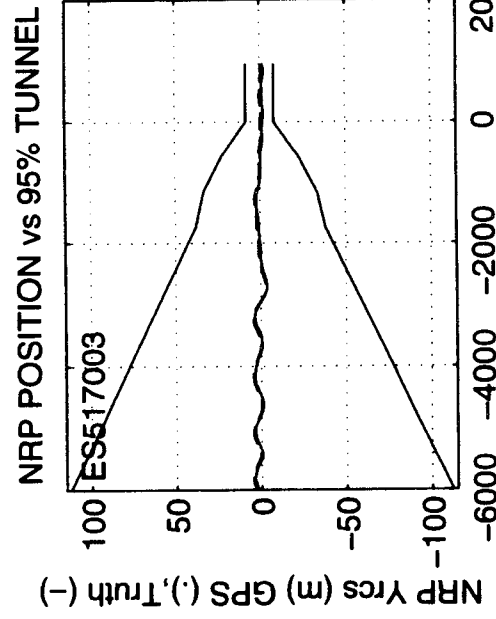
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.585  
NRP Yrcs MEAN DIFFERENCE (m): 1.188  
NRP Zrcs MEAN DIFFERENCE (m): 0.023

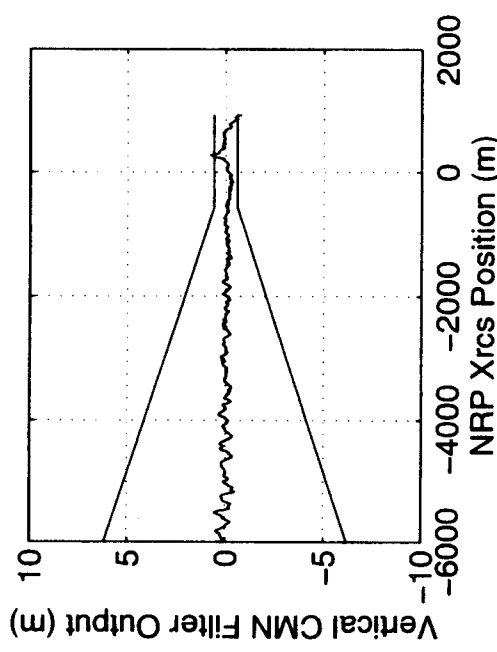
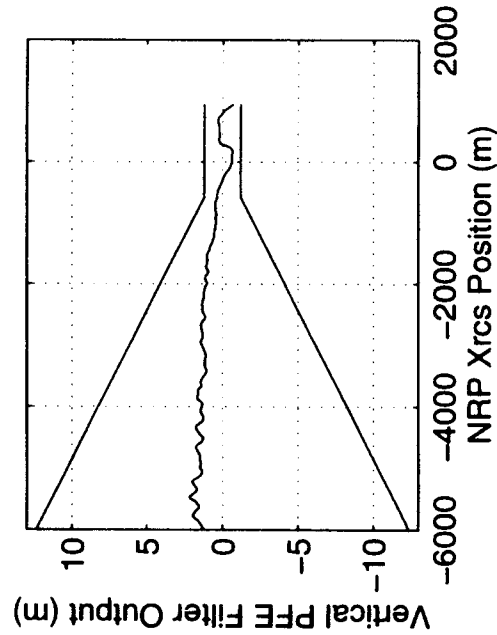
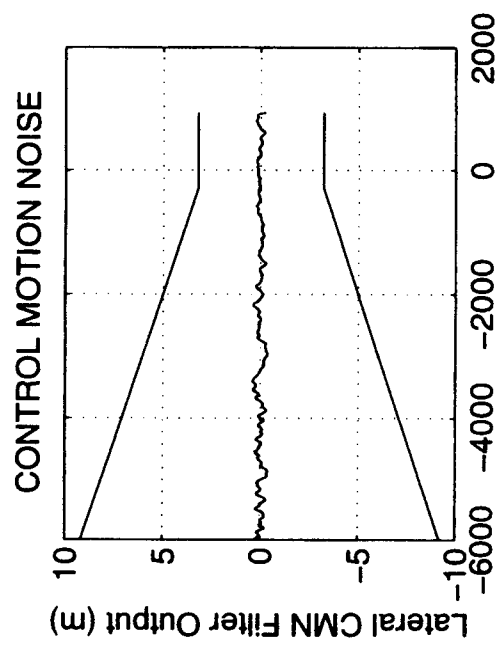
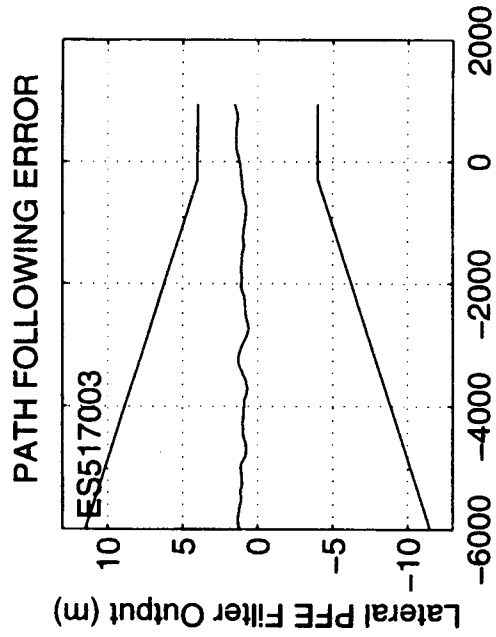
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.827  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.535  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.844

NRP Xrcs 2-RMS DIFFERENCE (m): 1.432  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.436  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.845

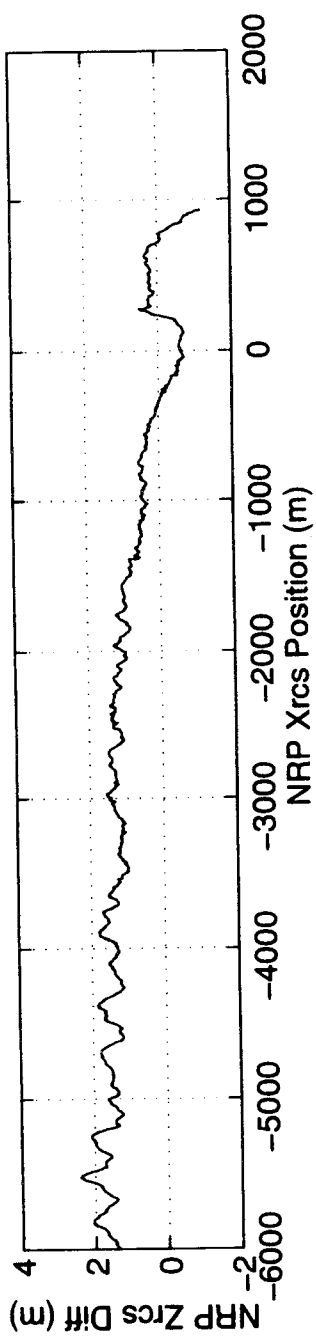
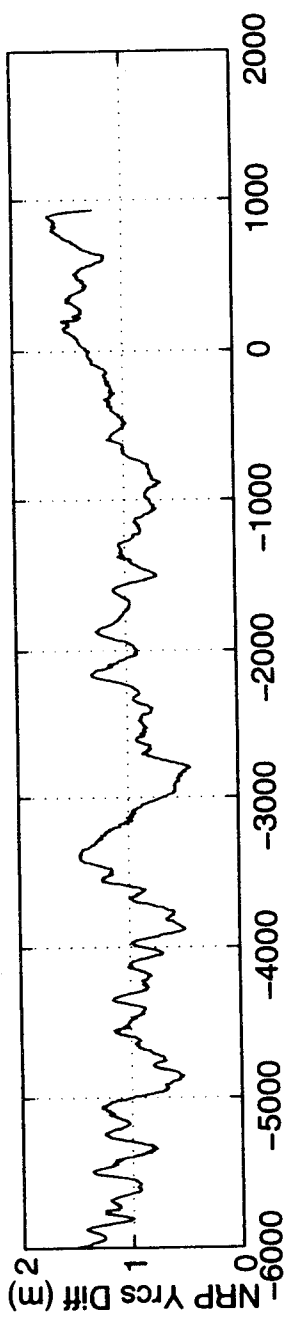
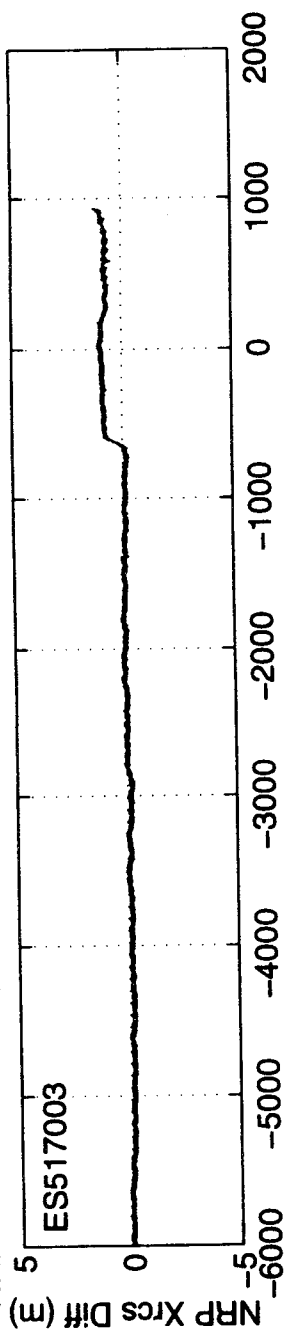
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 177.325  
LGRP Yrcs POSITION (m): -1.732





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES





APPROACH #: ES517004  
START TIME: 147919.990  
STOP TIME: 148085.264

MINIMUM HDOP: 1.0  
MAXIMUM HDOP: 1.0  
AVERAGE HDOP: 1.0

MINIMUM VDOP: 4.3  
MAXIMUM VDOP: 4.5  
AVERAGE VDOP: 4.4

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

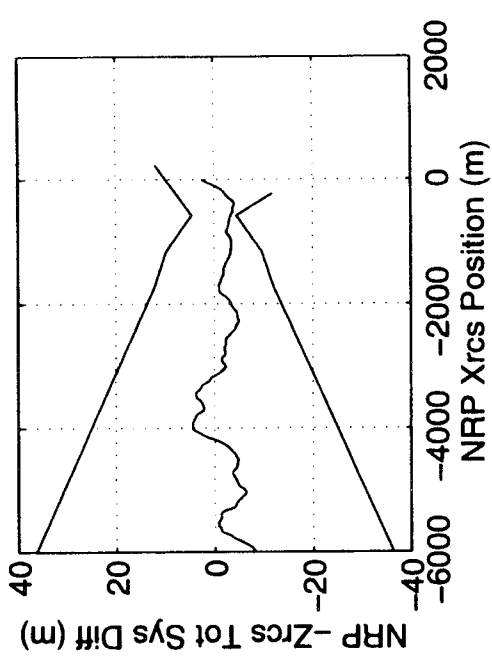
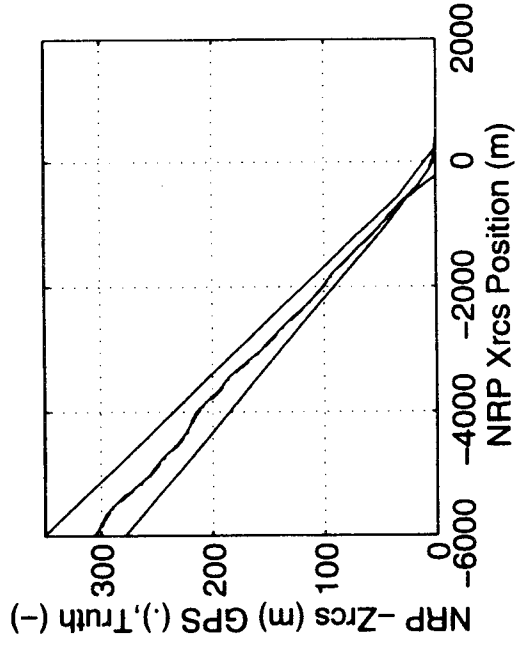
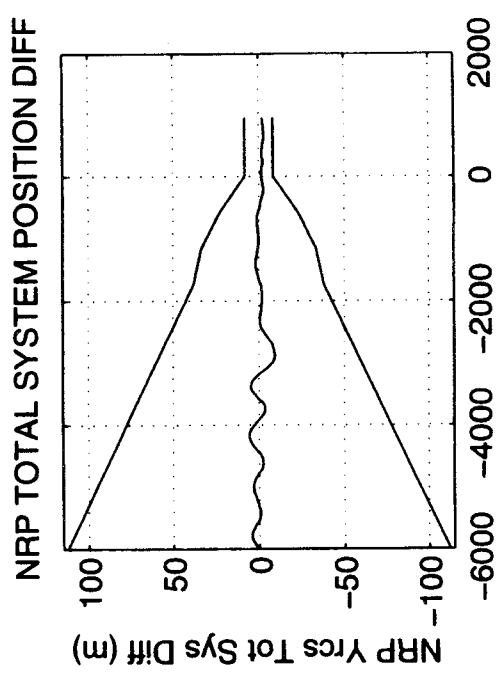
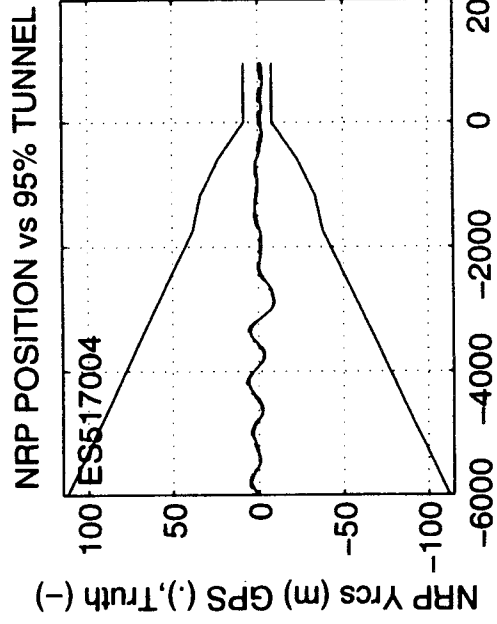
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.496  
NRP Yrcs MEAN DIFFERENCE (m): 1.094  
NRP Zrcs MEAN DIFFERENCE (m): 0.030

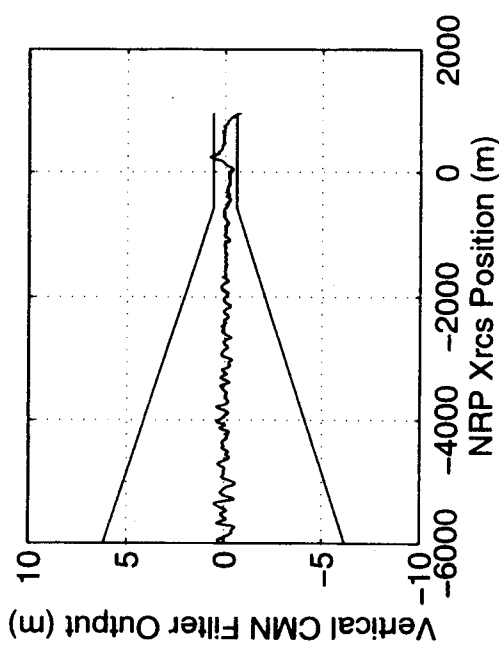
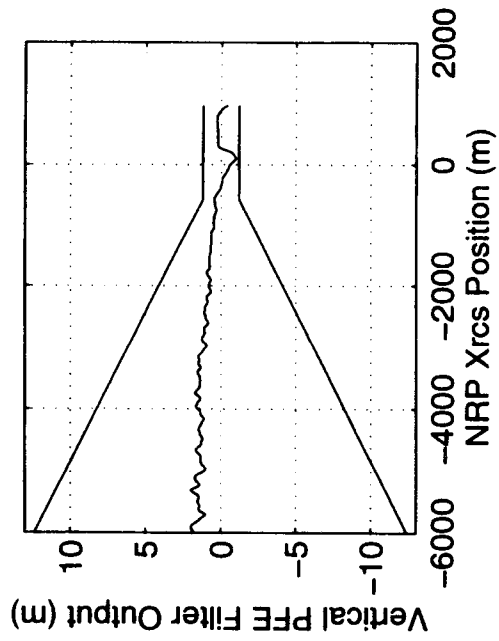
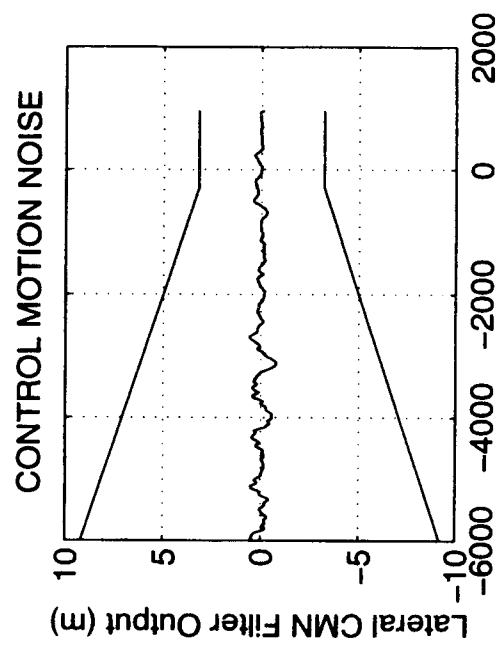
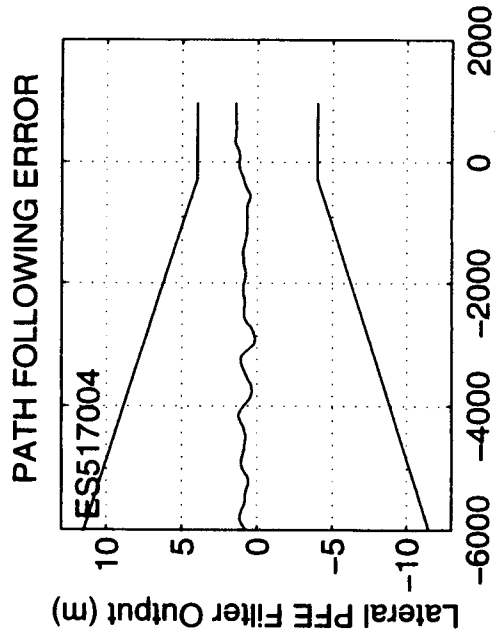
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.825  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.728  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.867

NRP Xrcs 2-RMS DIFFERENCE (m): 1.290  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.306  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.869

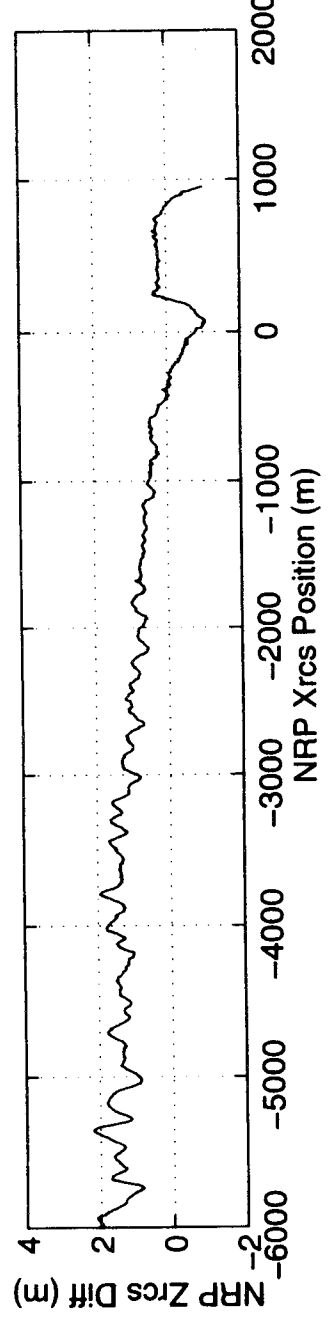
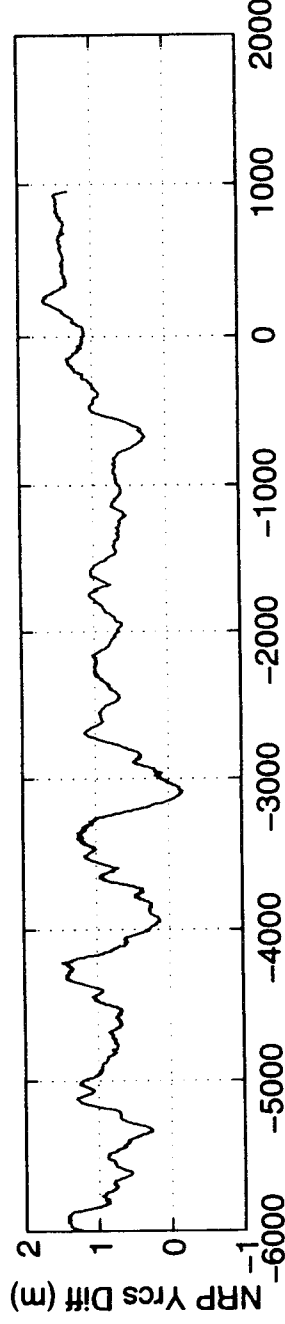
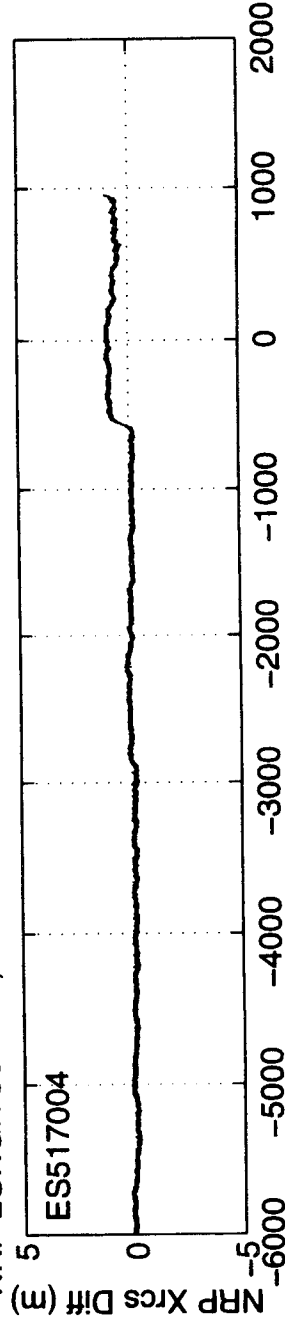
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 202.584  
LGRP Yrcs POSITION (m): -1.823





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517005  
START TIME: 148593.990  
STOP TIME: 148750.396

MINIMUM HDOP: 0.9  
MAXIMUM HDOP: 0.9  
AVERAGE HDOP: 0.9

MINIMUM VDOP: 4.2  
MAXIMUM VDOP: 4.5  
AVERAGE VDOP: 4.4

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

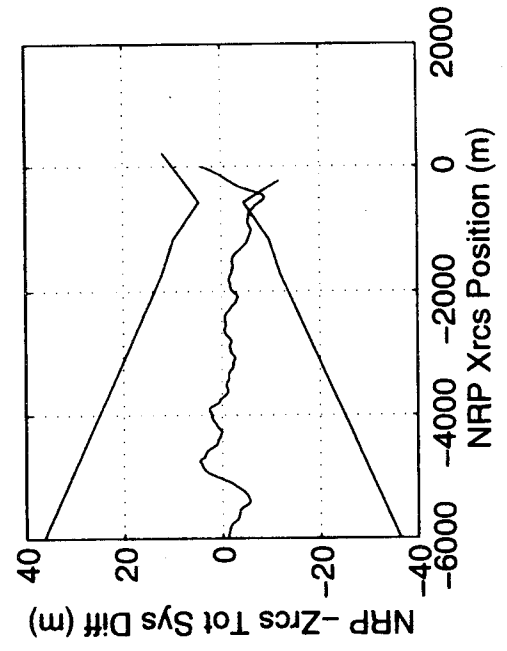
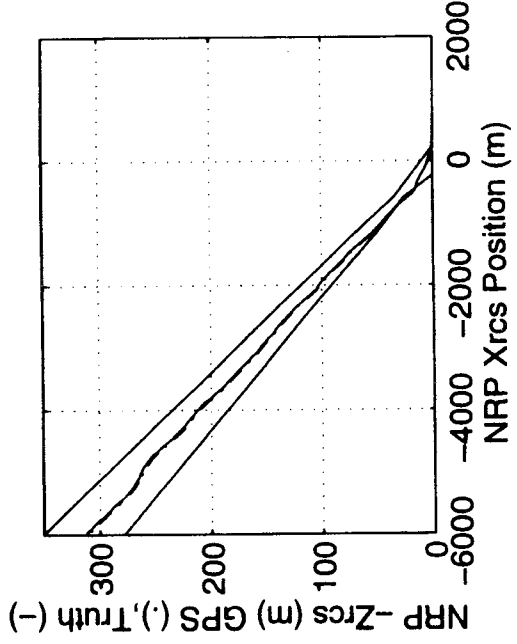
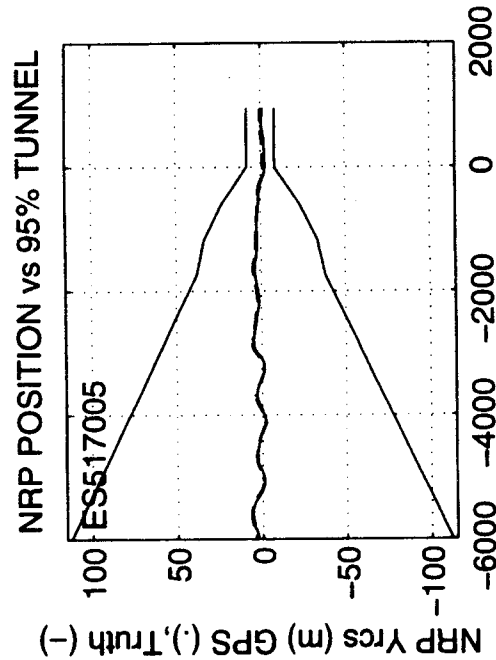
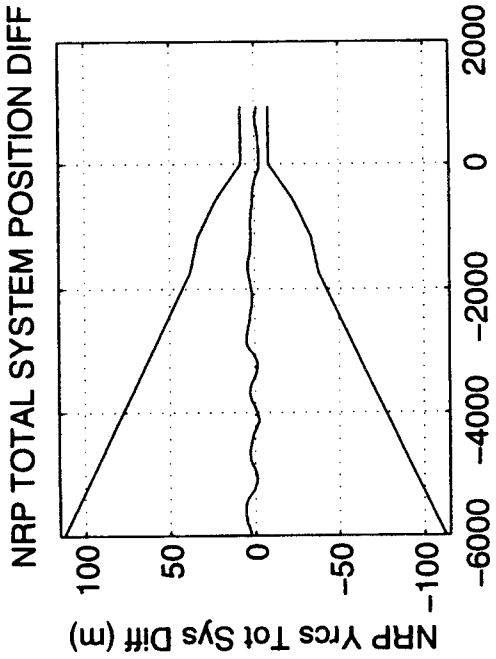
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NRP Xrcs MEAN DIFFERENCE (m): 0.636  
NRP Yrcs MEAN DIFFERENCE (m): 1.077  
NRP Zrcs MEAN DIFFERENCE (m): 0.174

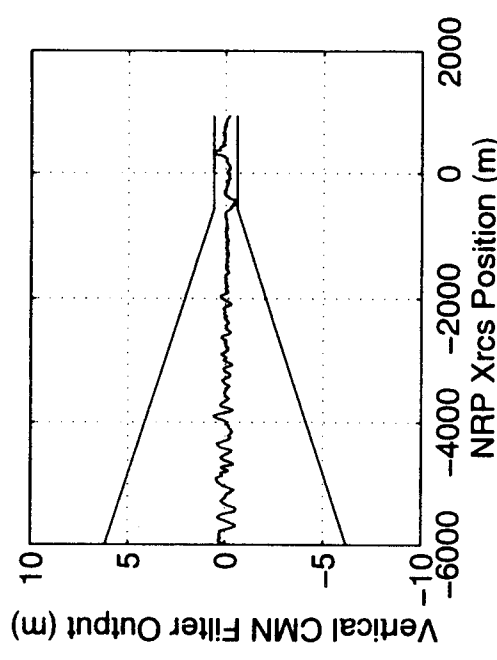
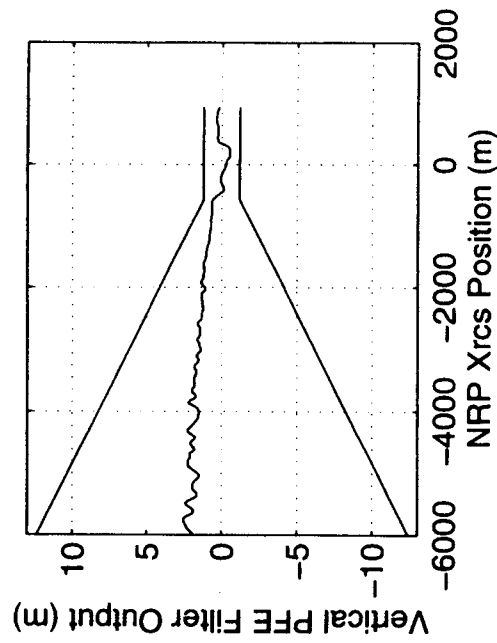
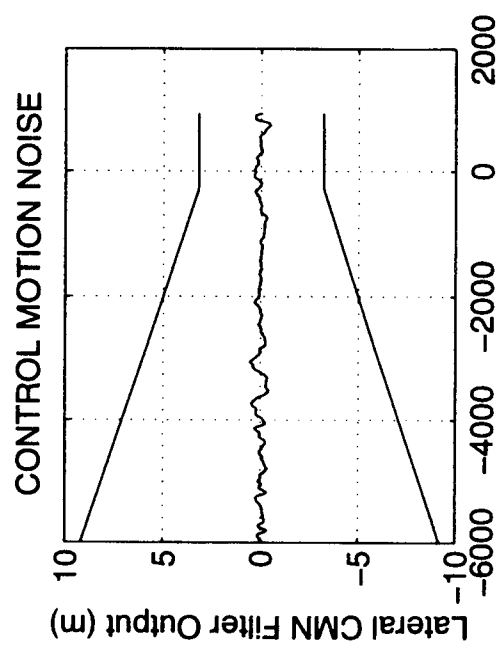
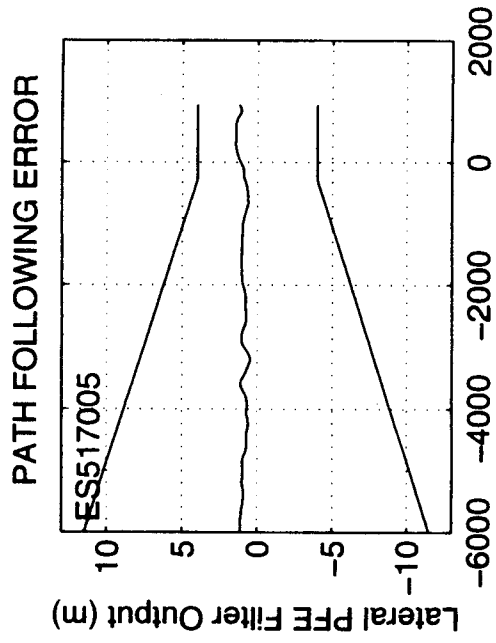
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.956  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.665  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.791

NRP Xrcs 2-RMS DIFFERENCE (m): 1.591  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.255  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.864

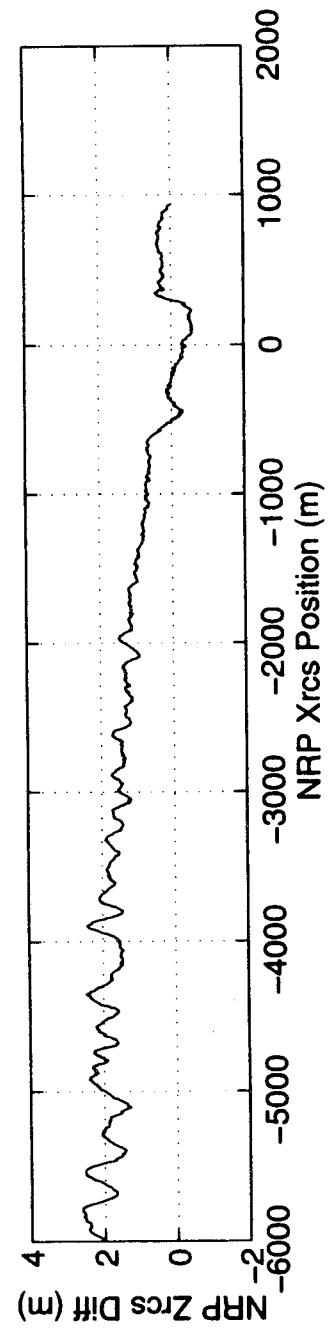
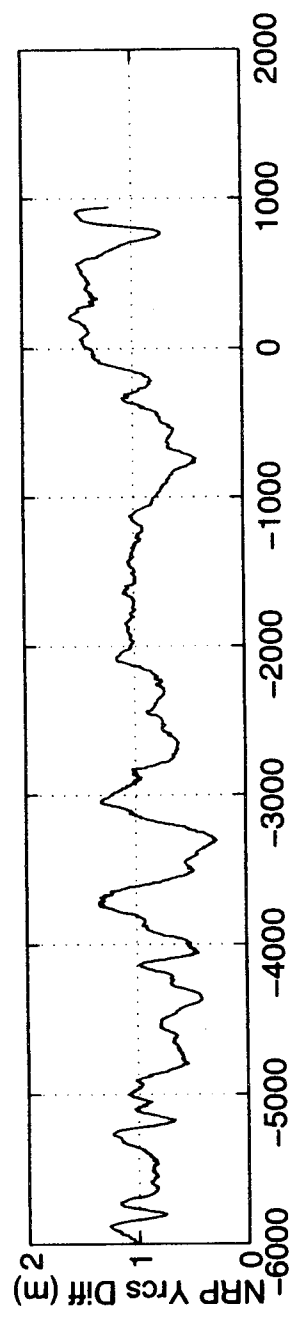
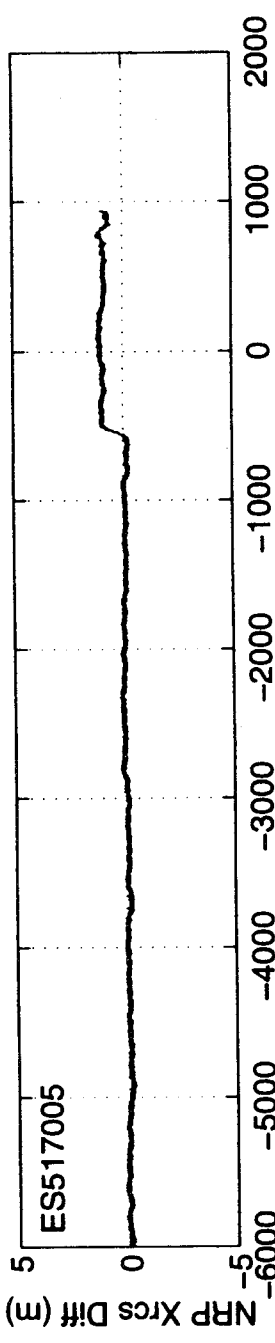
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

-----  
LGRP Xrcs POSITION (m): 250.487  
LGRP Yrcs POSITION (m): -2.010





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES





APPROACH #: ES517006  
START TIME: 149289.726  
STOP TIME: 149445.792

MINIMUM HDOP: 1.0  
MAXIMUM HDOP: 1.0  
AVERAGE HDOP: 1.0

MINIMUM VDOP: 8.0  
MAXIMUM VDOP: 8.6  
AVERAGE VDOP: 8.3

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

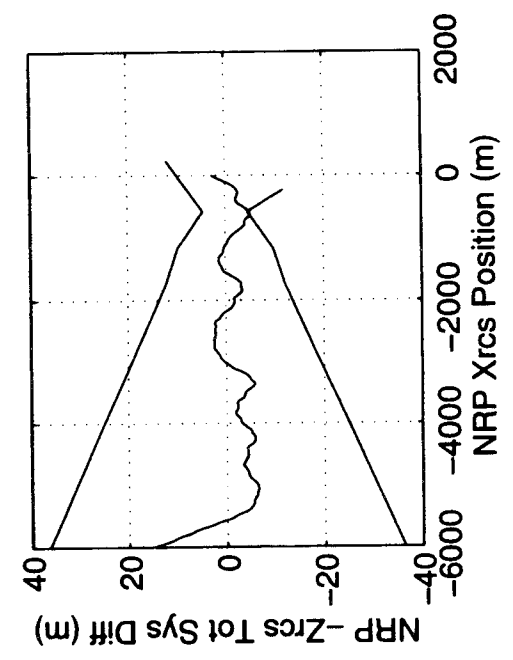
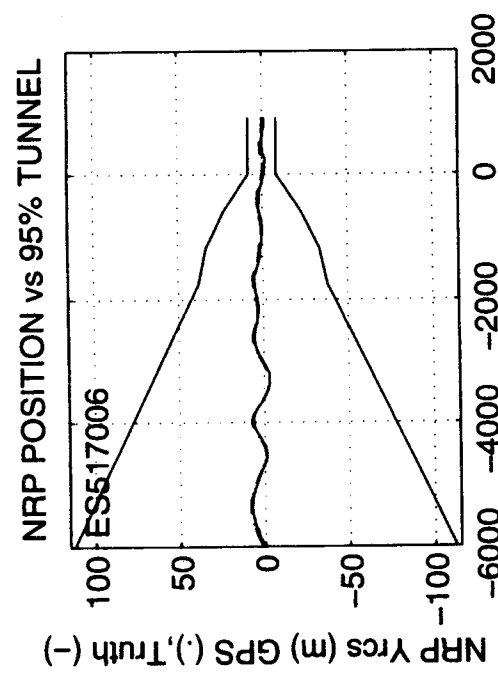
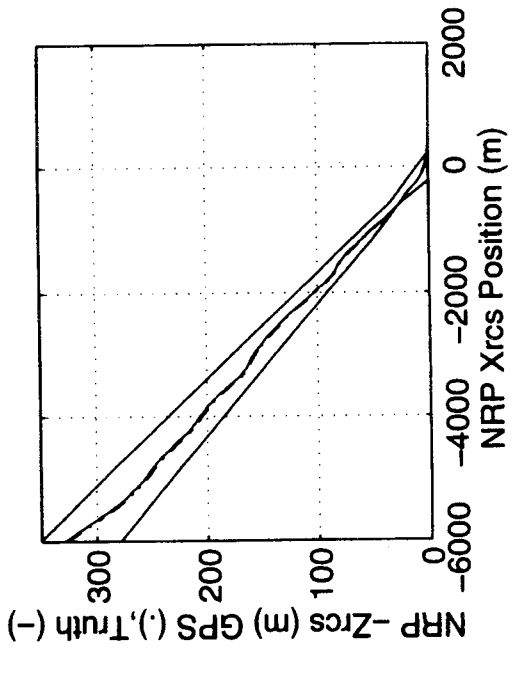
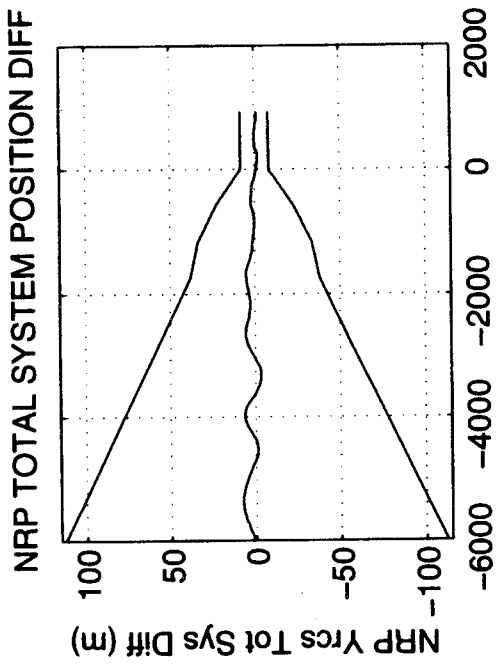
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NRP Xrcs MEAN DIFFERENCE (m): 0.472  
NRP Yrcs MEAN DIFFERENCE (m): 1.019  
NRP Zrcs MEAN DIFFERENCE (m): 0.174

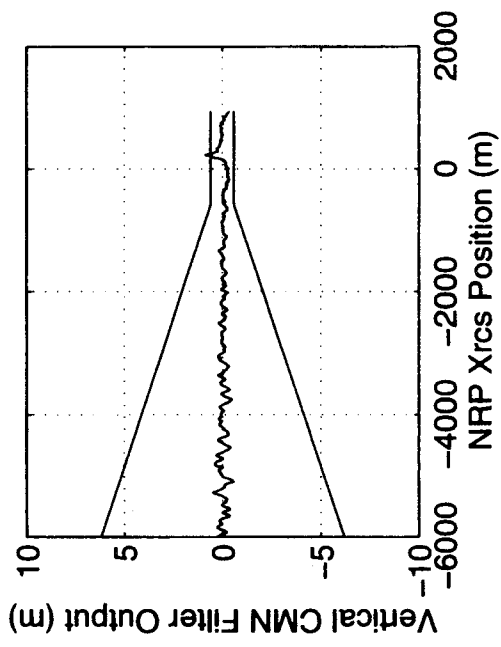
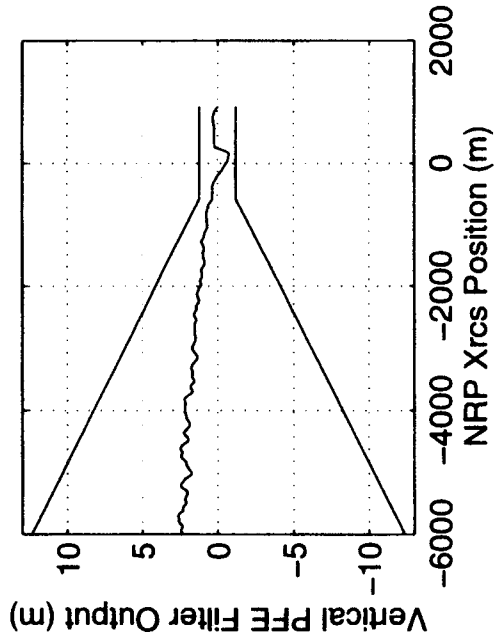
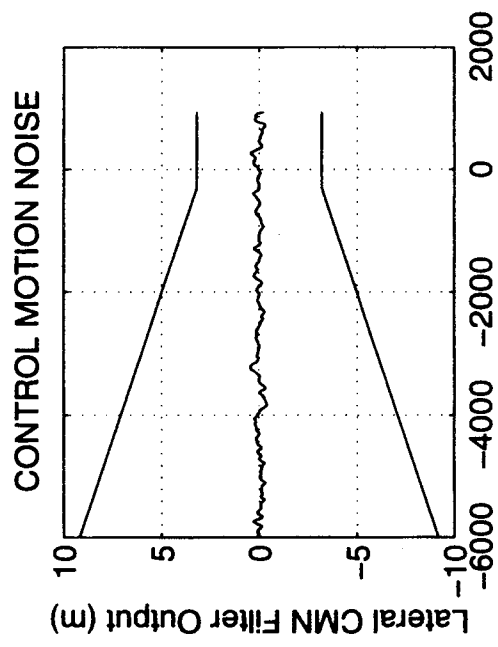
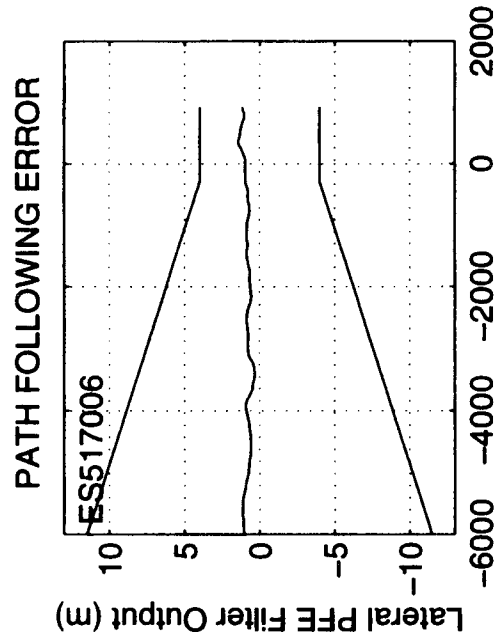
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.884  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.506  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.852

NRP Xrcs 2-RMS DIFFERENCE (m): 1.293  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.100  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.921

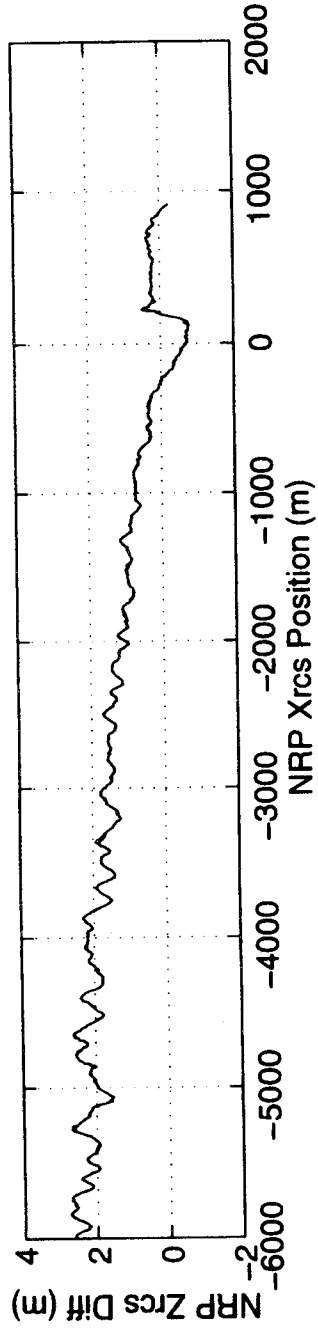
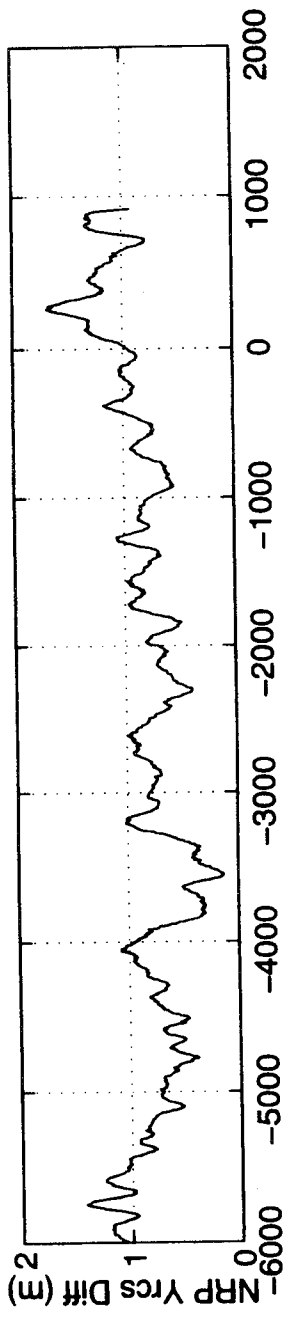
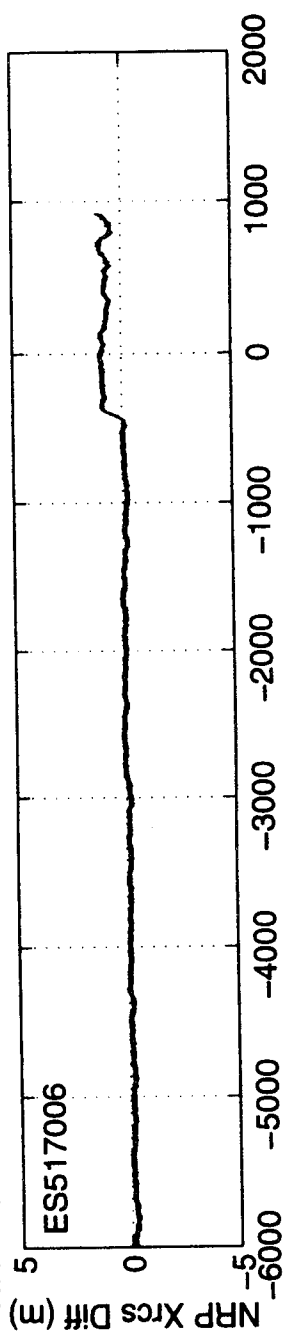
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 177.703  
LGRP Yrcs POSITION (m): -1.187





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517007  
START TIME: 149949.979  
STOP TIME: 150115.111

MINIMUM HDOP: 0.8  
MAXIMUM HDOP: 0.9  
AVERAGE HDOP: 0.9

MINIMUM VDOP: 6.4  
MAXIMUM VDOP: 7.2  
AVERAGE VDOP: 6.9

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
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\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

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TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
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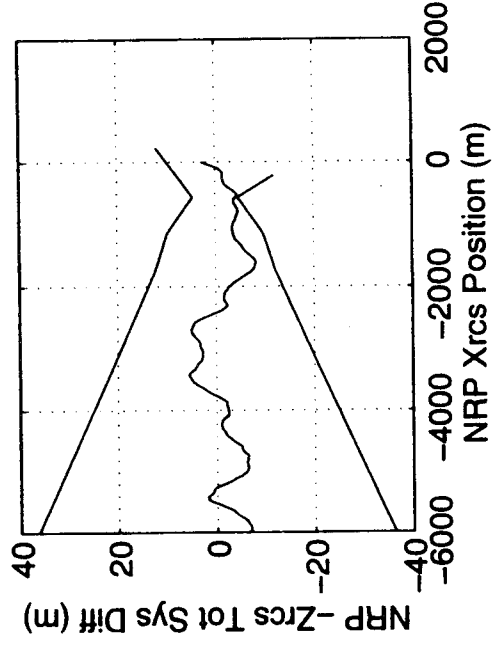
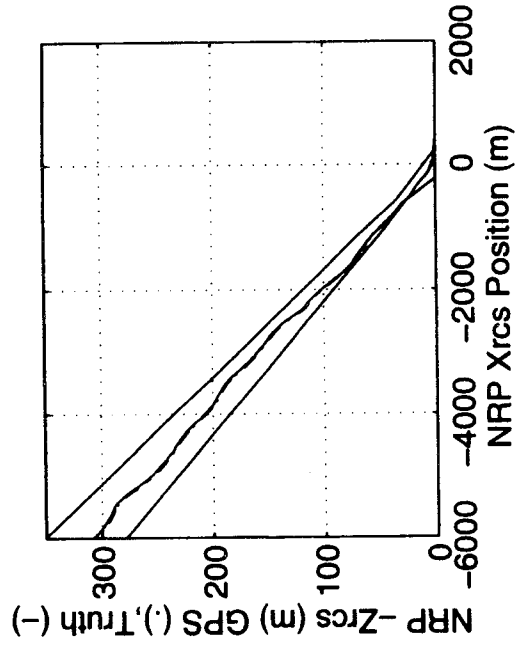
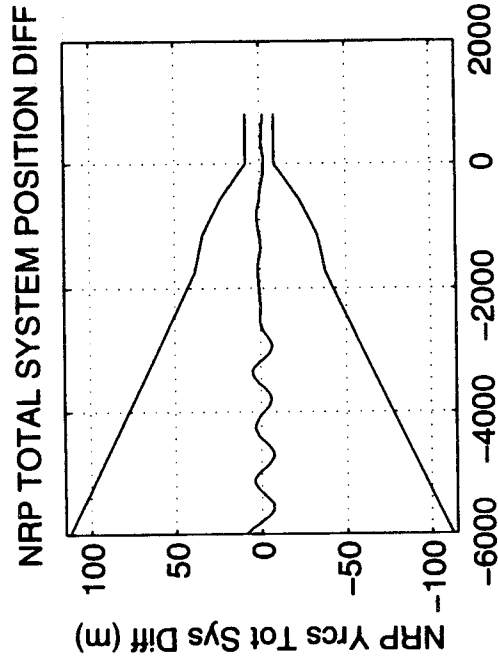
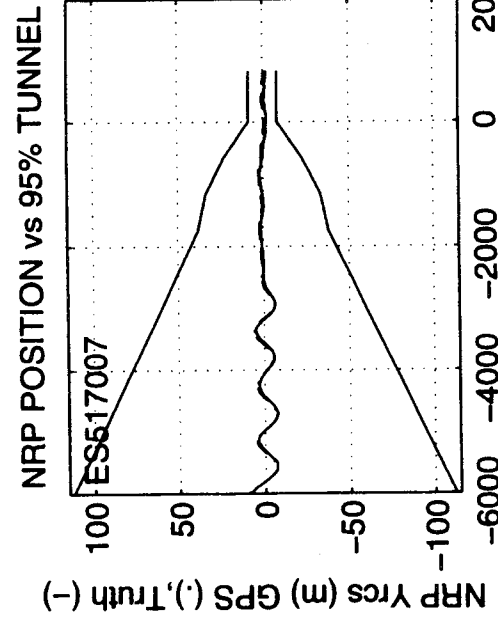
NRP Xrcs MEAN DIFFERENCE (m): 0.559  
NRP Yrcs MEAN DIFFERENCE (m): 1.159  
NRP Zrcs MEAN DIFFERENCE (m): 0.193

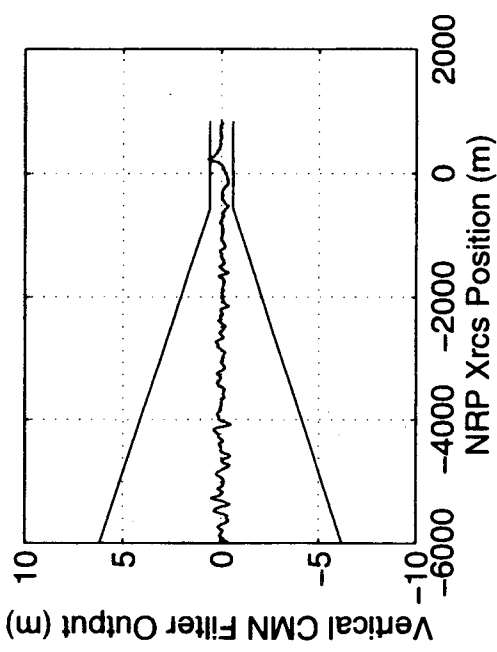
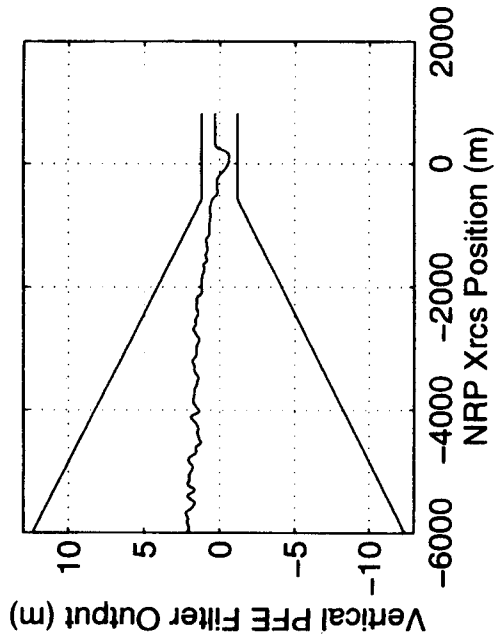
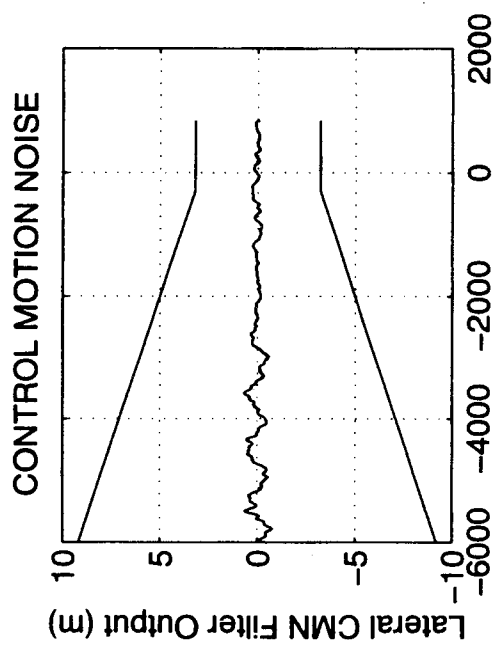
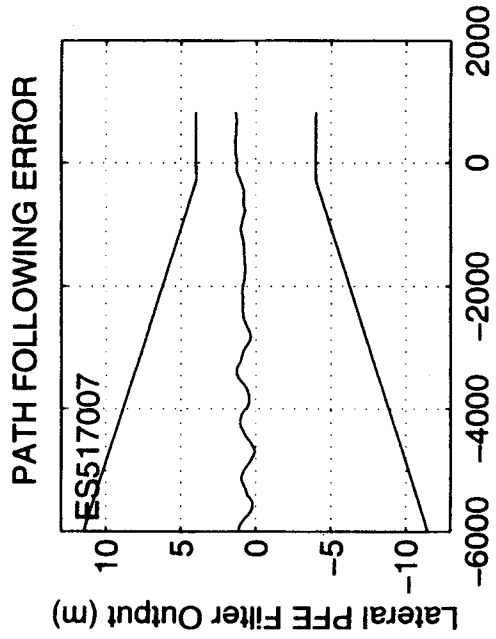
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.917  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.514  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.814

NRP Xrcs 2-RMS DIFFERENCE (m): 1.446  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.373  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.901

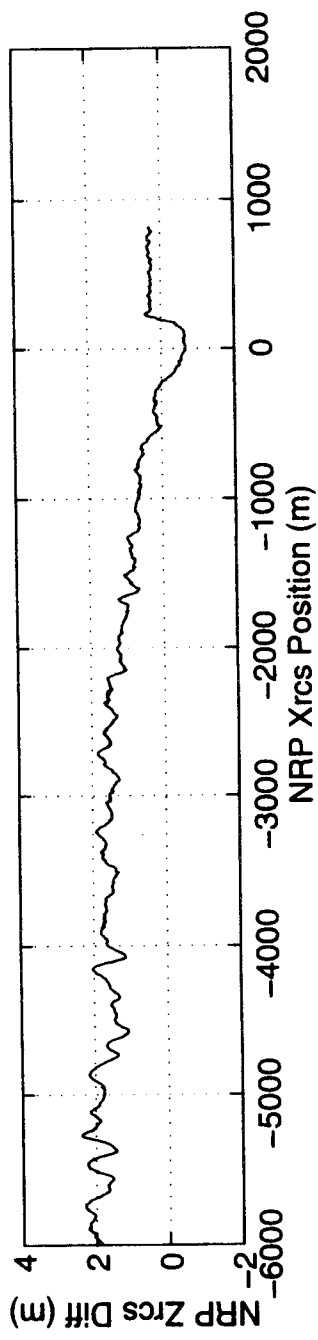
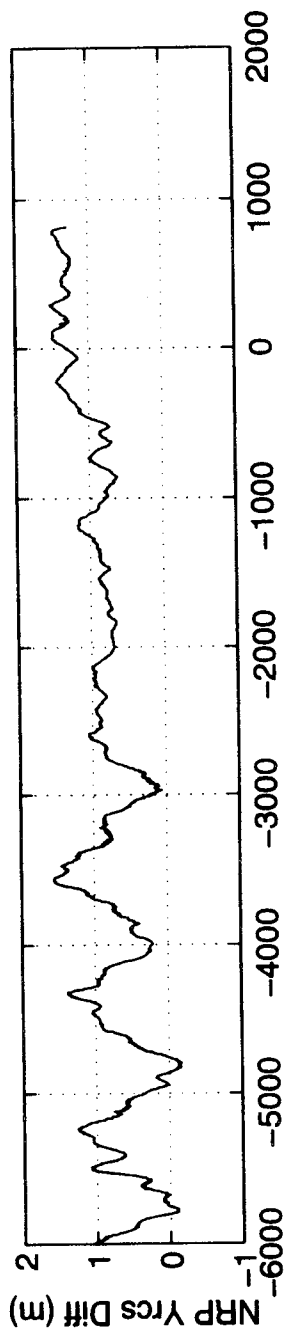
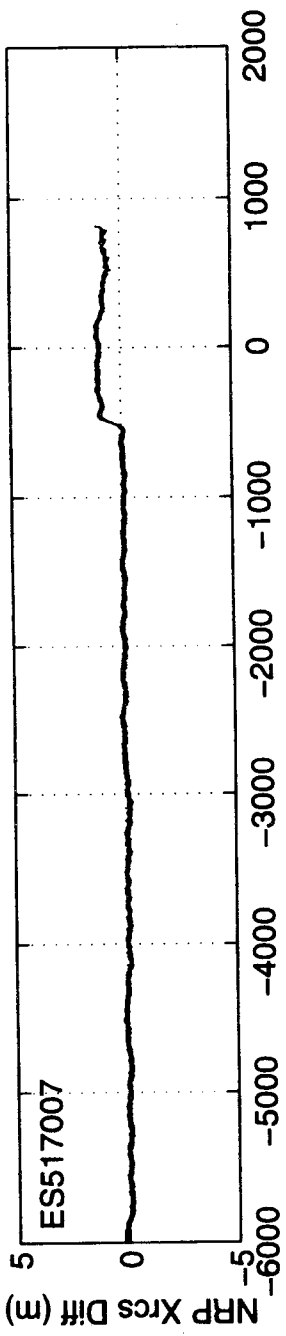
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----

LGRP Xrcs POSITION (m): 143.952  
LGRP Yrcs POSITION (m): -1.449





NRP LONGITUDINAL, LATERAL AND VERTICAL POSITION DIFFERENCES





APPROACH #: ES517008  
START TIME: 150595.264  
STOP TIME: 150760.330

MINIMUM HDOP: 0.8  
MAXIMUM HDOP: 0.8  
AVERAGE HDOP: 0.8

MINIMUM VDOP: 4.7  
MAXIMUM VDOP: 5.4  
AVERAGE VDOP: 5.0

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

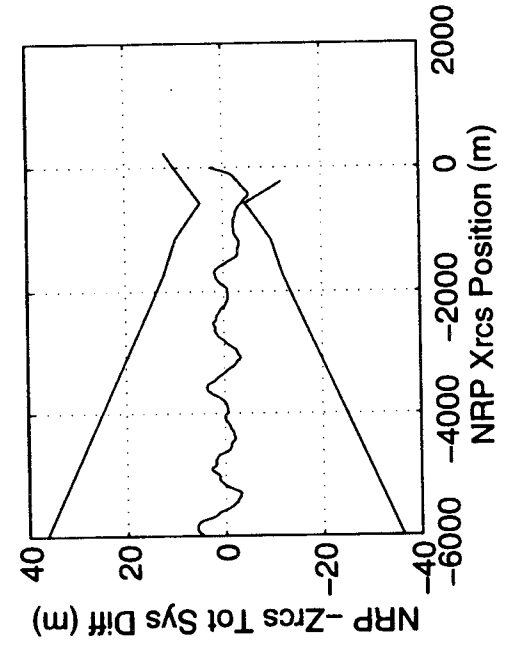
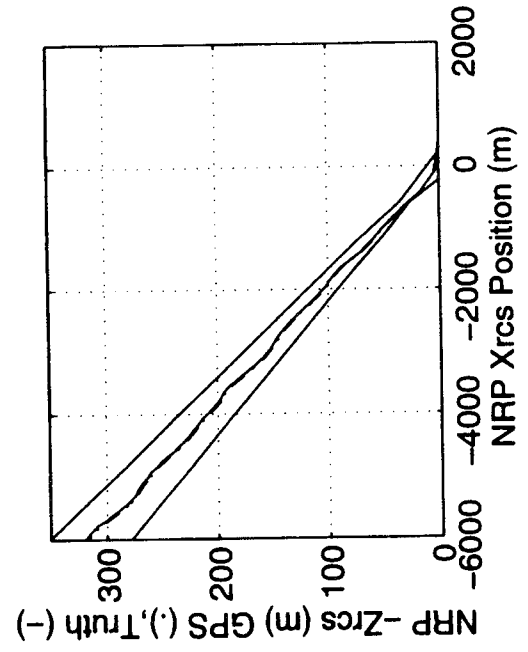
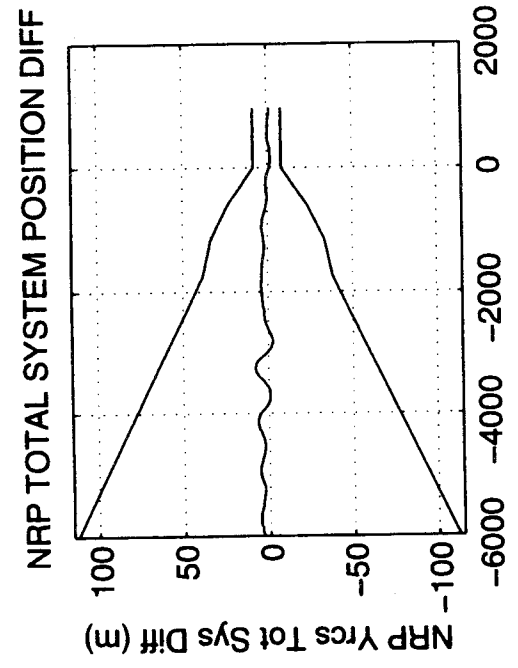
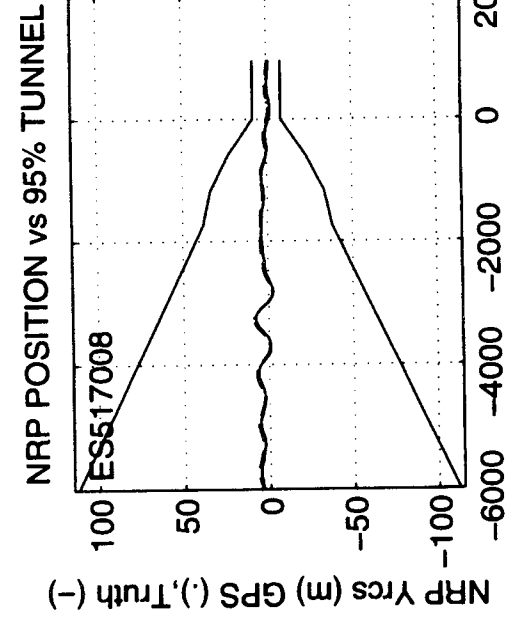
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.488  
NRP Yrcs MEAN DIFFERENCE (m): 1.028  
NRP Zrcs MEAN DIFFERENCE (m): 0.241

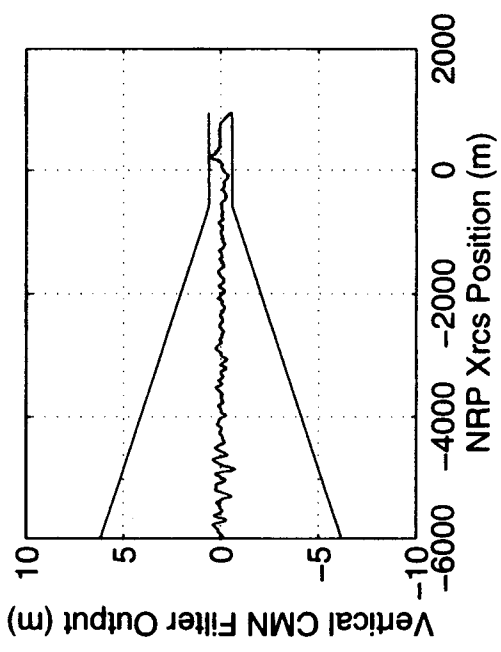
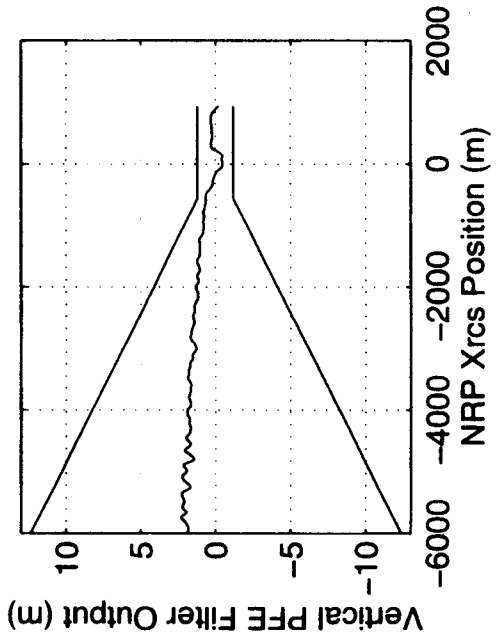
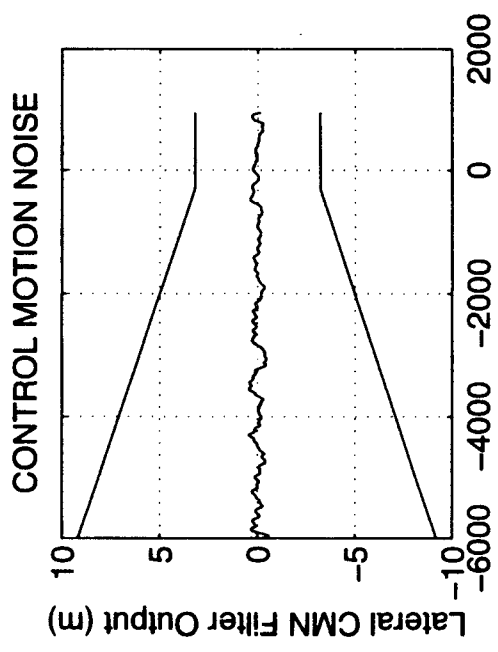
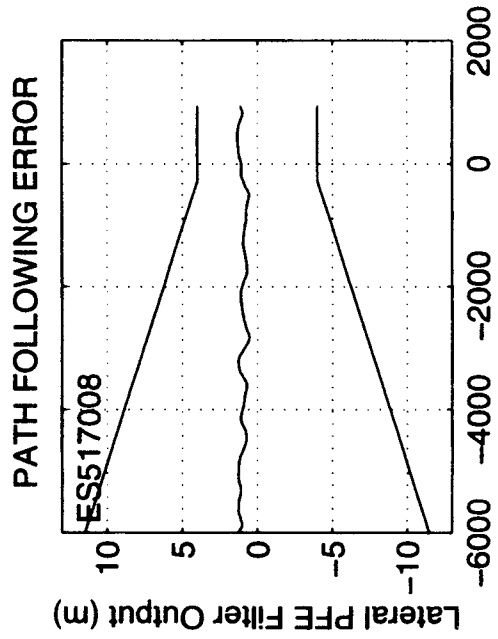
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.839  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.551  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.811

NRP Xrcs 2-RMS DIFFERENCE (m): 1.288  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.128  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.944

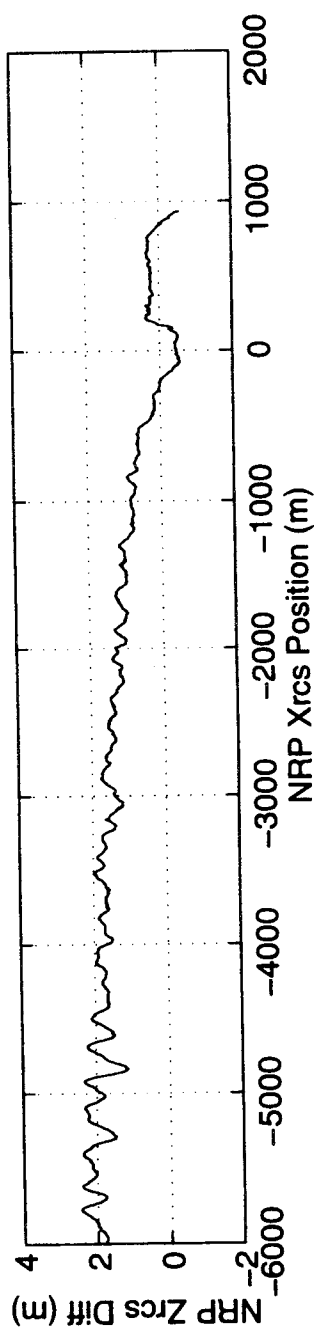
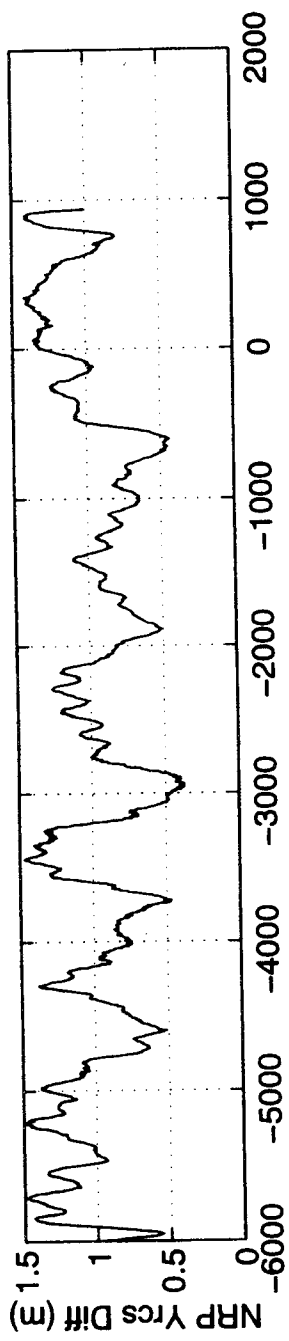
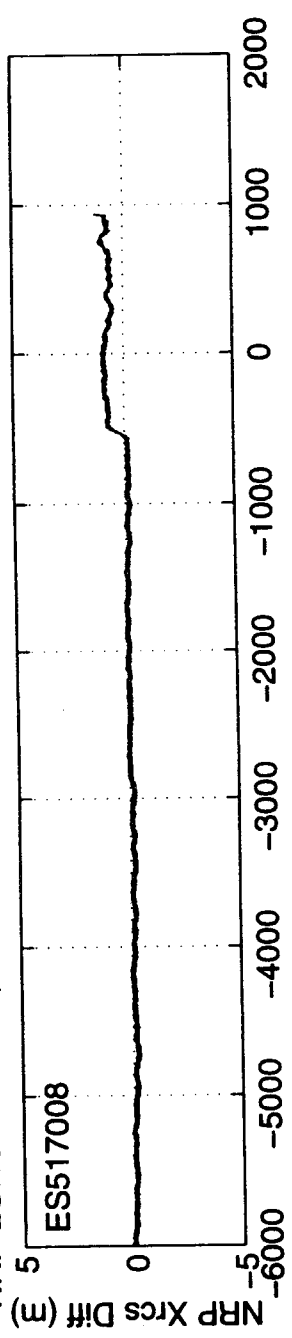
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 119.964  
LGRP Yrcs POSITION (m): -1.518





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517009  
START TIME: 151160.462  
STOP TIME: 151324.990

MINIMUM HDOP: 0.7  
MAXIMUM HDOP: 0.8  
AVERAGE HDOP: 0.8

MINIMUM VDOP: 3.6  
MAXIMUM VDOP: 3.9  
AVERAGE VDOP: 3.7

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

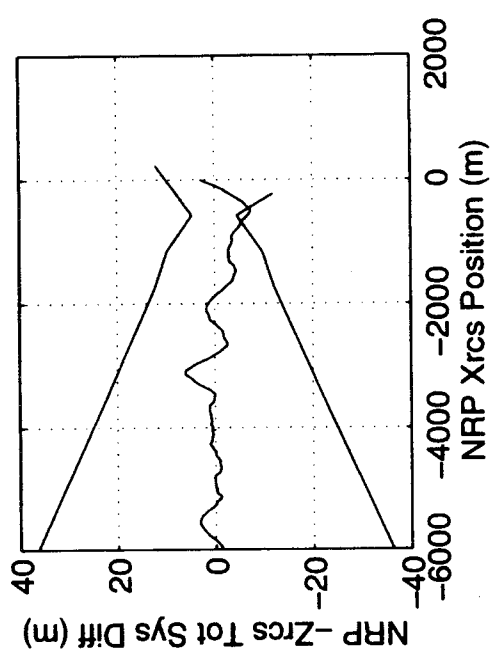
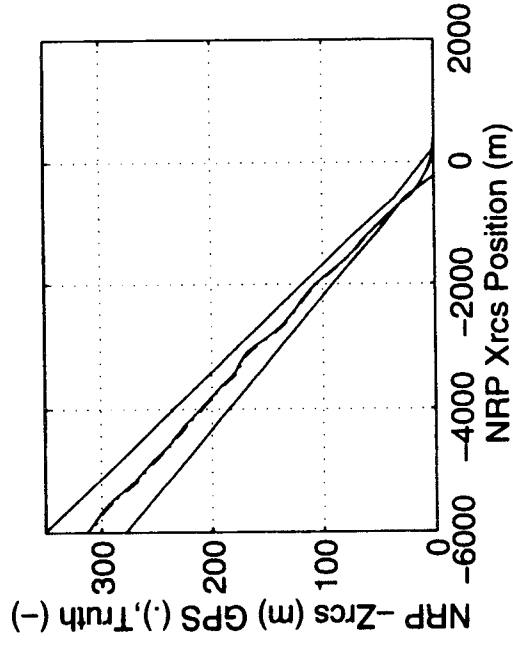
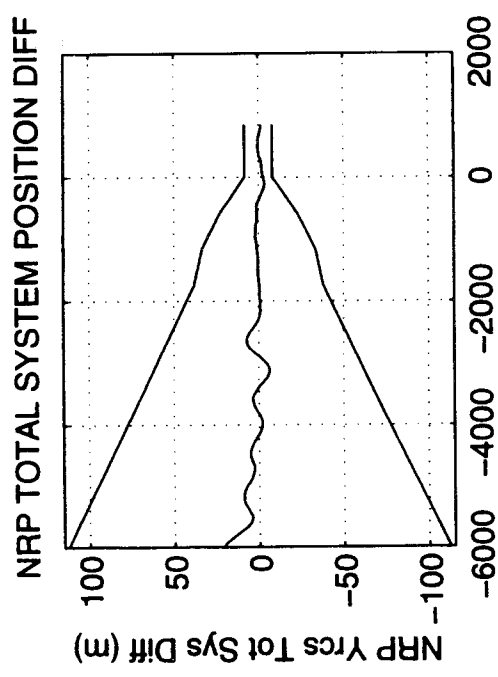
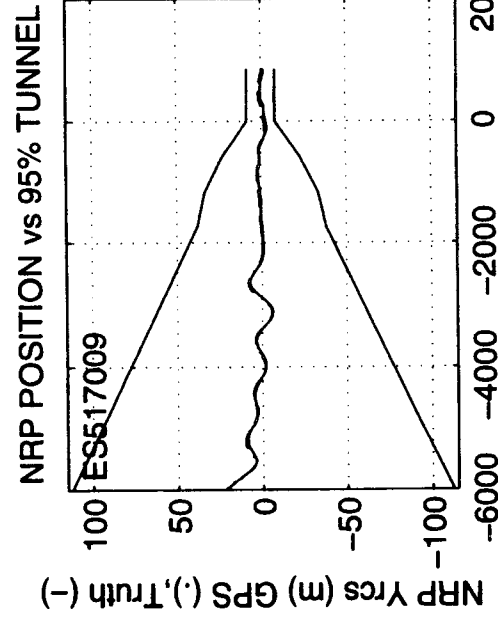
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NRP Xrcs MEAN DIFFERENCE (m): 0.288  
NRP Yrcs MEAN DIFFERENCE (m): 0.912  
NRP Zrcs MEAN DIFFERENCE (m): 0.227

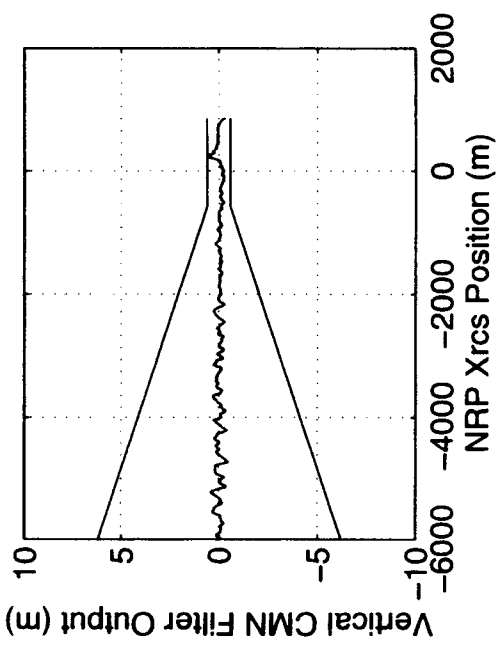
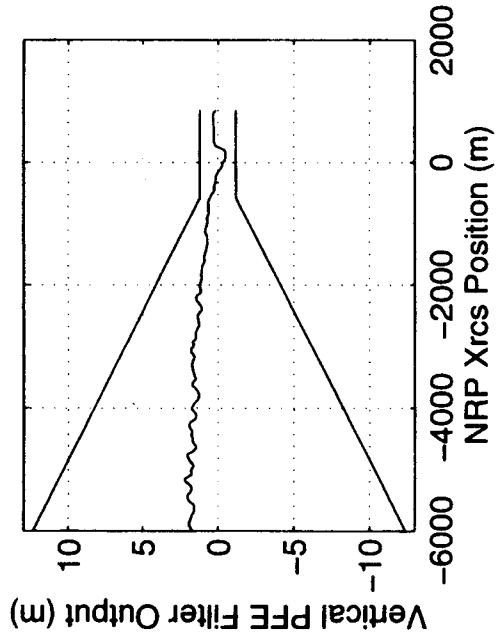
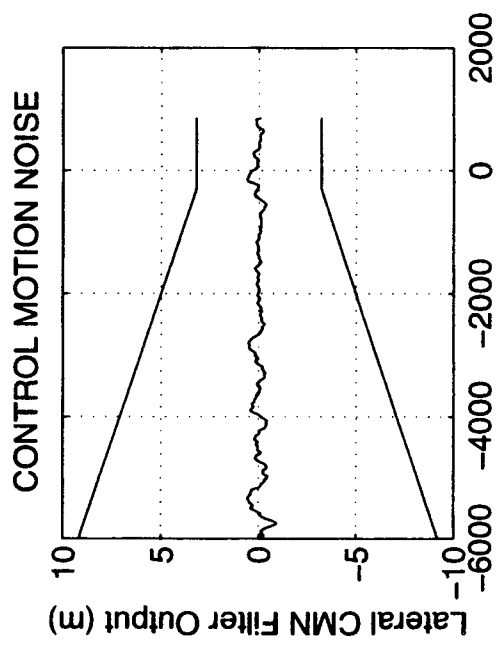
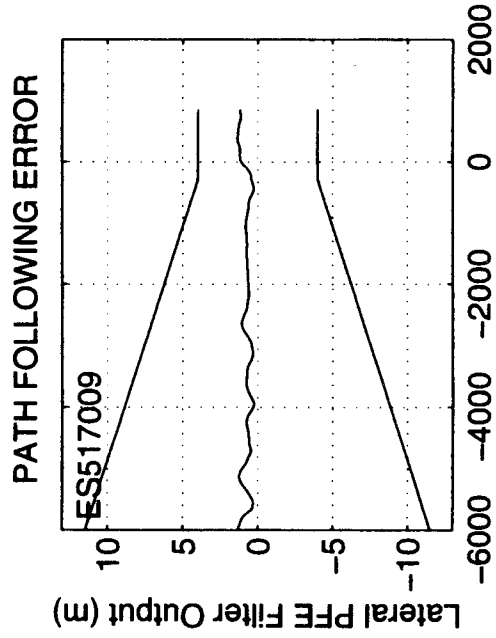
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.829  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.791  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.750

NRP Xrcs 2-RMS DIFFERENCE (m): 1.010  
NRP Yrcs 2-RMS DIFFERENCE (m): 1.989  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.876

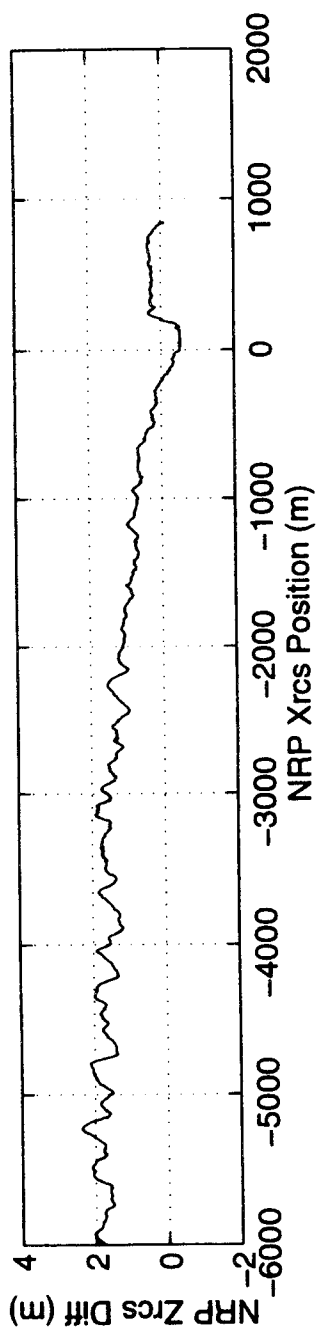
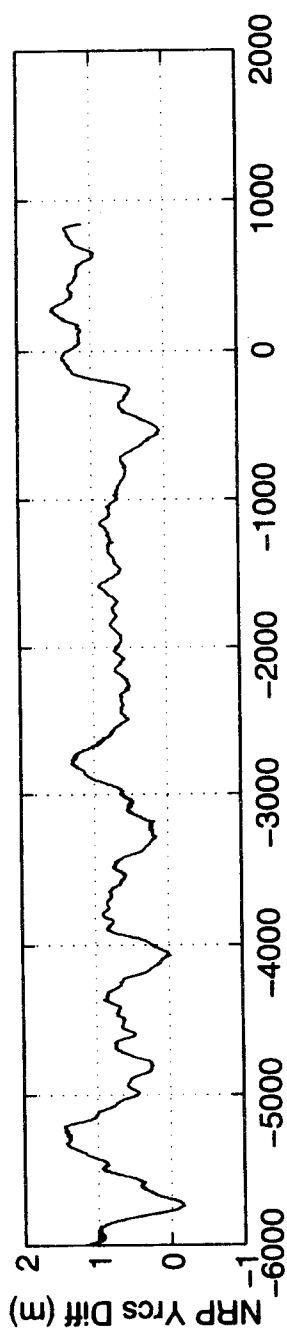
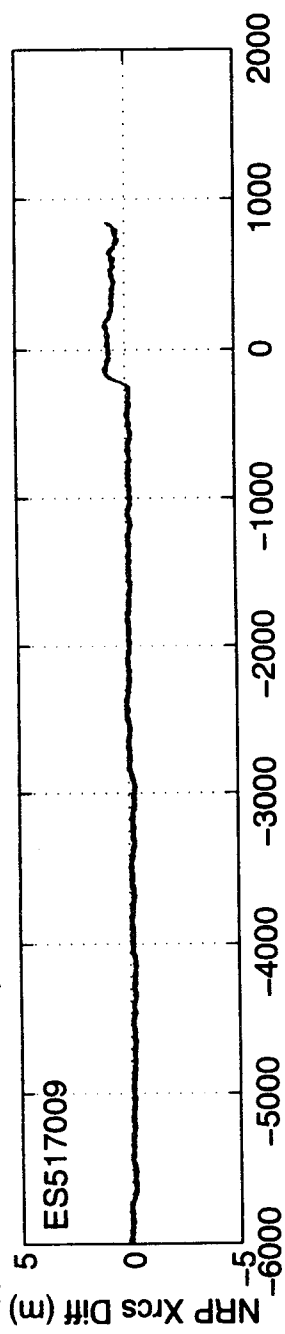
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 191.918  
LGRP Yrcs POSITION (m): -1.342





NRP LONGITUDINAL, LATERAL AND VERTICAL POSITION DIFFERENCES





APPROACH #: ES517010  
START TIME: 151715.385  
STOP TIME: 151880.990

MINIMUM HDOP: 0.8  
MAXIMUM HDOP: 0.8  
AVERAGE HDOP: 0.8

MINIMUM VDOP: 2.7  
MAXIMUM VDOP: 3.0  
AVERAGE VDOP: 2.8

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

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TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
-----

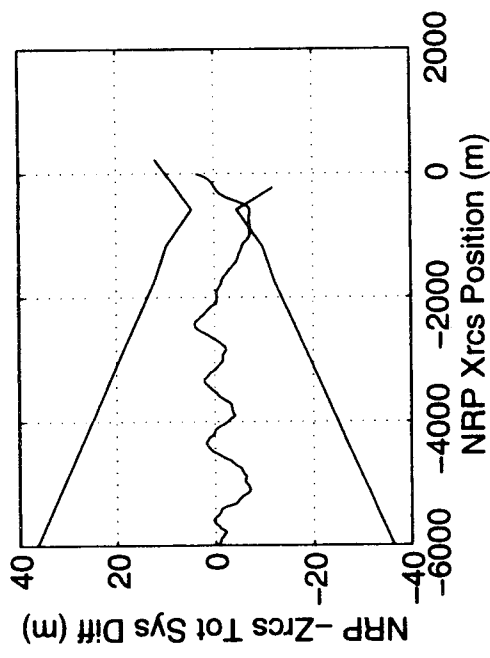
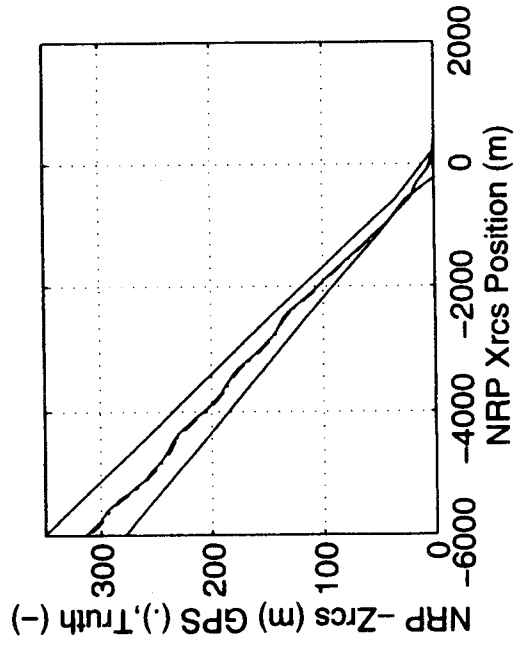
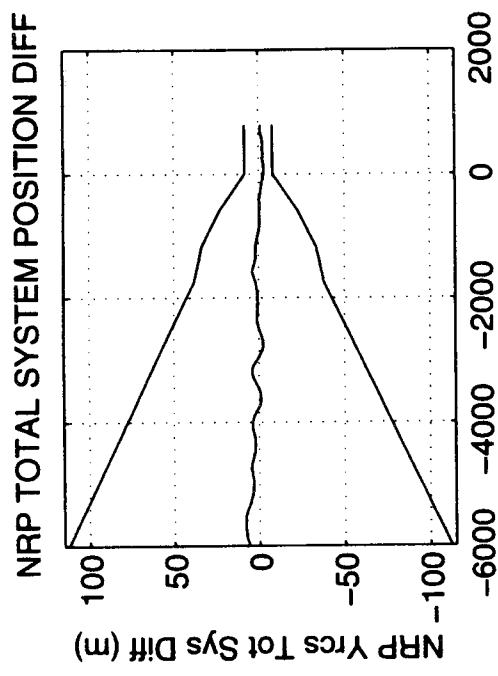
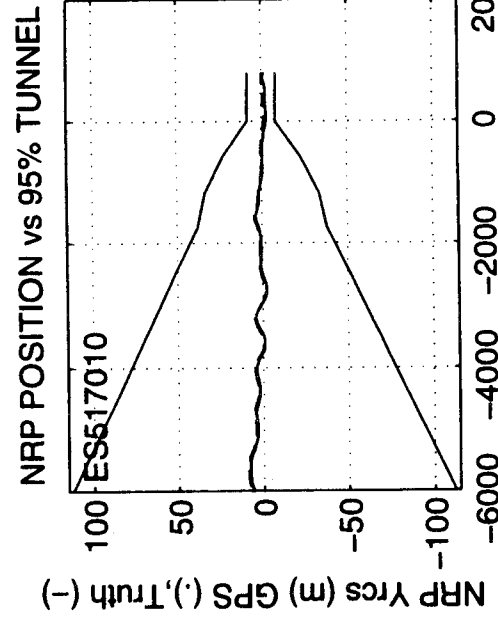
NRP Xrcs MEAN DIFFERENCE (m): 0.309  
NRP Yrcs MEAN DIFFERENCE (m): 1.018  
NRP Zrcs MEAN DIFFERENCE (m): 0.286

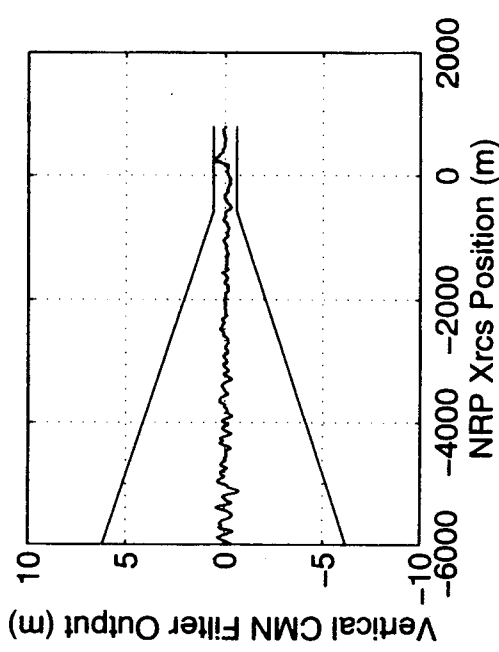
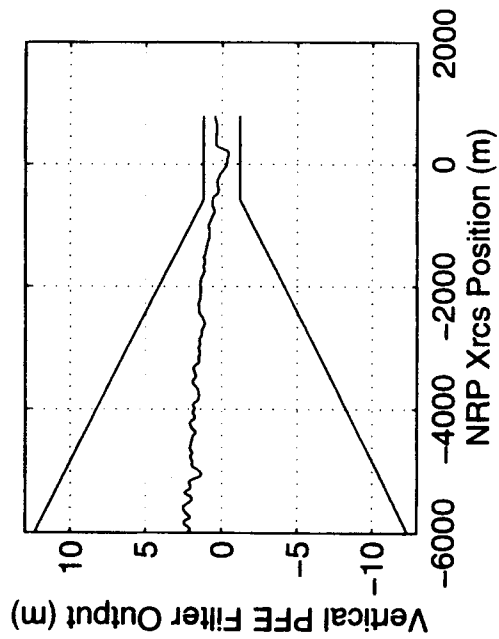
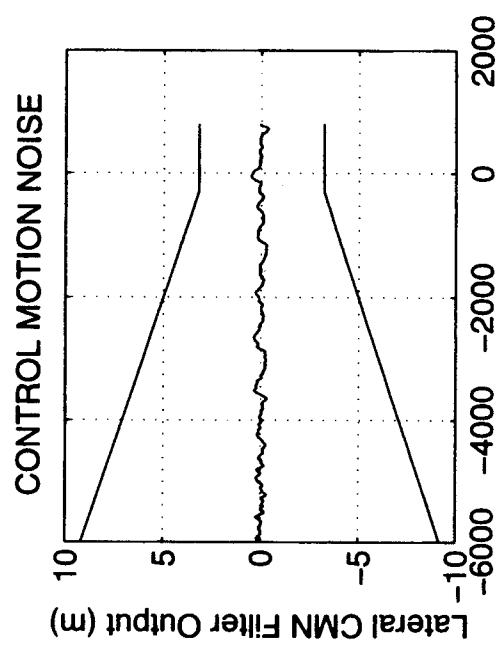
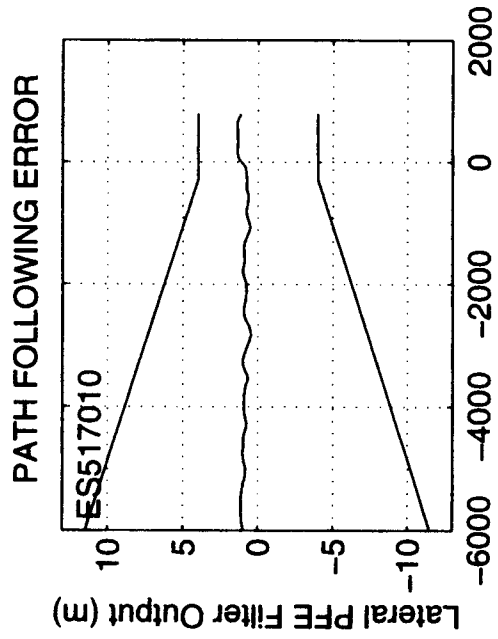
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.887  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.670  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.722

NRP Xrcs 2-RMS DIFFERENCE (m): 1.081  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.144  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.922

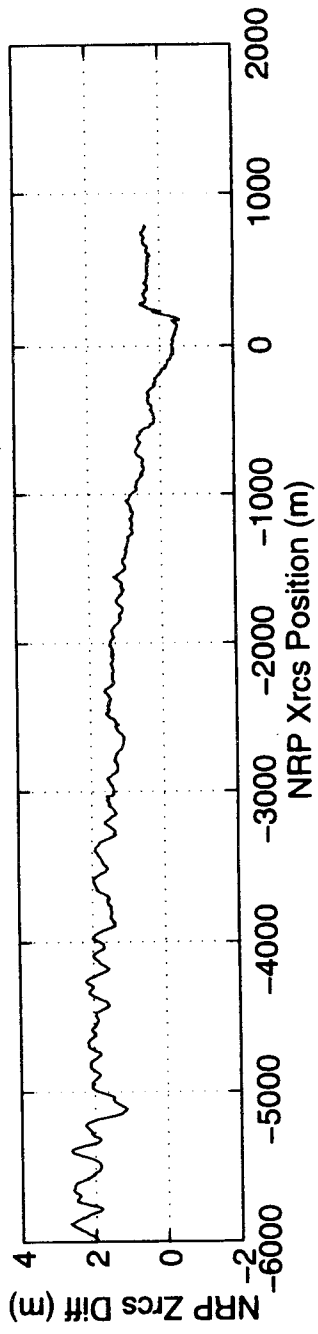
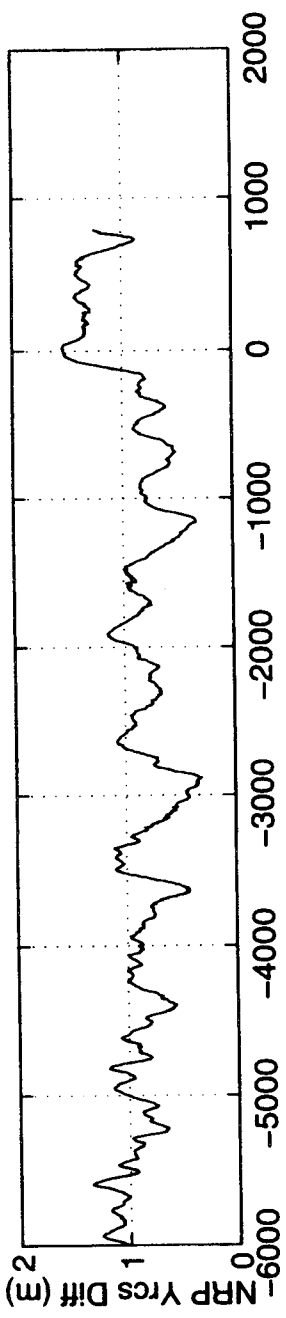
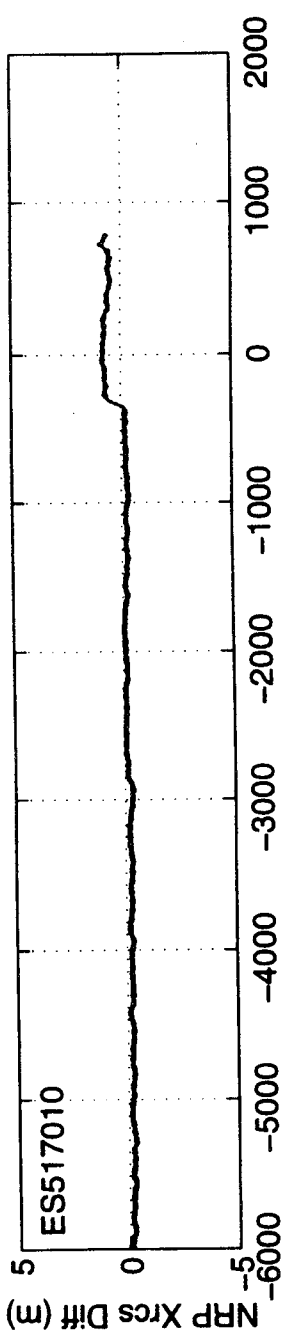
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----

LGRP Xrcs POSITION (m): 138.777  
LGRP Yrcs POSITION (m): -2.601





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517011  
START TIME: 152287.253  
STOP TIME: 152455.264

MINIMUM HDOP: 0.8  
MAXIMUM HDOP: 1.3  
AVERAGE HDOP: 1.0

MINIMUM VDOP: 2.2  
MAXIMUM VDOP: 6.2  
AVERAGE VDOP: 4.0

MINIMUM NUMBER OF SVs: 6  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

-----  
TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
-----

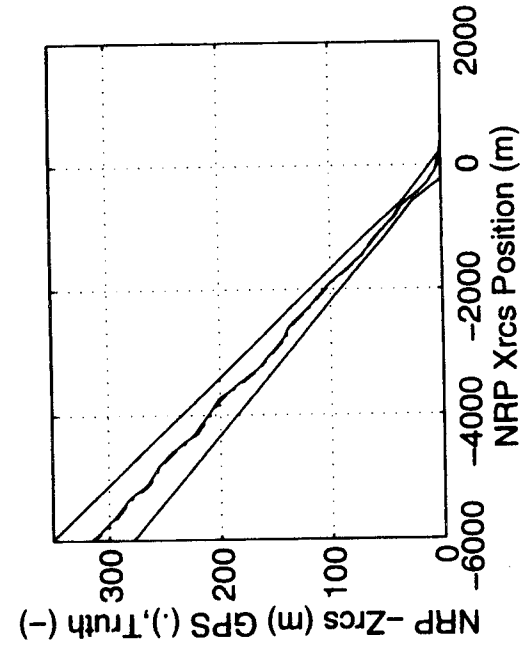
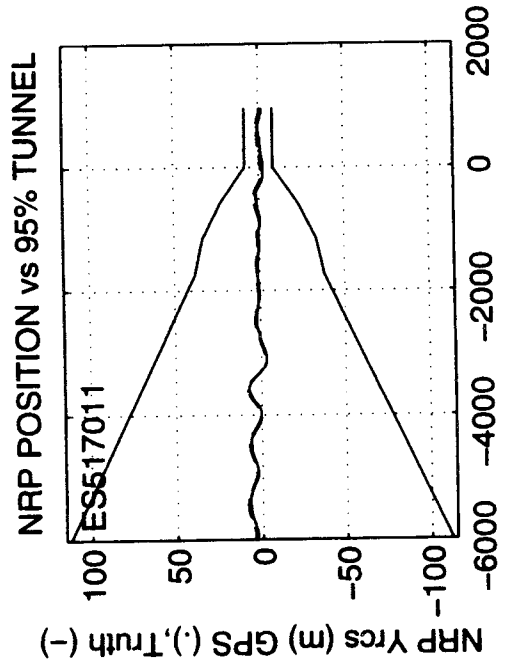
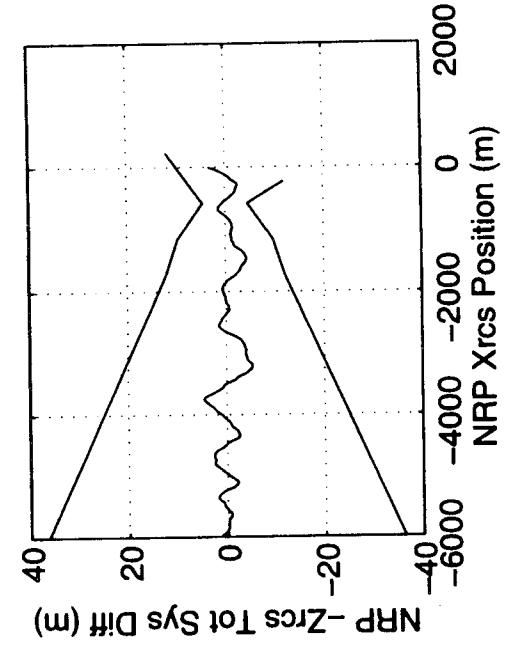
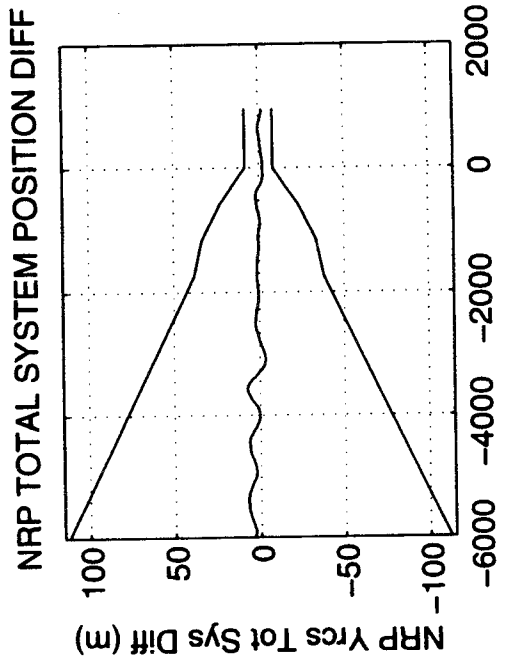
NRP Xrcs MEAN DIFFERENCE (m): 0.561  
NRP Yrcs MEAN DIFFERENCE (m): 1.207  
NRP Zrcs MEAN DIFFERENCE (m): 0.217

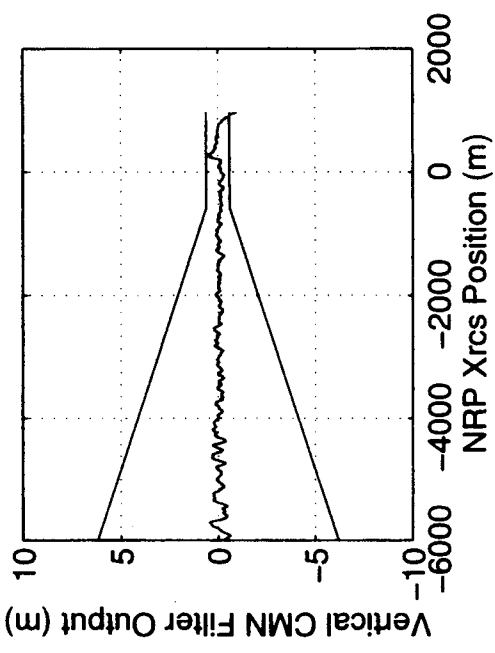
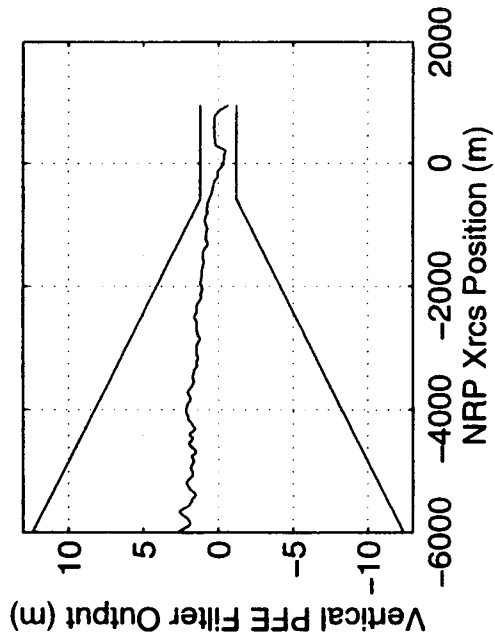
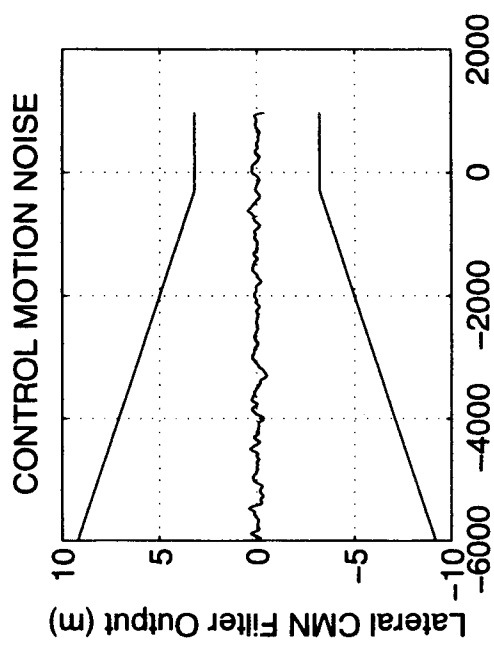
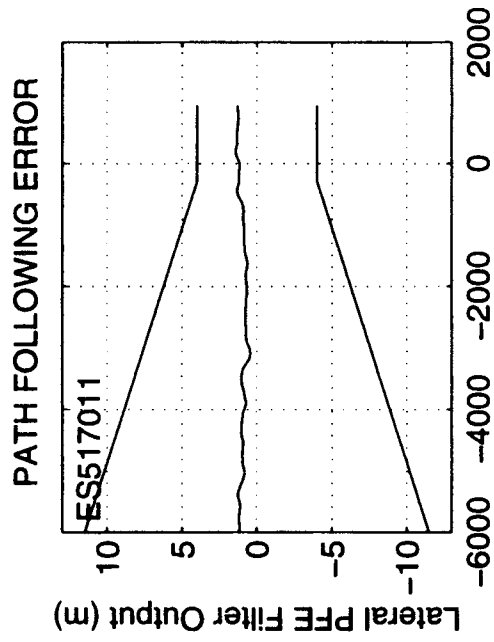
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.842  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.391  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.884

NRP Xrcs 2-RMS DIFFERENCE (m): 1.403  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.446  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.984

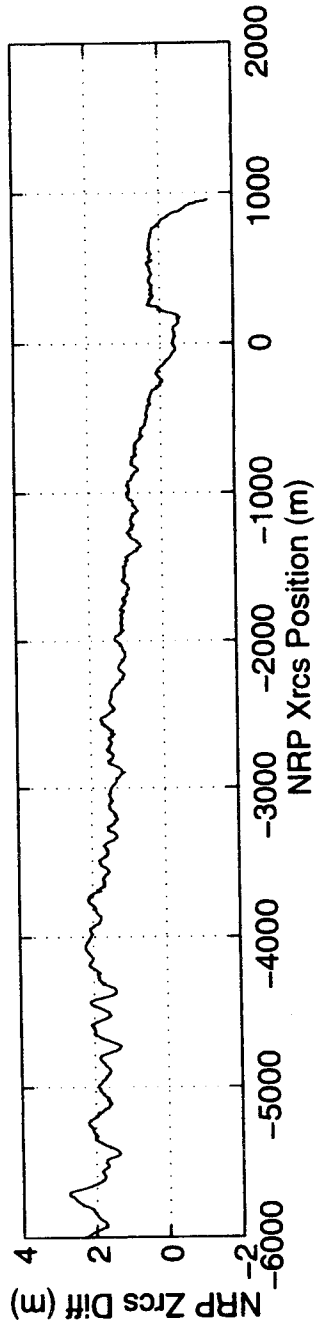
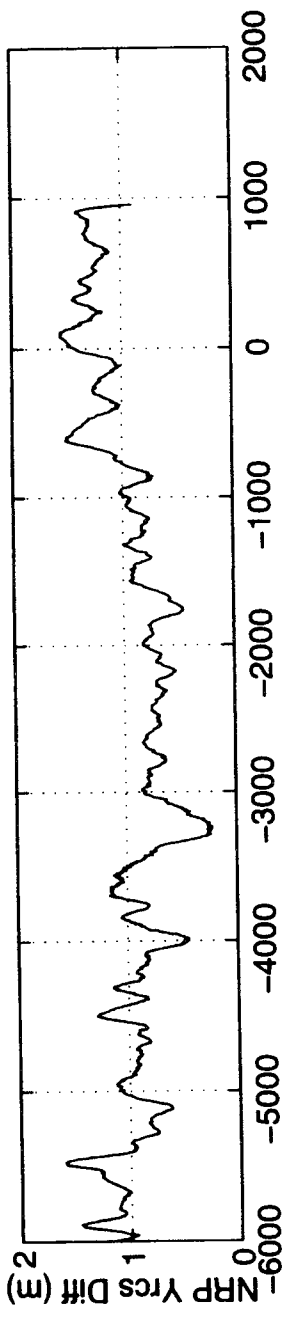
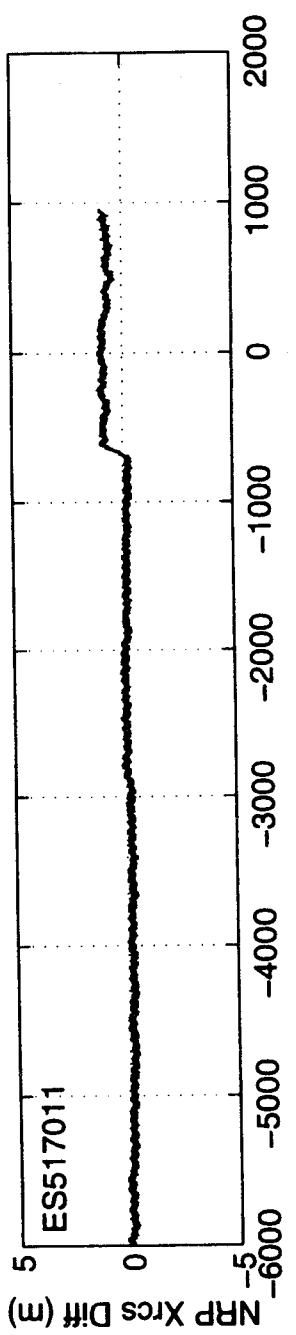
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----

LGRP Xrcs POSITION (m): 159.779  
LGRP Yrcs POSITION (m): -1.451





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES





APPROACH #: ES517012  
START TIME: 152820.462  
STOP TIME: 152991.847

MINIMUM HDOP: 1.4  
MAXIMUM HDOP: 1.4  
AVERAGE HDOP: 1.4

MINIMUM VDOP: 5.1  
MAXIMUM VDOP: 5.5  
AVERAGE VDOP: 5.4

MINIMUM NUMBER OF SVs: 6  
MAXIMUM NUMBER OF SVs: 6  
AVERAGE NUMBER OF SVs: 6

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

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TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
-----

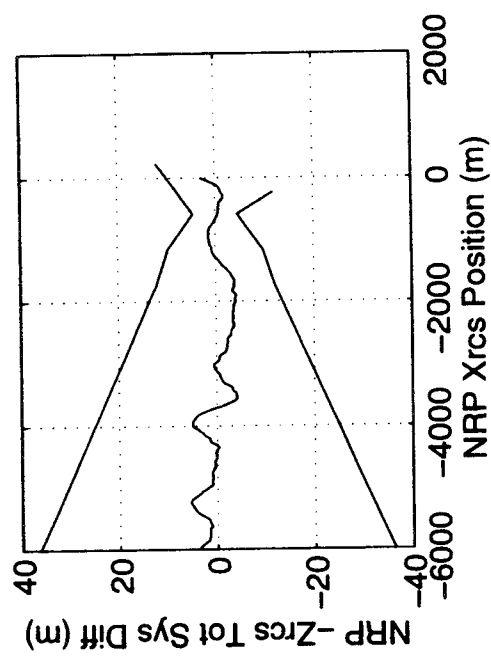
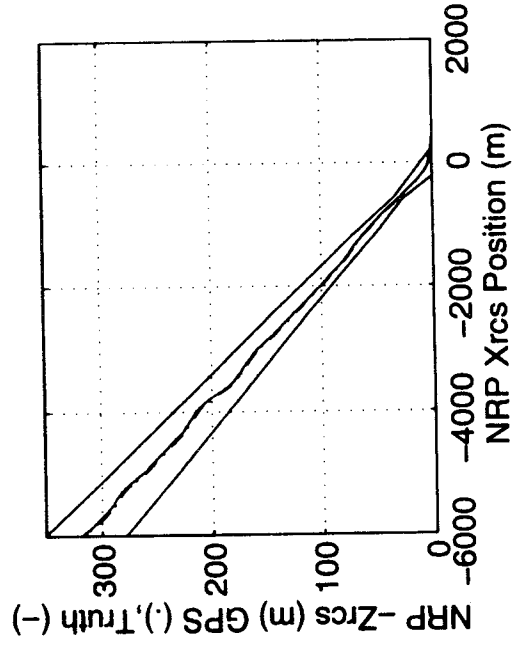
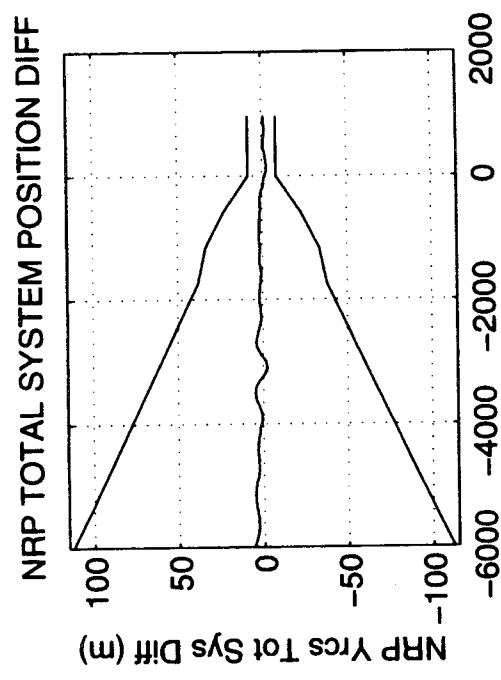
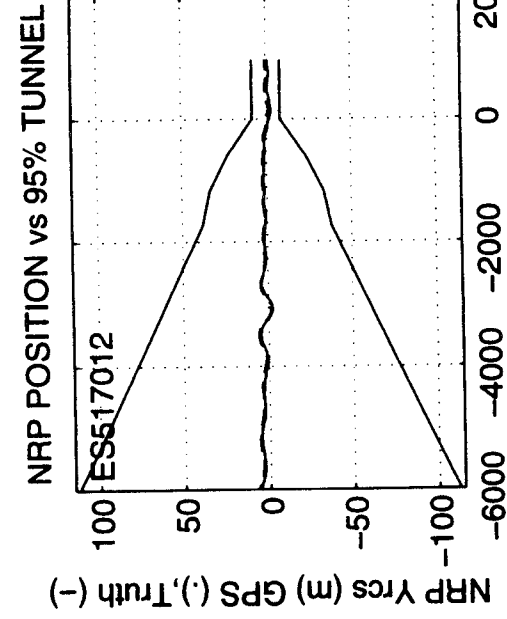
NRP Xrcs MEAN DIFFERENCE (m): 0.486  
NRP Yrcs MEAN DIFFERENCE (m): 1.177  
NRP Zrcs MEAN DIFFERENCE (m): 0.195

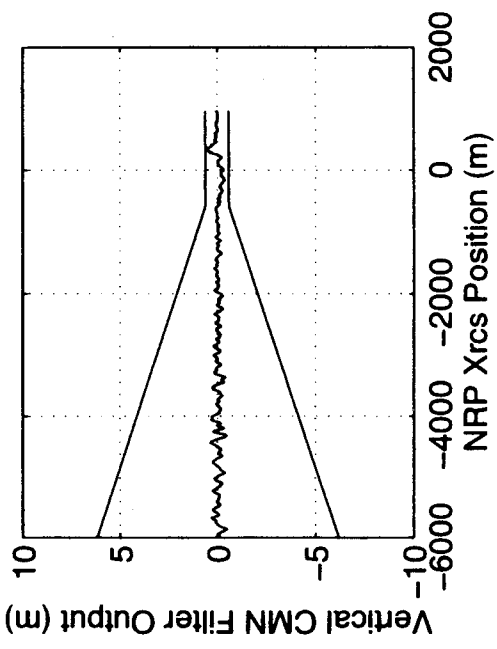
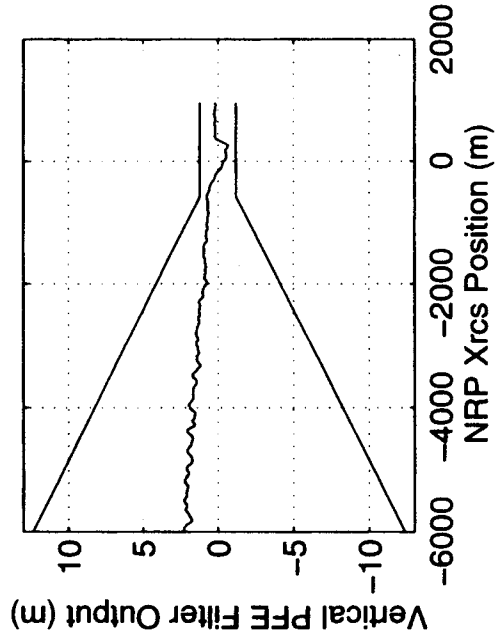
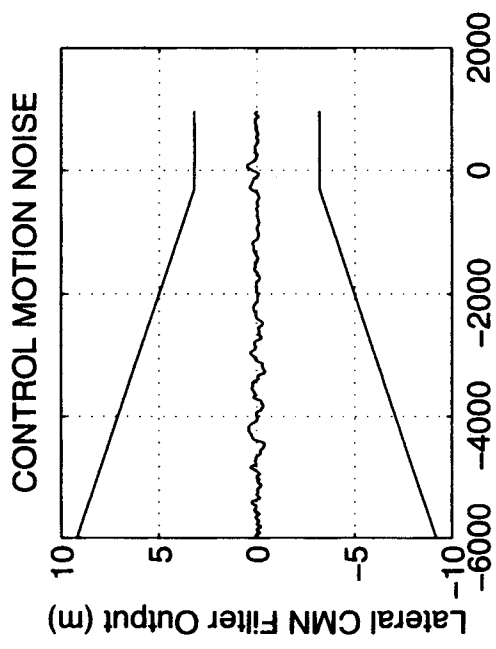
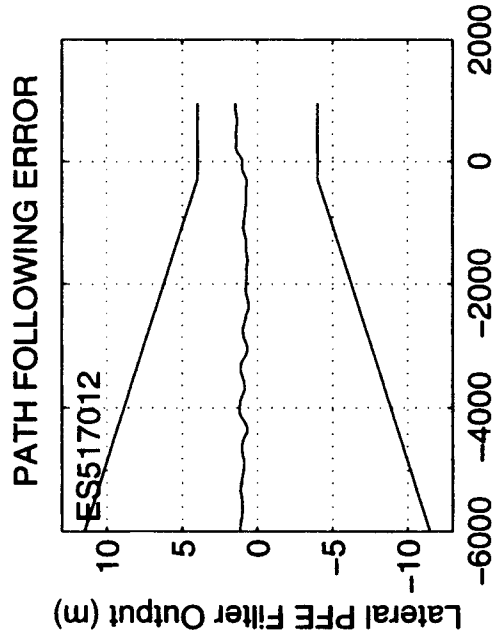
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.917  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.636  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.812

NRP Xrcs 2-RMS DIFFERENCE (m): 1.336  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.438  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.901

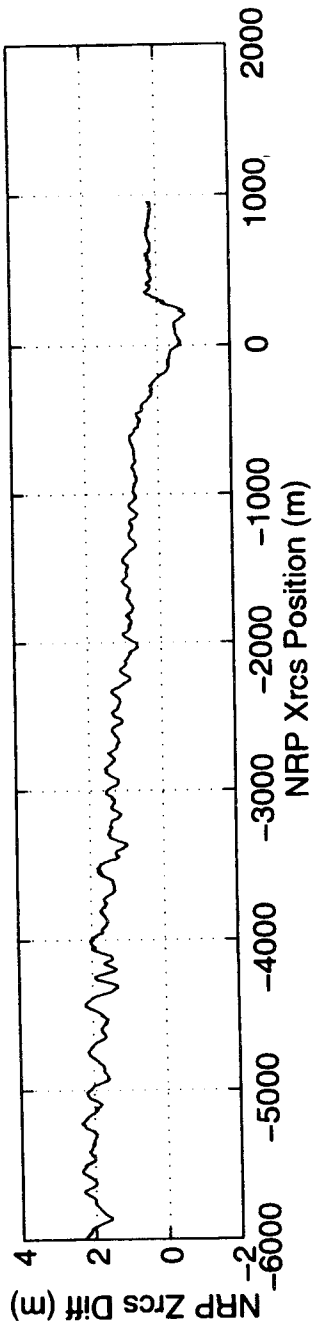
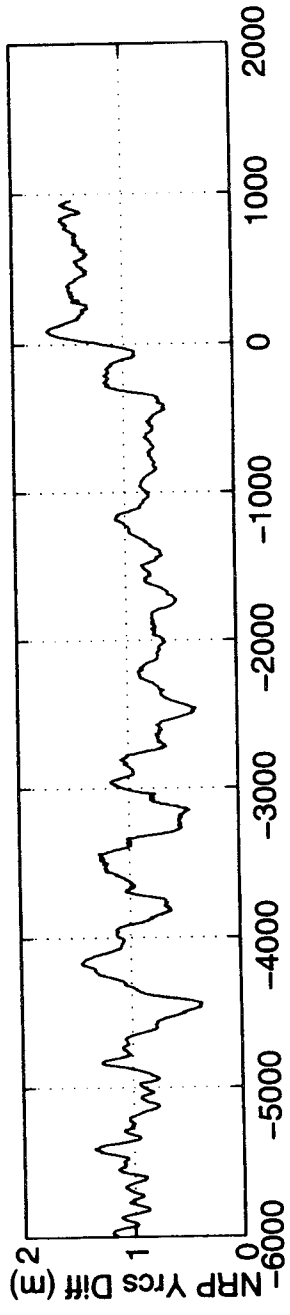
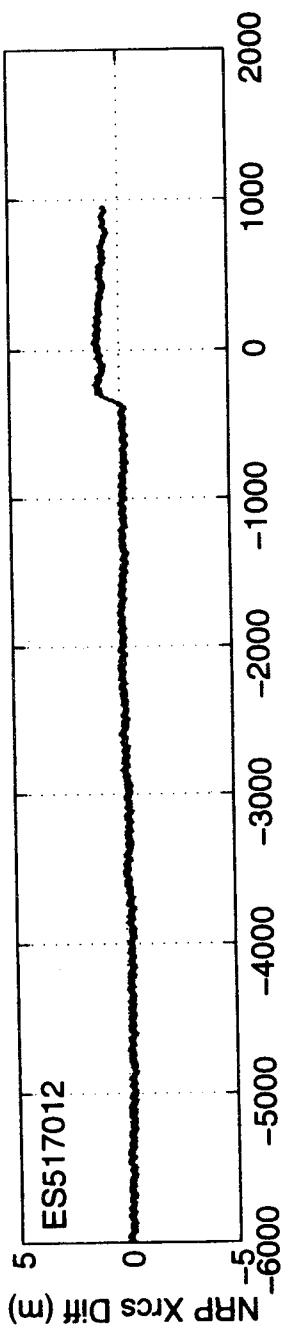
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----

LGRP Xrcs POSITION (m): 264.286  
LGRP Yrcs POSITION (m): -1.750





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517013  
START TIME: 161071.045  
STOP TIME: 161400.243

MINIMUM HDOP: 0.7  
MAXIMUM HDOP: 0.8  
AVERAGE HDOP: 0.8

MINIMUM VDOP: 2.7  
MAXIMUM VDOP: 2.9  
AVERAGE VDOP: 2.8

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID STATIC TRIAL \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL STATIC TRIAL \*  
\*\*\*\*\*

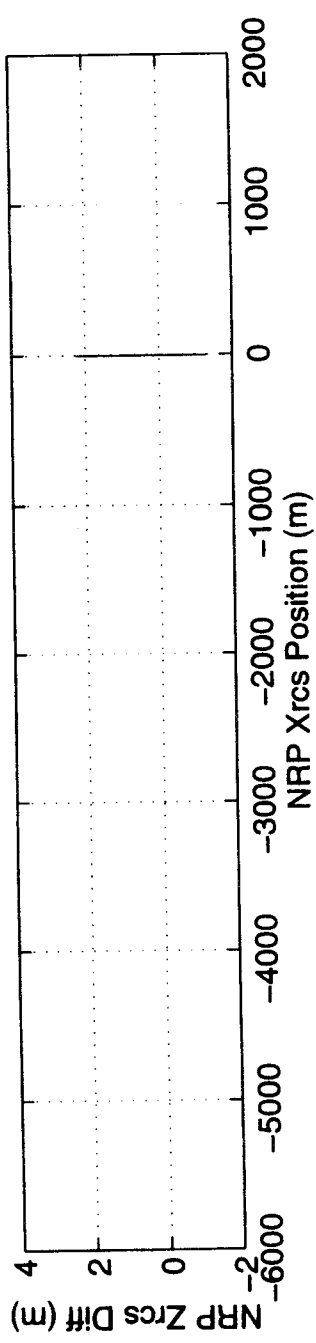
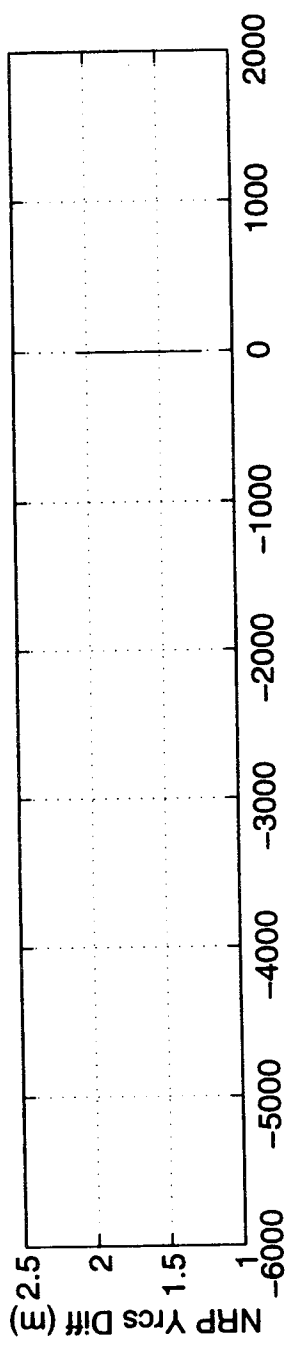
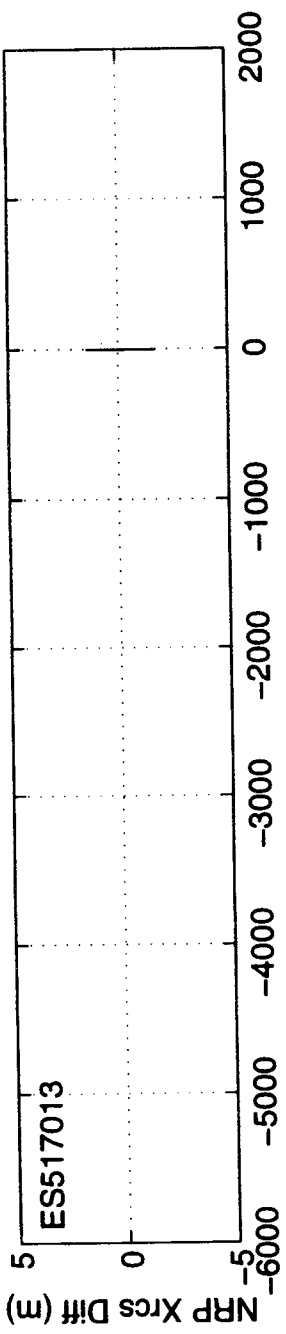
TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.362  
NRP Yrcs MEAN DIFFERENCE (m): 1.612  
NRP Zrcs MEAN DIFFERENCE (m): 0.404

NRP Xrcs 2-SIGMA DIFFERENCE (m): 1.209  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.154  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.957

NRP Xrcs 2-RMS DIFFERENCE (m): 1.409  
NRP Yrcs 2-RMS DIFFERENCE (m): 3.227  
NRP Zrcs 2-RMS DIFFERENCE (m): 1.252

NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517014  
START TIME: 162125.594  
STOP TIME: 162284.726

MINIMUM HDOP: 0.5  
MAXIMUM HDOP: 0.6  
AVERAGE HDOP: 0.6

MINIMUM VDOP: 1.3  
MAXIMUM VDOP: 1.5  
AVERAGE VDOP: 1.4

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 9  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

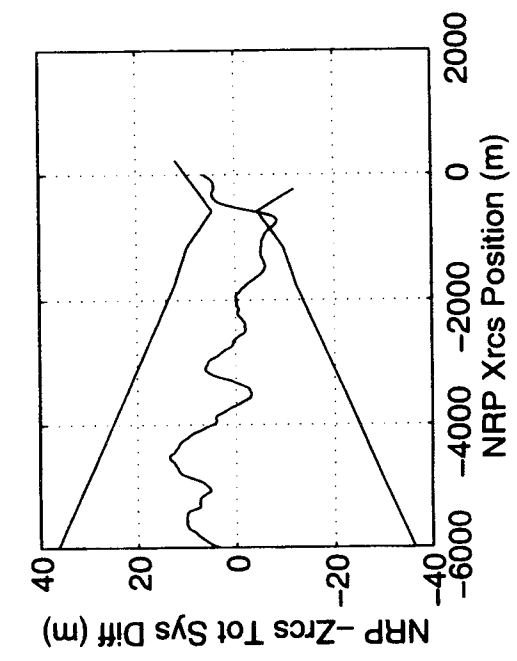
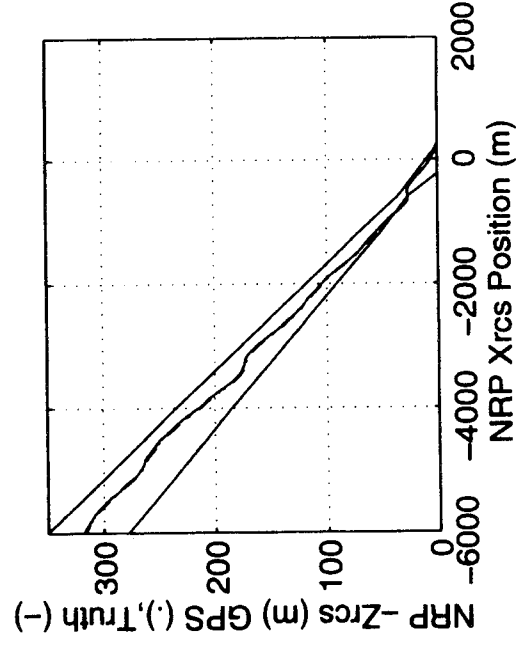
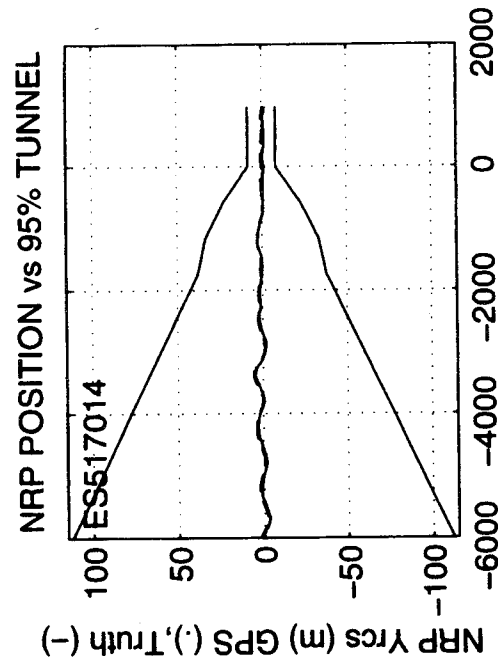
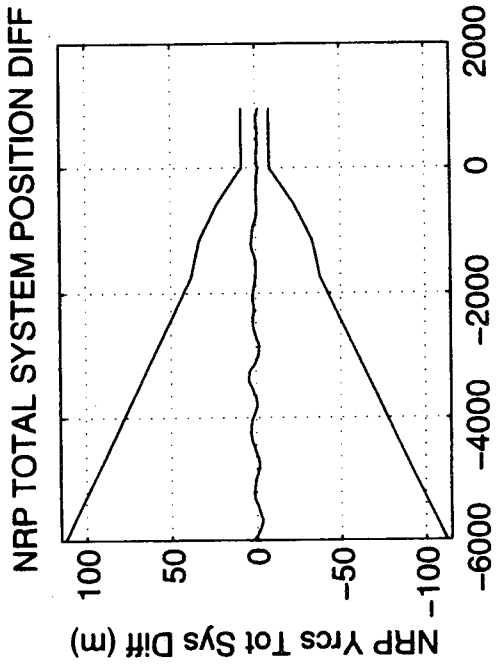
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.481  
NRP Yrcs MEAN DIFFERENCE (m): 0.961  
NRP Zrcs MEAN DIFFERENCE (m): 0.083

NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.916  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.939  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.773

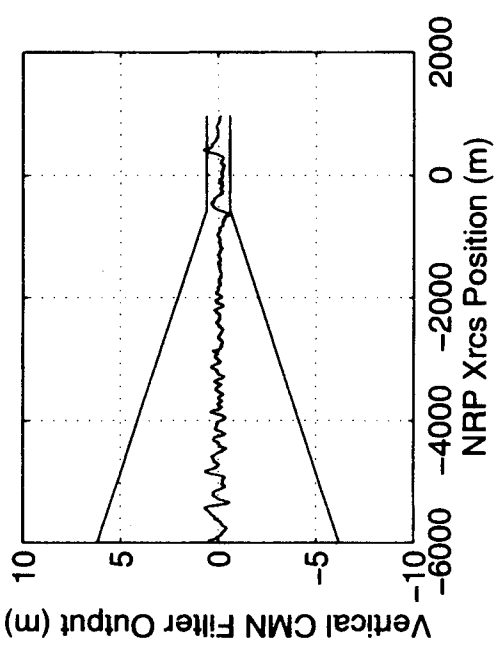
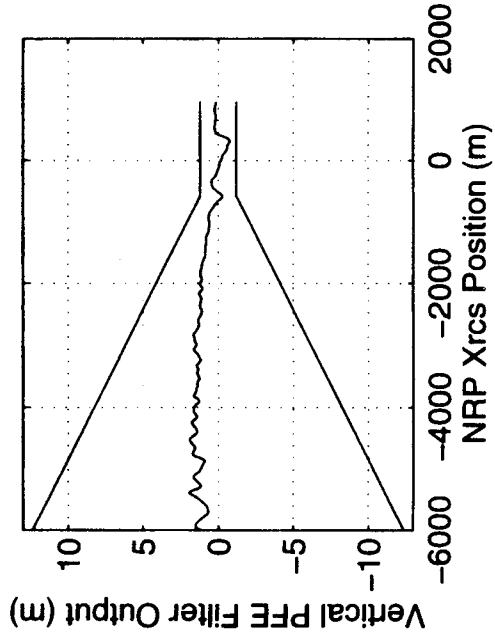
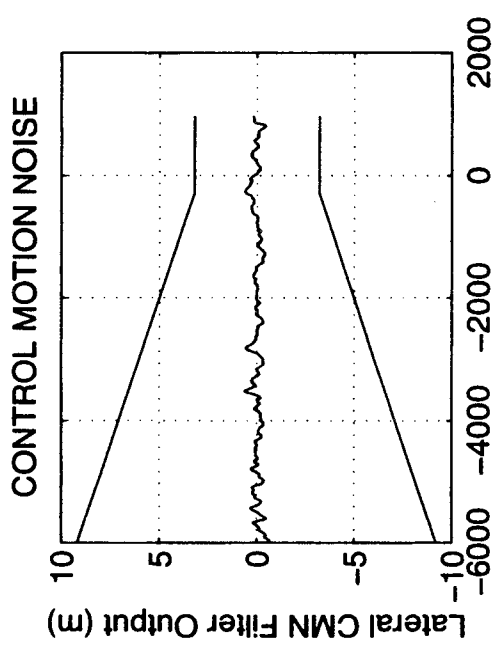
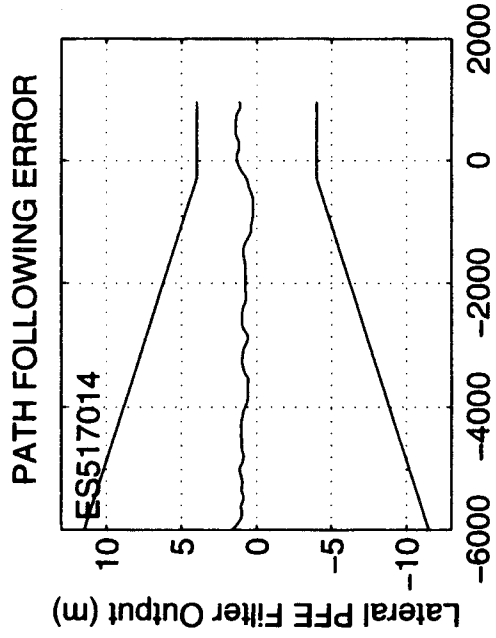
NRP Xrcs 2-RMS DIFFERENCE (m): 1.328  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.140  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.790

-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

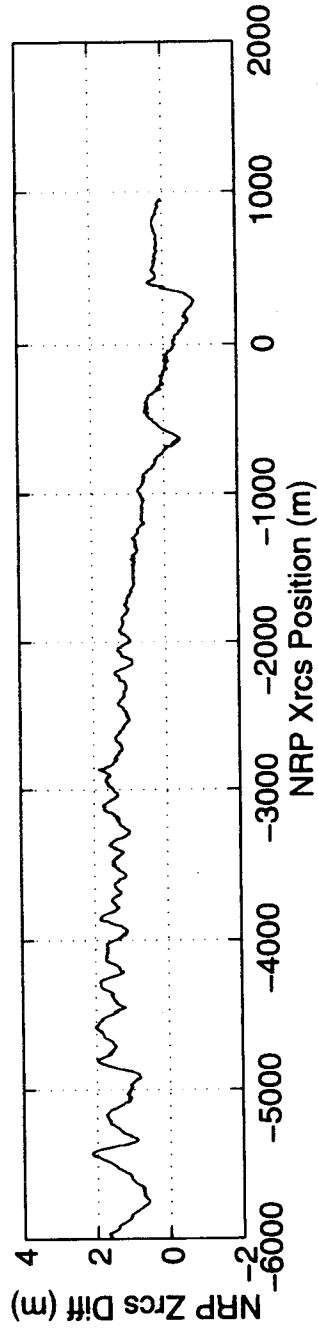
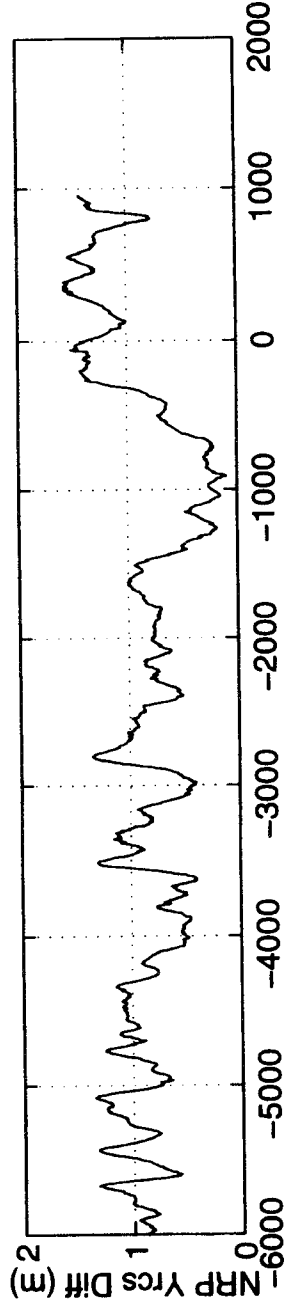
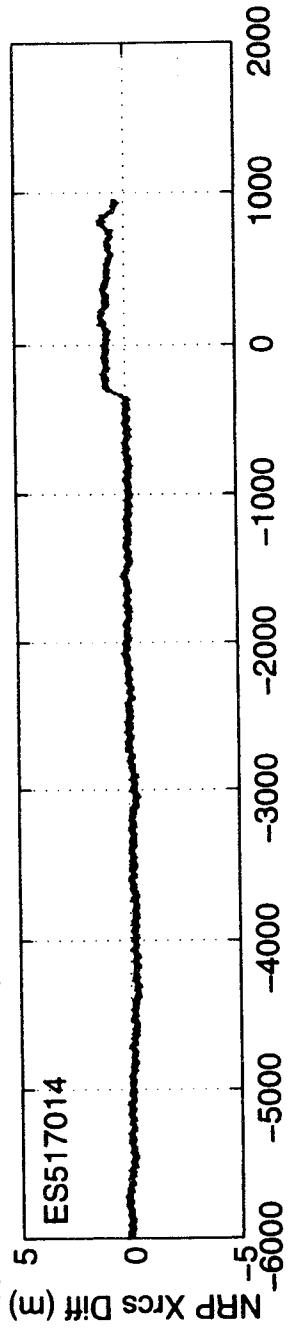
LGRP Xrcs POSITION (m): 343.112  
LGRP Yrcs POSITION (m): -0.791







NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517015  
START TIME: 162660.660  
STOP TIME: 162823.198

MINIMUM HDOP: 0.5  
MAXIMUM HDOP: 0.5  
AVERAGE HDOP: 0.5

MINIMUM VDOP: 1.2  
MAXIMUM VDOP: 1.3  
AVERAGE VDOP: 1.2

MINIMUM NUMBER OF SVs: 9  
MAXIMUM NUMBER OF SVs: 9  
AVERAGE NUMBER OF SVs: 9

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

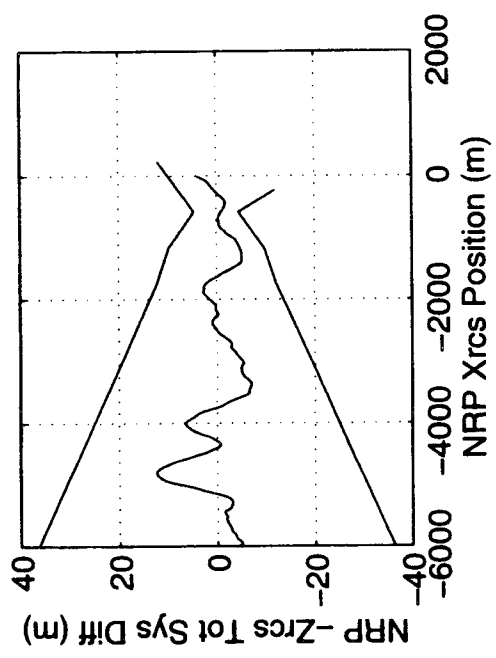
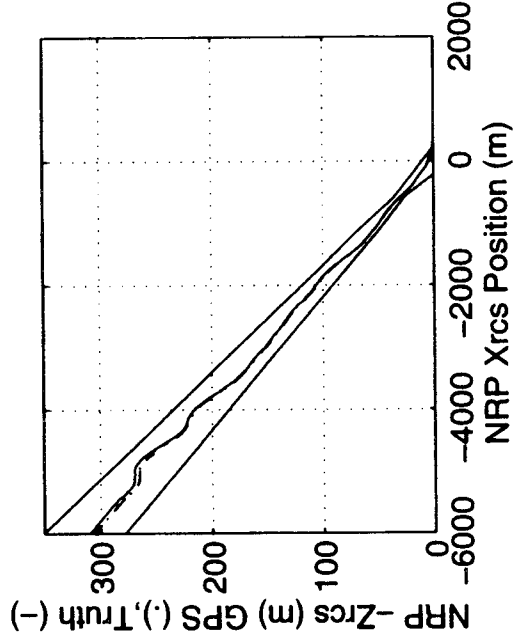
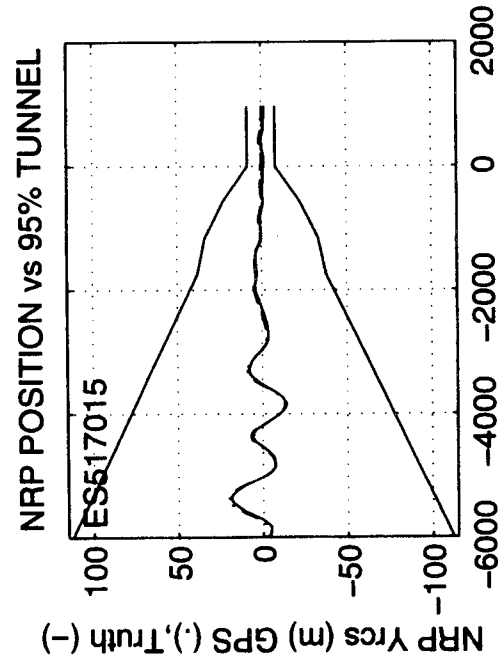
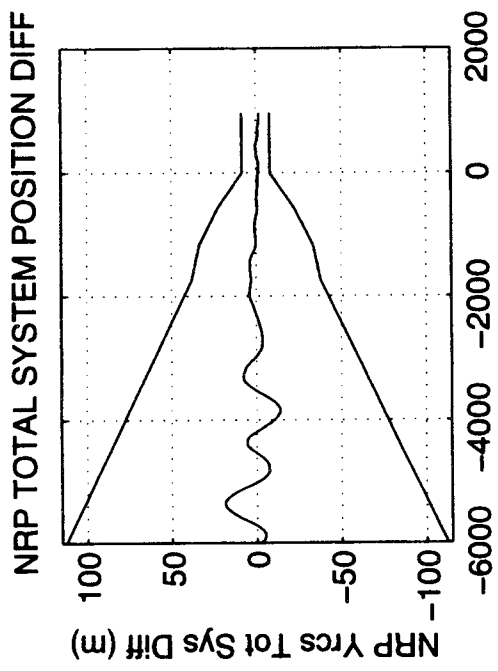
-----  
NRP Xrcs MEAN DIFFERENCE (m) : 0.621  
NRP Yrcs MEAN DIFFERENCE (m) : 1.176  
NRP Zrcs MEAN DIFFERENCE (m) : 0.104

NRP Xrcs 2-SIGMA DIFFERENCE (m) : 0.961  
NRP Yrcs 2-SIGMA DIFFERENCE (m) : 0.679  
NRP Zrcs 2-SIGMA DIFFERENCE (m) : 0.699

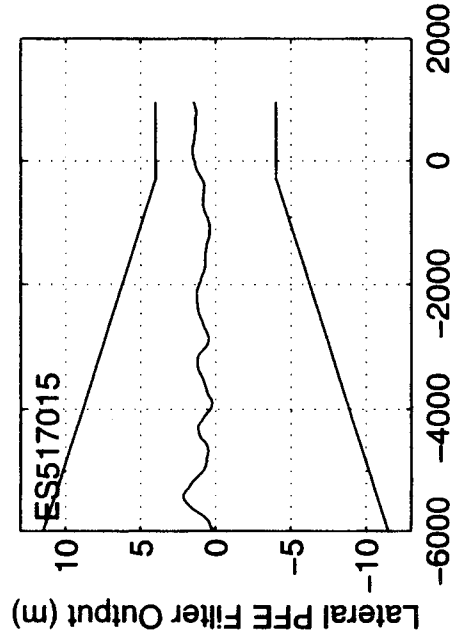
NRP Xrcs 2-RMS DIFFERENCE (m) : 1.570  
NRP Yrcs 2-RMS DIFFERENCE (m) : 2.447  
NRP Zrcs 2-RMS DIFFERENCE (m) : 0.729

-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

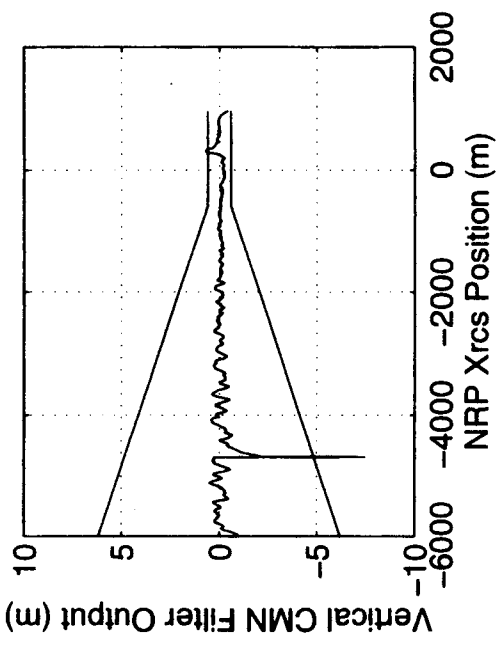
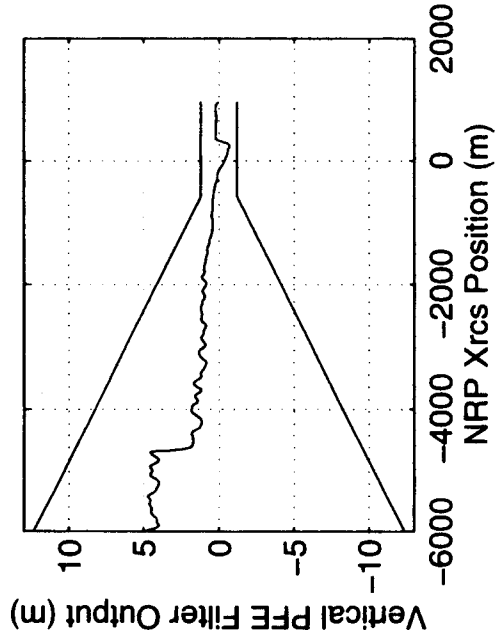
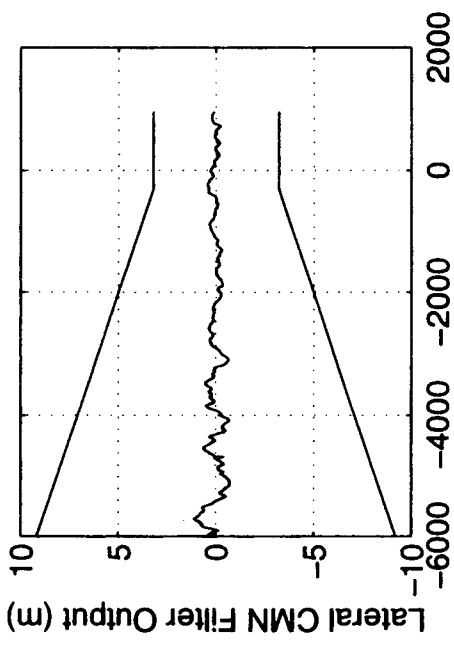
LGRP Xrcs POSITION (m) : 264.285  
LGRP Yrcs POSITION (m) : -0.038



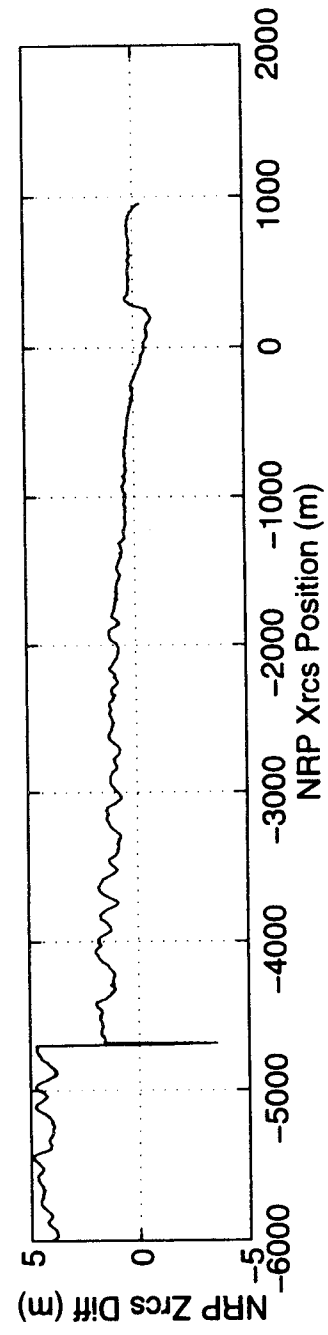
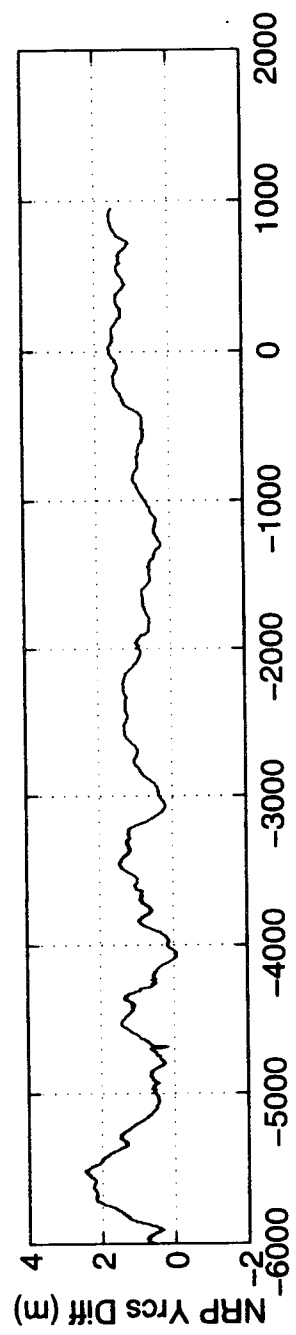
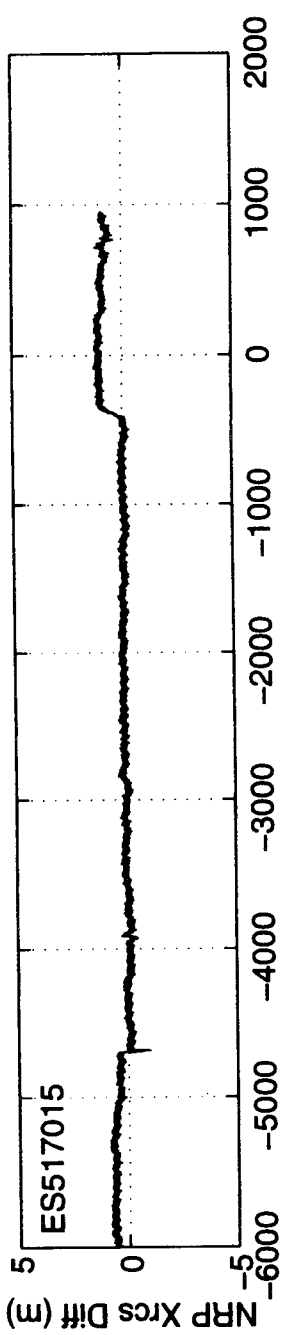
### PATH FOLLOWING ERROR



### CONTROL MOTION NOISE



NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517016  
START TIME: 163240.319  
STOP TIME: 163400.122

MINIMUM HDOP: 0.7  
MAXIMUM HDOP: 0.7  
AVERAGE HDOP: 0.7

MINIMUM VDOP: 1.6  
MAXIMUM VDOP: 1.7  
AVERAGE VDOP: 1.7

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

-----  
TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
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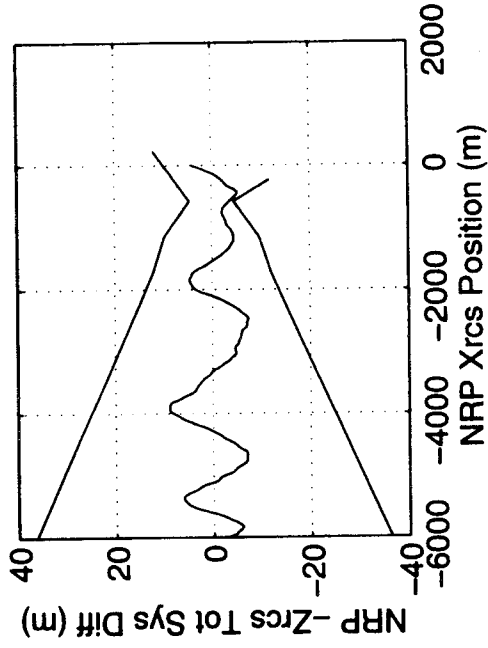
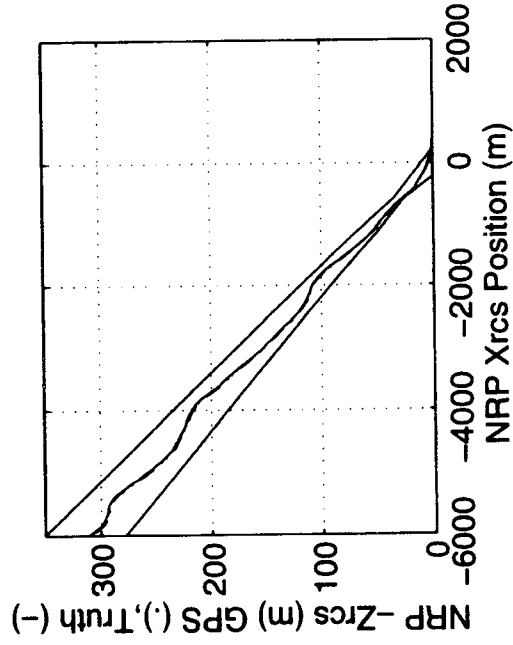
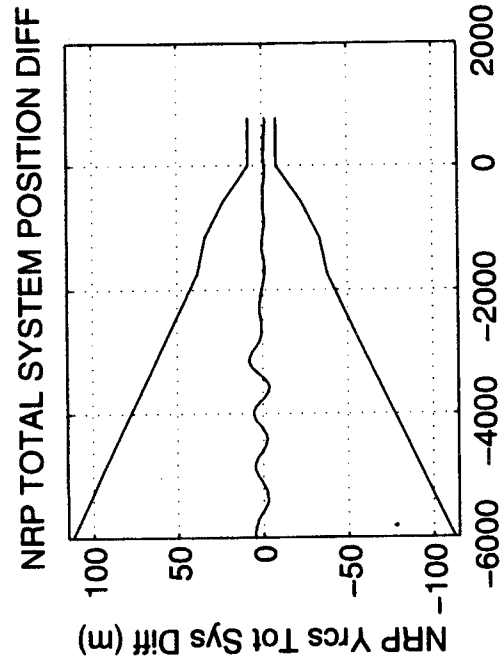
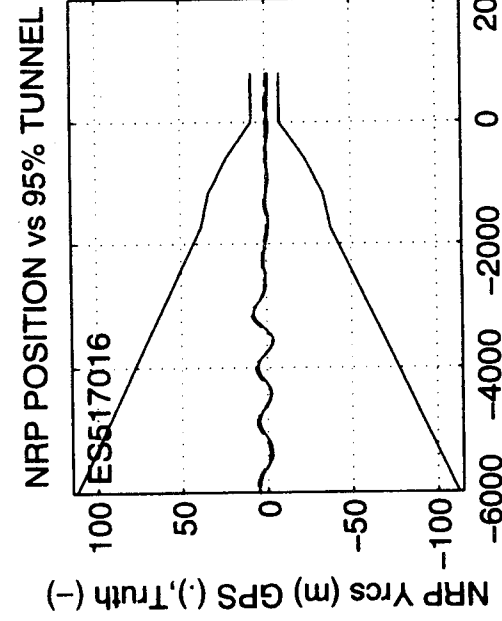
NRP Xrcs MEAN DIFFERENCE (m): 0.645  
NRP Yrcs MEAN DIFFERENCE (m): 1.055  
NRP Zrcs MEAN DIFFERENCE (m): 0.097

NRP Xrcs 2-SIGMA DIFFERENCE (m): 1.045  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.679  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.718

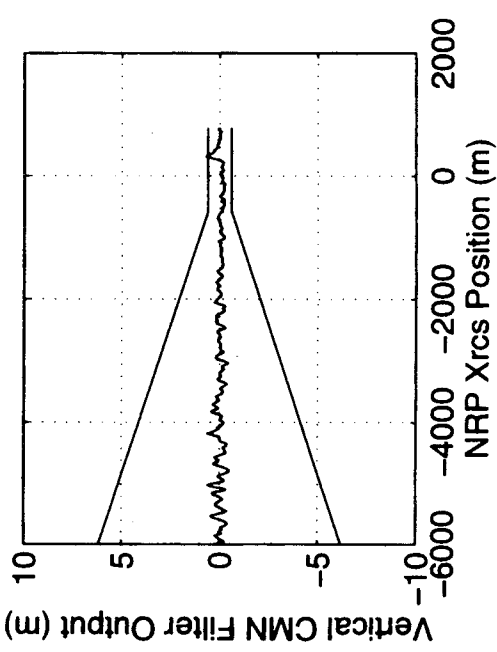
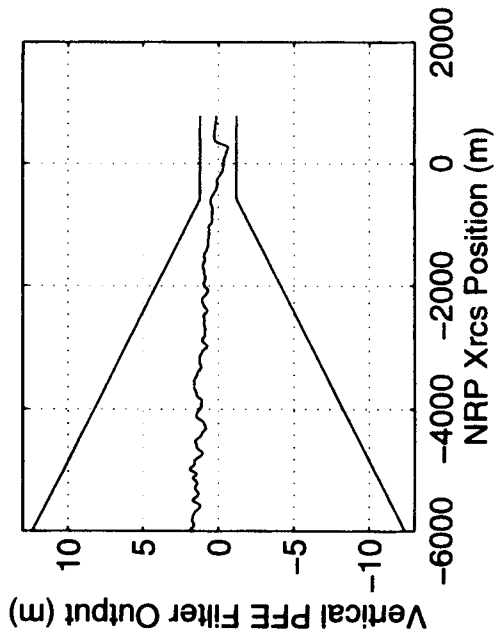
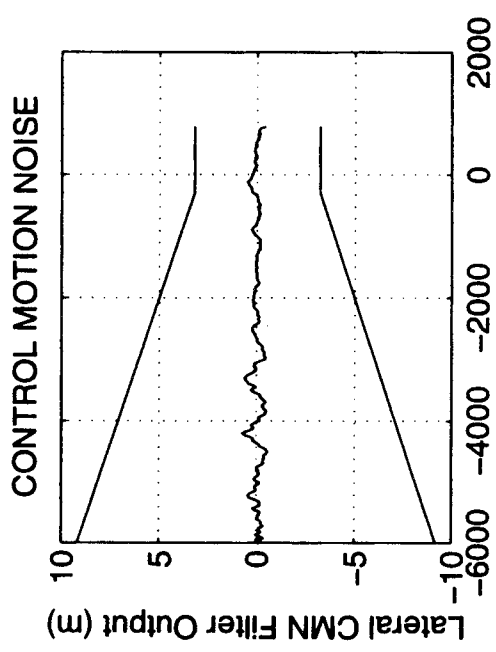
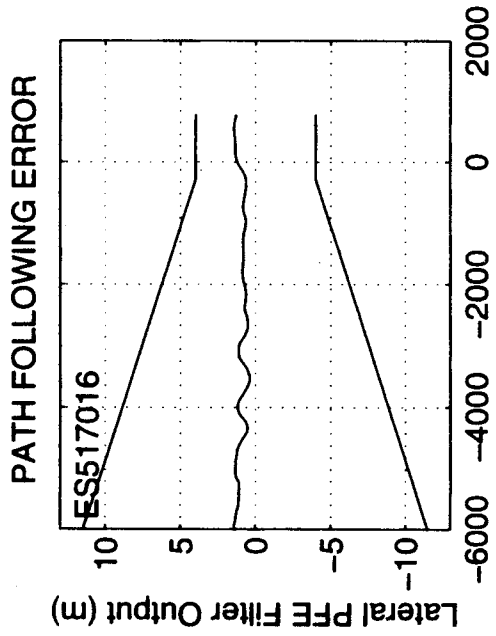
NRP Xrcs 2-RMS DIFFERENCE (m): 1.660  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.216  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.744

-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
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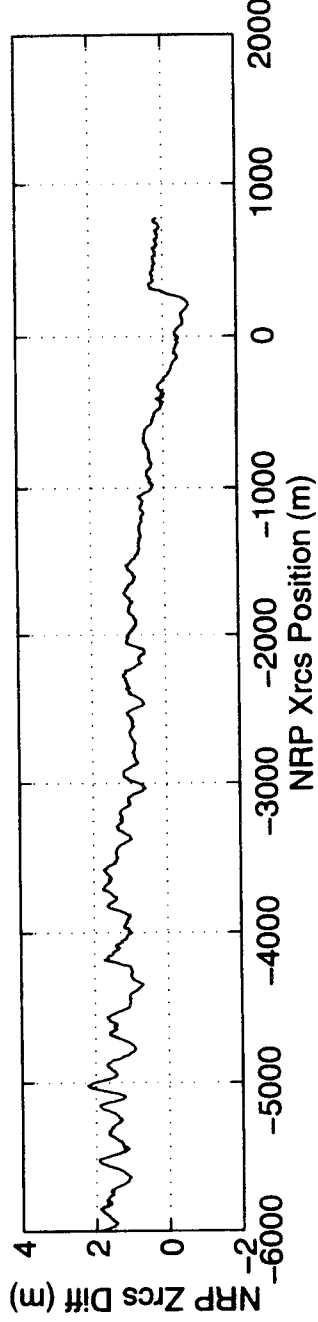
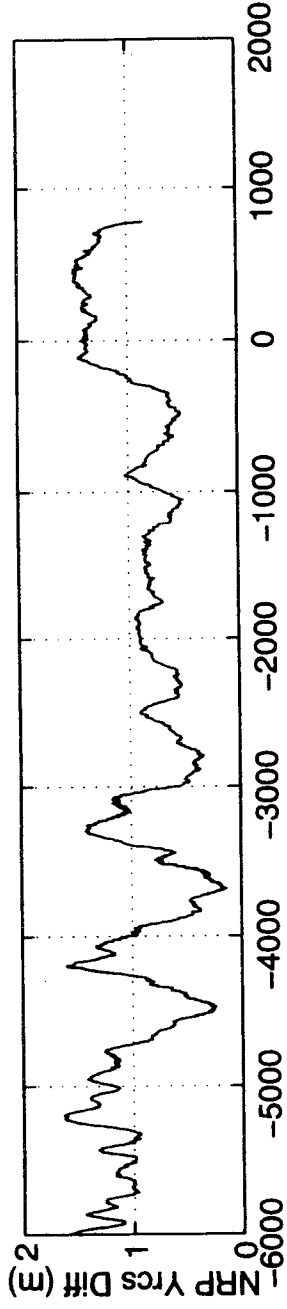
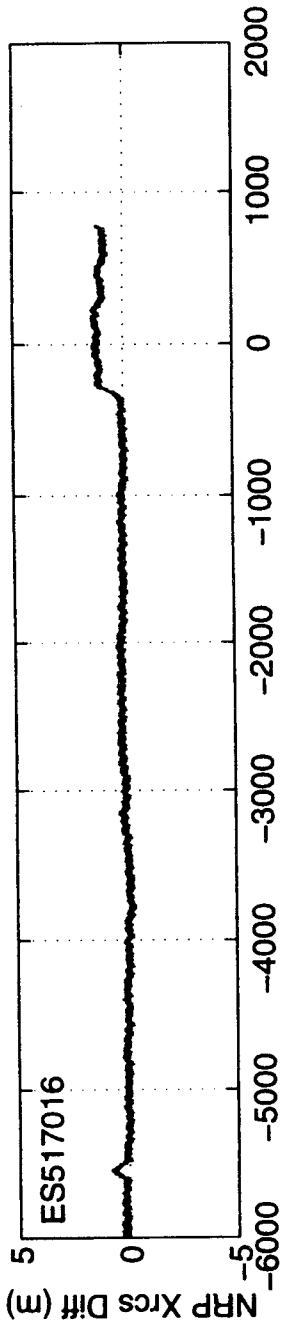
LGRP Xrcs POSITION (m): 255.607  
LGRP Yrcs POSITION (m): -0.586







NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517101  
START TIME: 229444.494  
STOP TIME: 229771.990

MINIMUM HDOP: 1.0  
MAXIMUM HDOP: 1.3  
AVERAGE HDOP: 1.1

MINIMUM VDOP: 1.5  
MAXIMUM VDOP: 3.0  
AVERAGE VDOP: 2.1

MINIMUM NUMBER OF SVs: 6  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
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\*\*\*\*\*  
\* VALID STATIC TRIAL \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL STATIC TRIAL \*  
\*\*\*\*\*

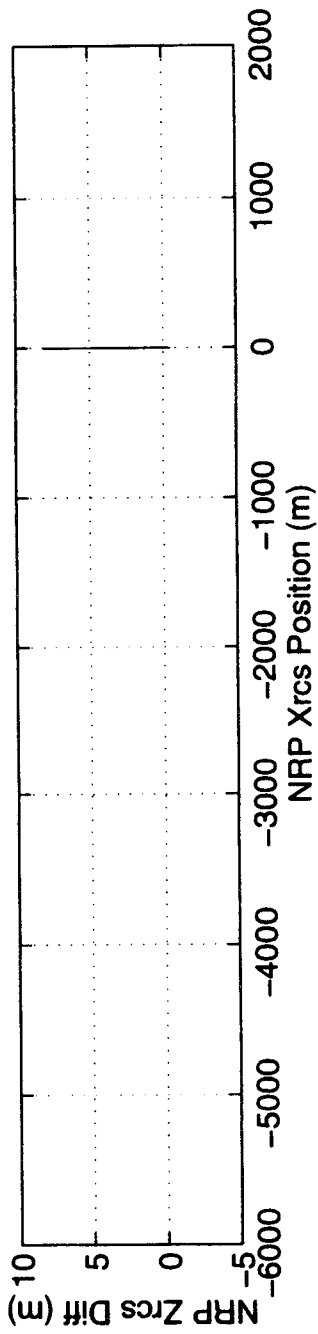
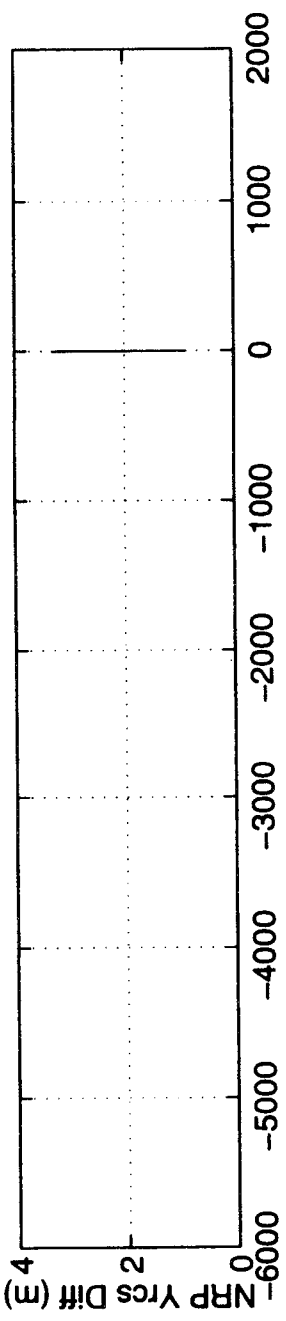
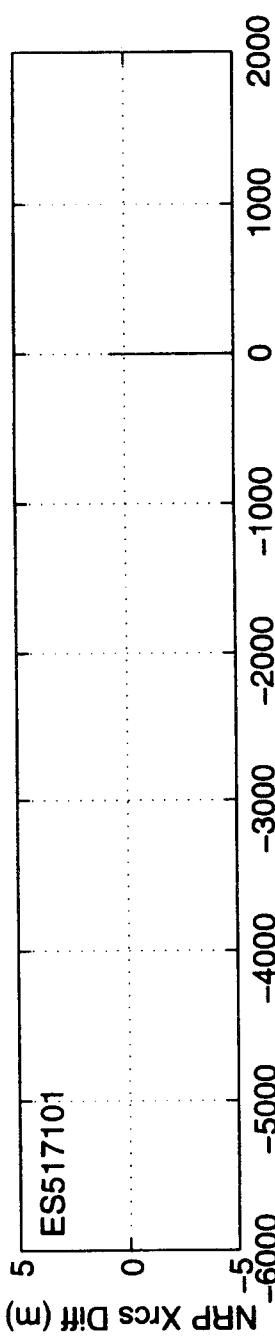
TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

-----  
NRP Xrcs MEAN DIFFERENCE (m): -1.540  
NRP Yrcs MEAN DIFFERENCE (m): 1.810  
NRP Zrcs MEAN DIFFERENCE (m): 1.810

NRP Xrcs 2-SIGMA DIFFERENCE (m): 6.130  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 1.228  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 4.871

NRP Xrcs 2-RMS DIFFERENCE (m): 6.860  
NRP Yrcs 2-RMS DIFFERENCE (m): 3.823  
NRP Zrcs 2-RMS DIFFERENCE (m): 6.069

NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517102  
START TIME: 230352.462  
STOP TIME: 230511.990

MINIMUM HDOP: 0.6  
MAXIMUM HDOP: 0.6  
AVERAGE HDOP: 0.6

MINIMUM VDOP: 1.2  
MAXIMUM VDOP: 1.3  
AVERAGE VDOP: 1.3

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
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\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

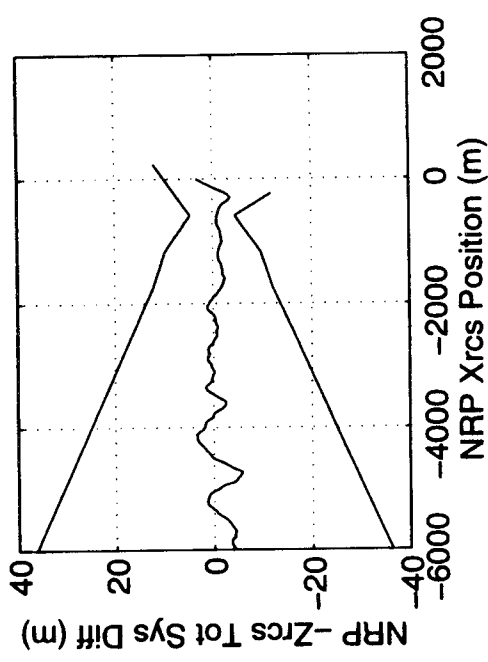
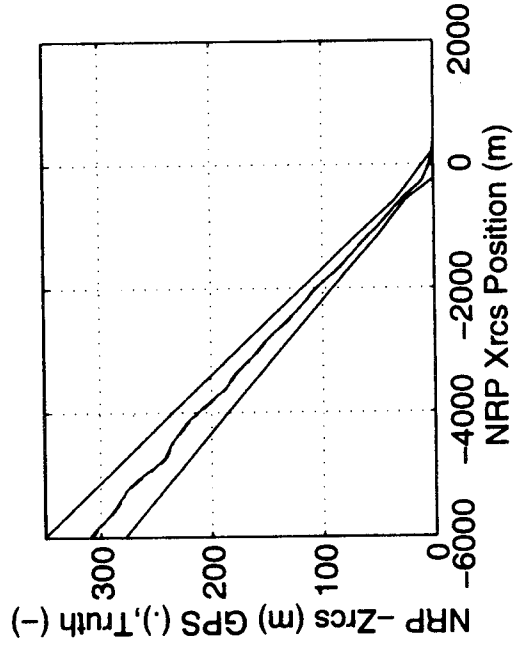
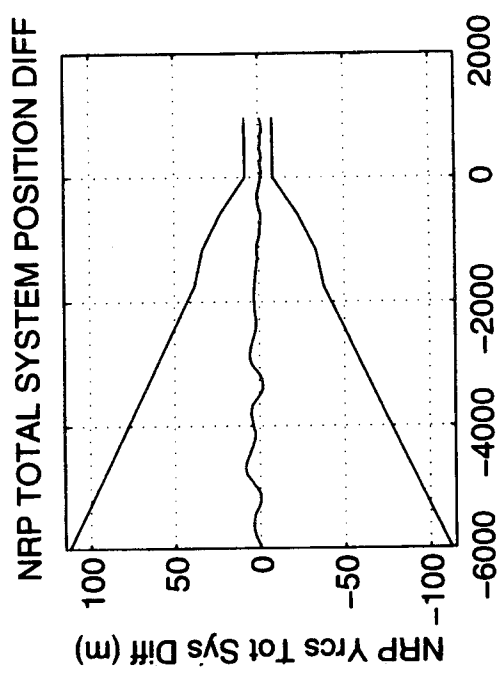
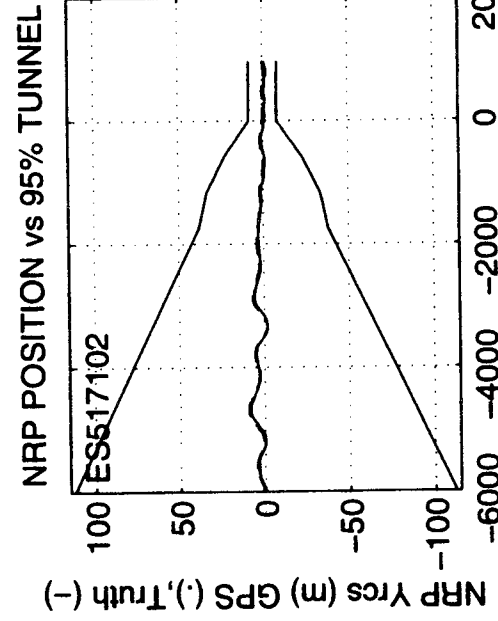
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.621  
NRP Yrcs MEAN DIFFERENCE (m): 1.060  
NRP Zrcs MEAN DIFFERENCE (m): -0.014

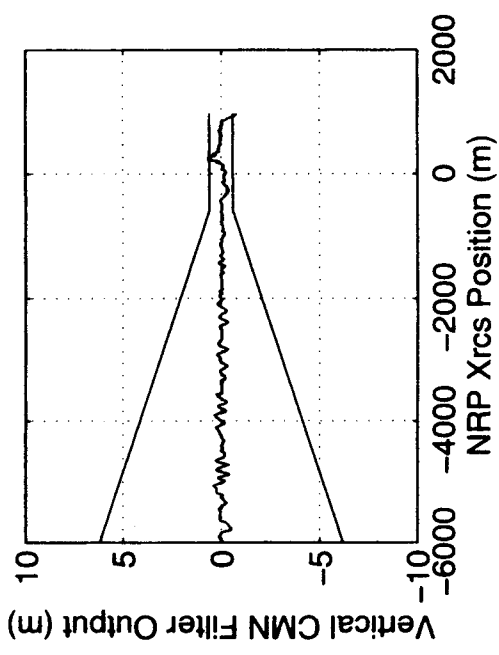
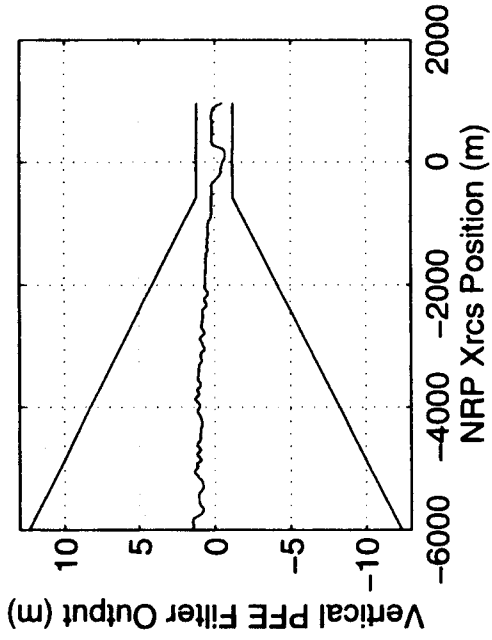
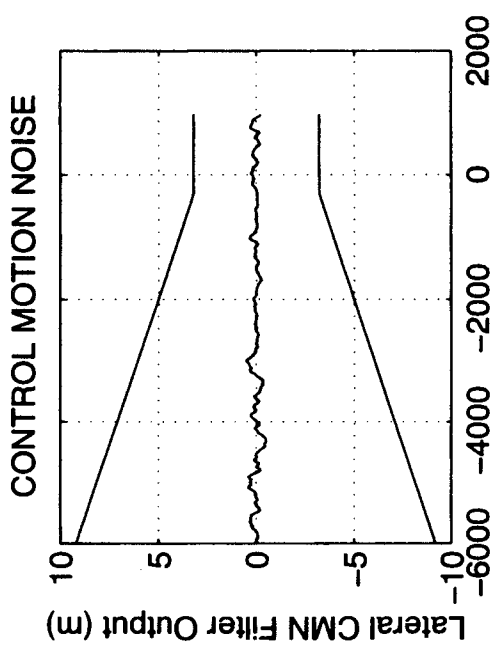
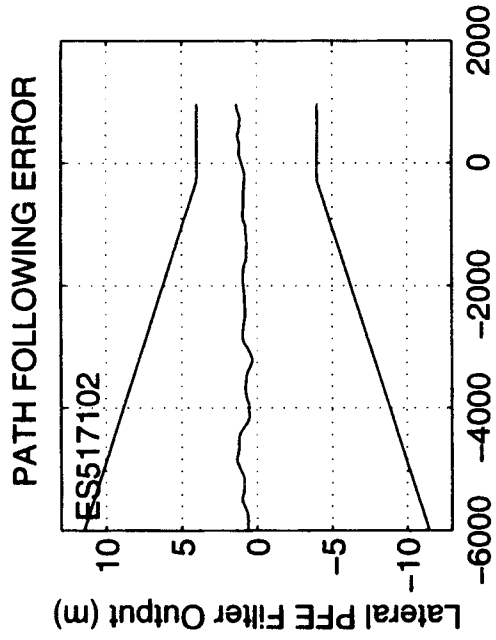
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.400  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.423  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.723

NRP Xrcs 2-RMS DIFFERENCE (m): 1.305  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.162  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.723

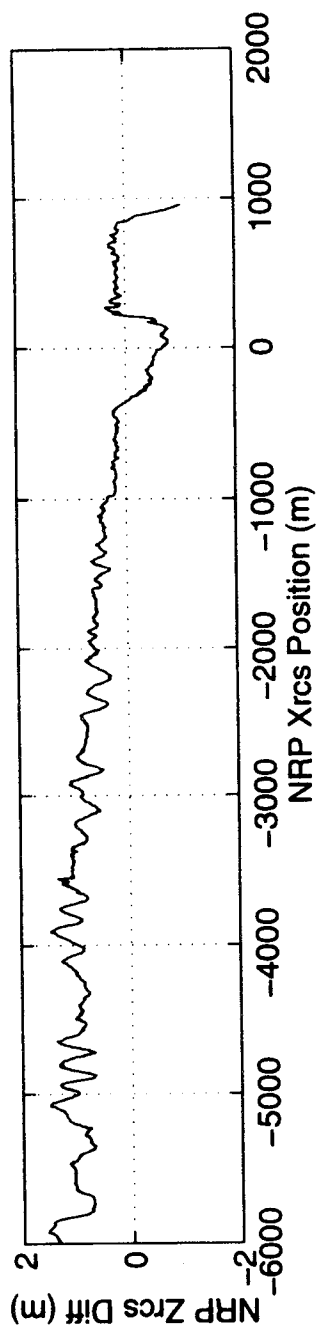
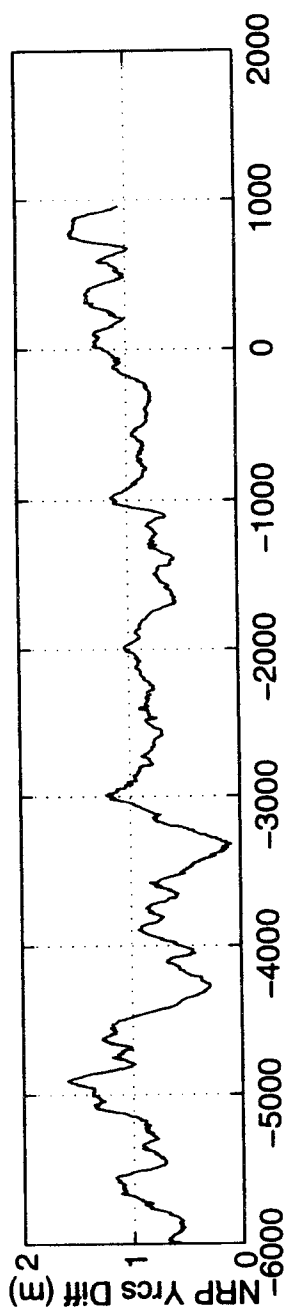
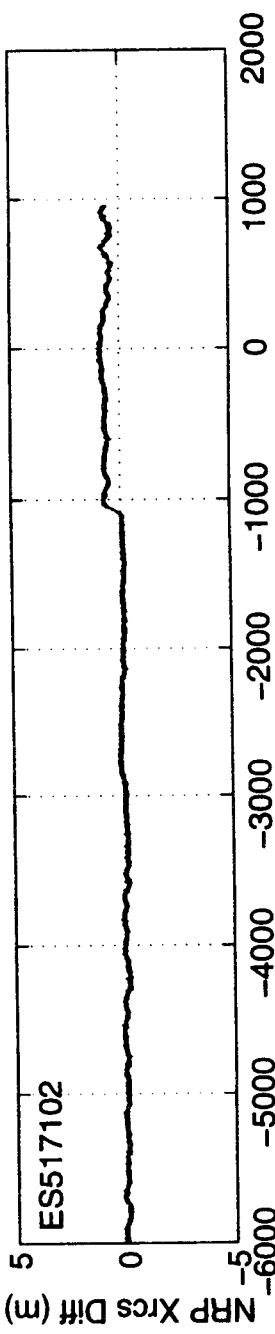
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 153.869  
LGRP Yrcs POSITION (m): -0.657





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES





APPROACH #: ES517103  
START TIME: 230935.792  
STOP TIME: 231098.517

MINIMUM HDOP: 0.6  
MAXIMUM HDOP: 0.6  
AVERAGE HDOP: 0.6

MINIMUM VDOP: 1.3  
MAXIMUM VDOP: 1.4  
AVERAGE VDOP: 1.4

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
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\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

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TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
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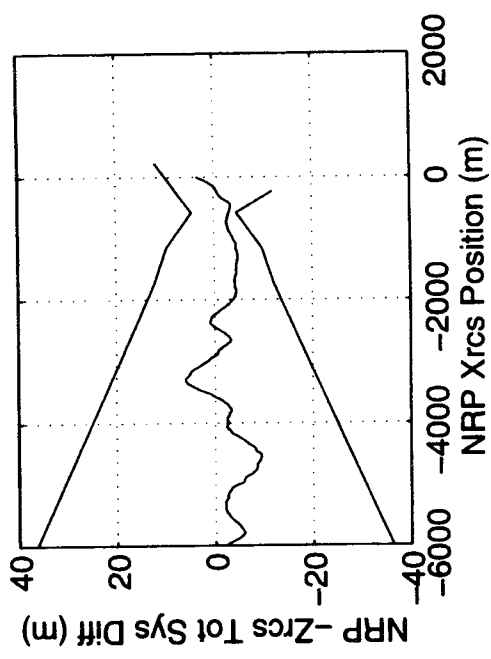
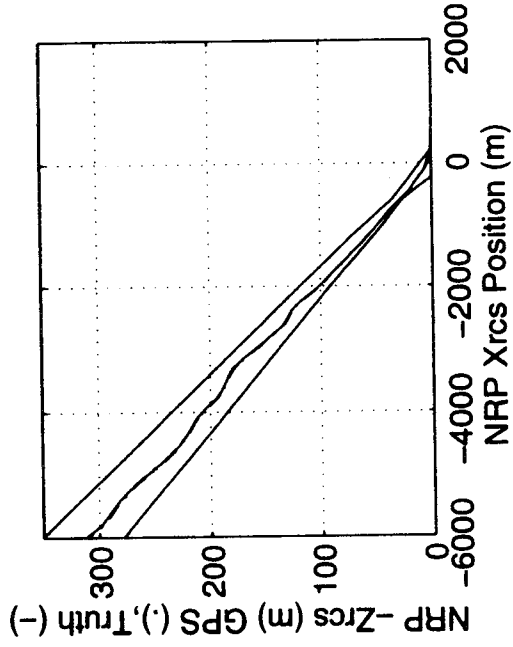
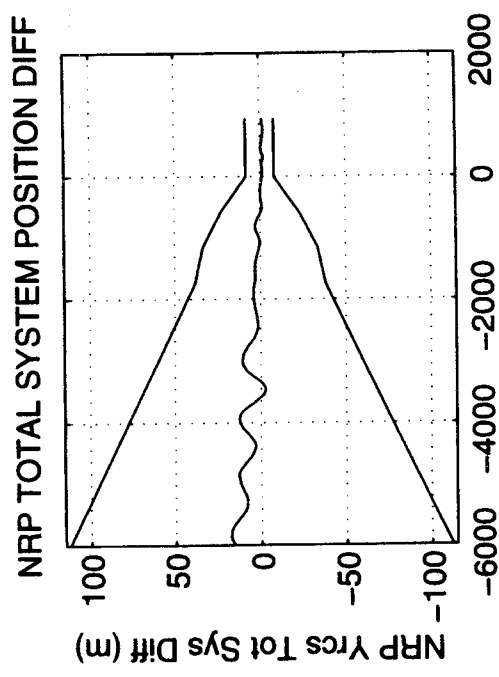
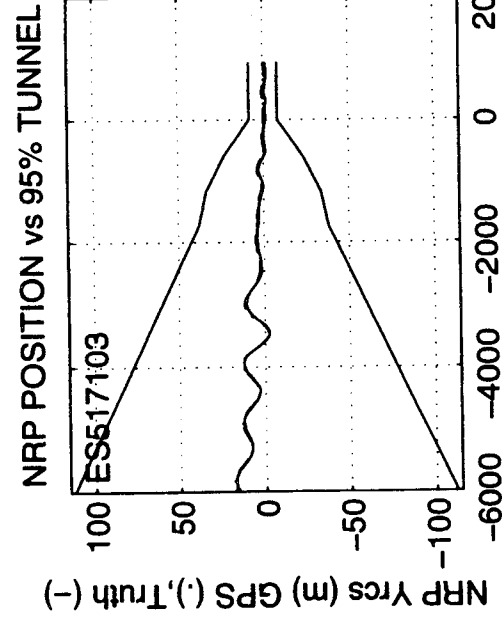
NRP Xrcs MEAN DIFFERENCE (m): 0.566  
NRP Yrcs MEAN DIFFERENCE (m): 1.022  
NRP Zrcs MEAN DIFFERENCE (m): -0.047

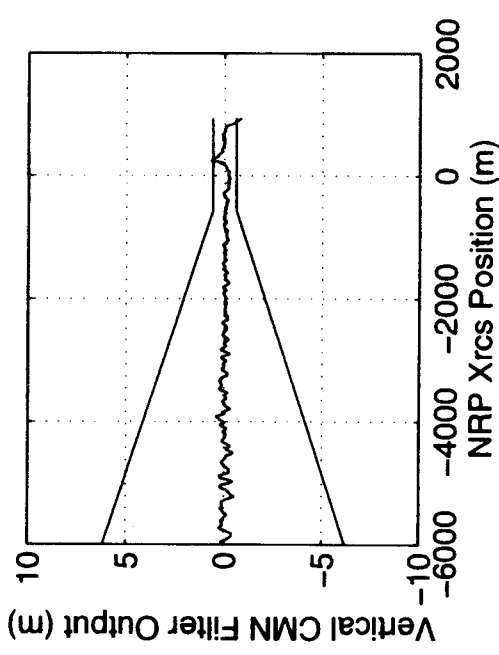
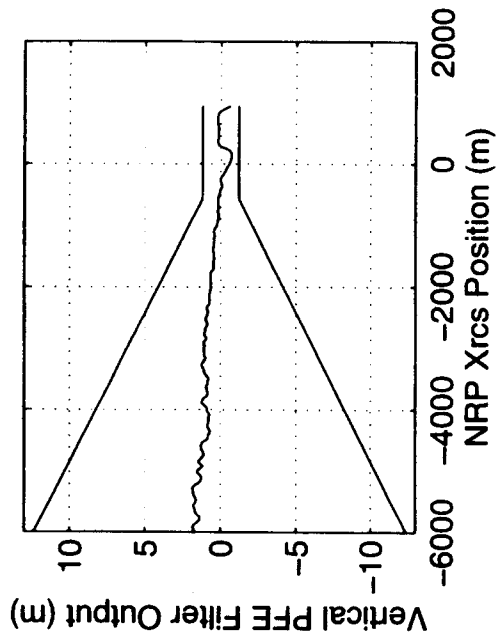
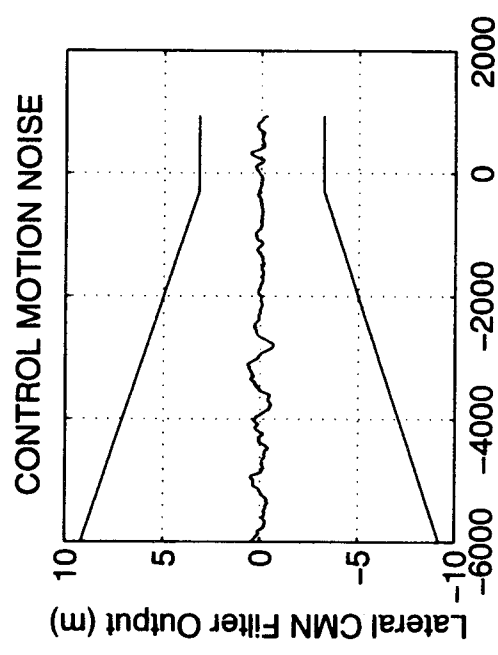
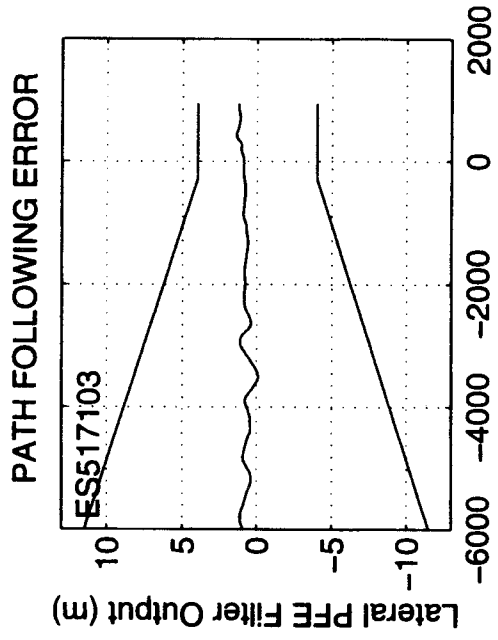
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.344  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.460  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.682

NRP Xrcs 2-RMS DIFFERENCE (m): 1.183  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.095  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.689

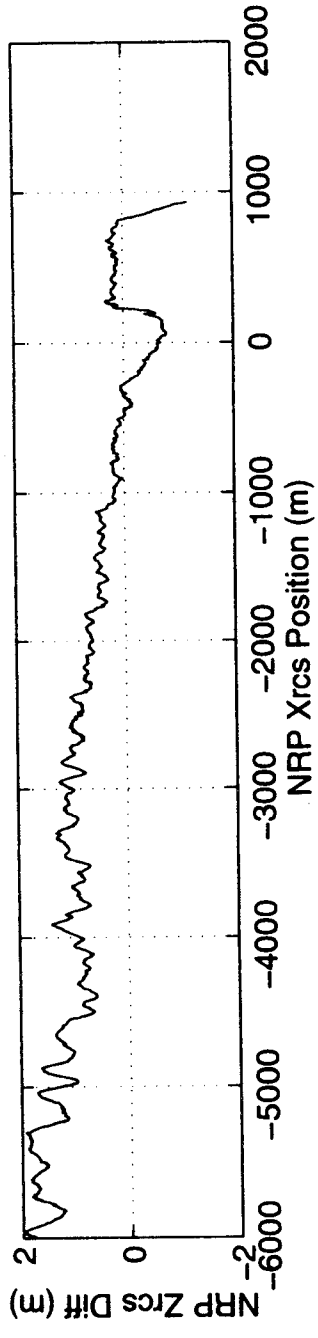
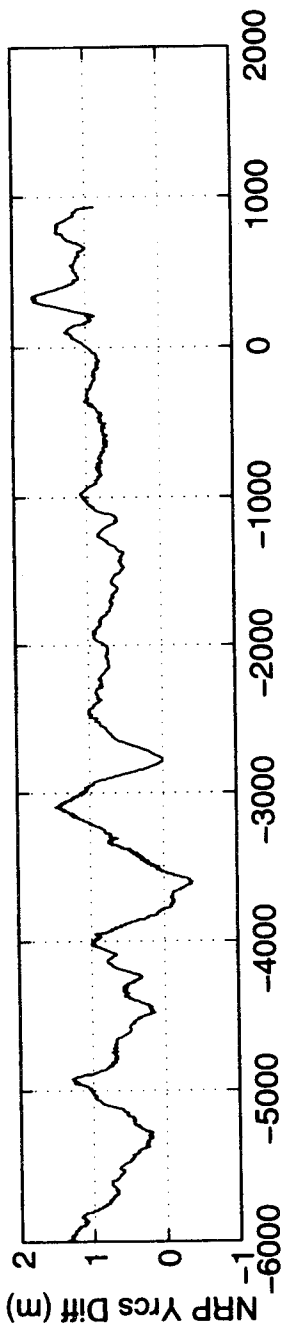
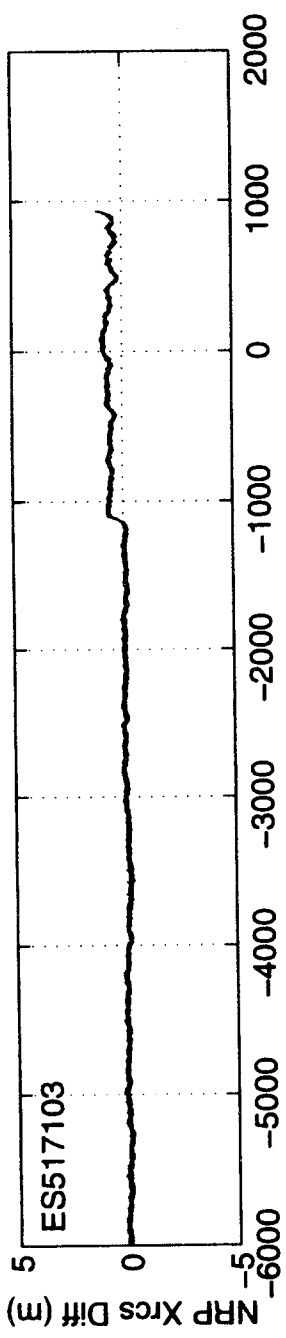
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----

LGRP Xrcs POSITION (m): 171.348  
LGRP Yrcs POSITION (m): -0.602





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517104  
START TIME: 231514.056  
STOP TIME: 231675.462

MINIMUM HDOP: 0.6  
MAXIMUM HDOP: 0.6  
AVERAGE HDOP: 0.6

MINIMUM VDOP: 1.8  
MAXIMUM VDOP: 1.9  
AVERAGE VDOP: 1.9

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

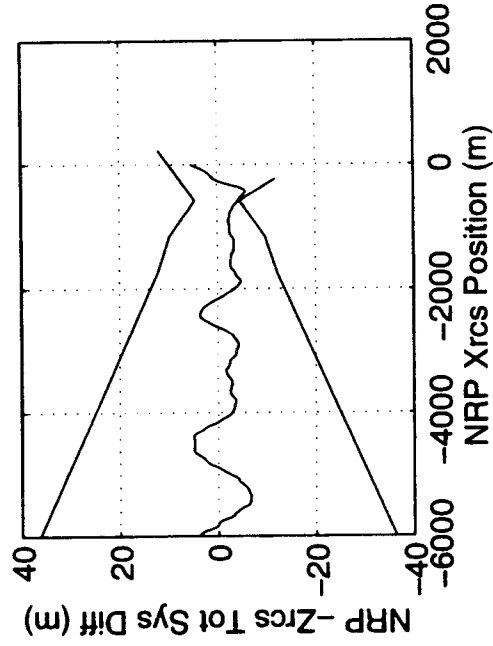
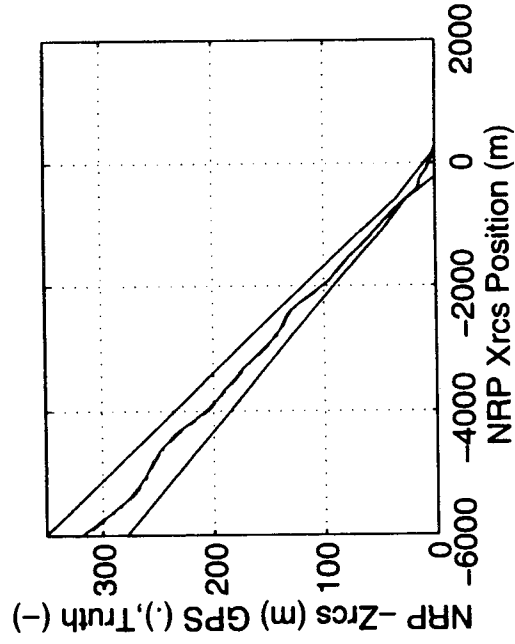
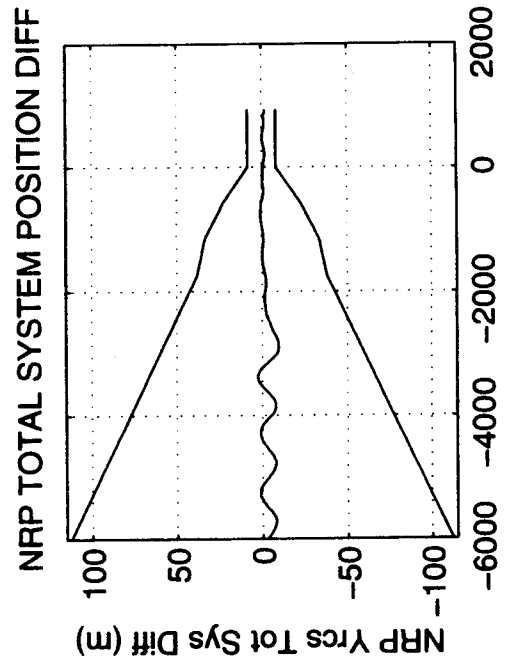
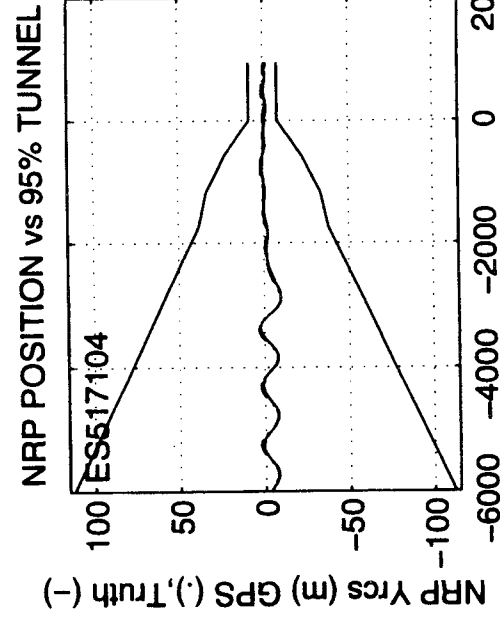
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.475  
NRP Yrcs MEAN DIFFERENCE (m): 0.942  
NRP Zrcs MEAN DIFFERENCE (m): -0.044

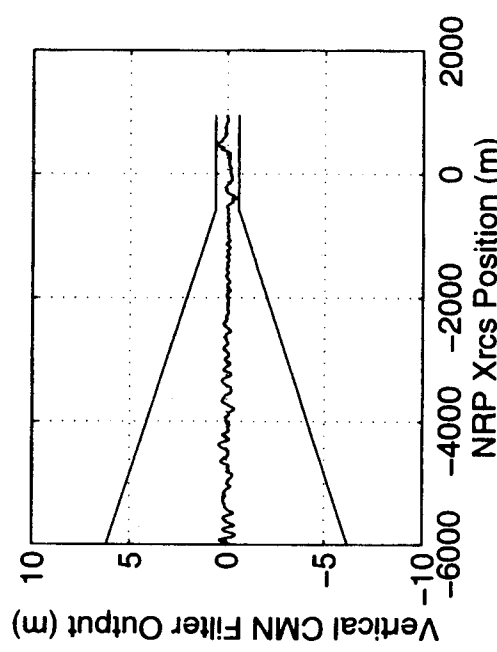
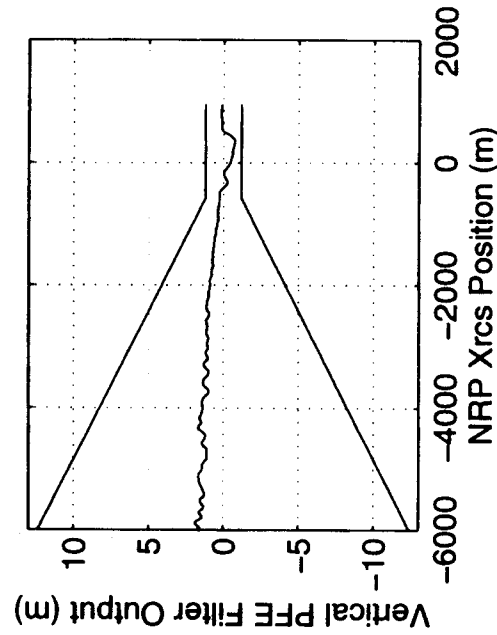
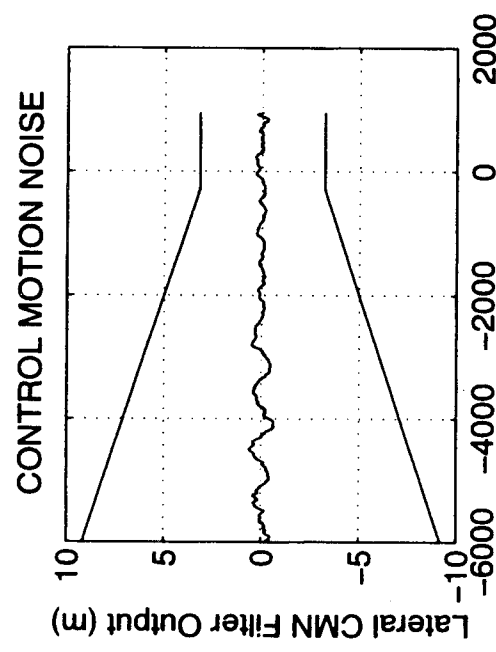
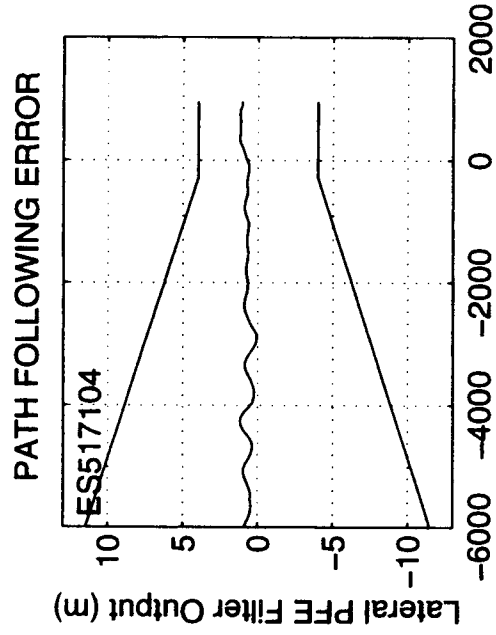
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.371  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.496  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.757

NRP Xrcs 2-RMS DIFFERENCE (m): 1.019  
NRP Yrcs 2-RMS DIFFERENCE (m): 1.948  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.762

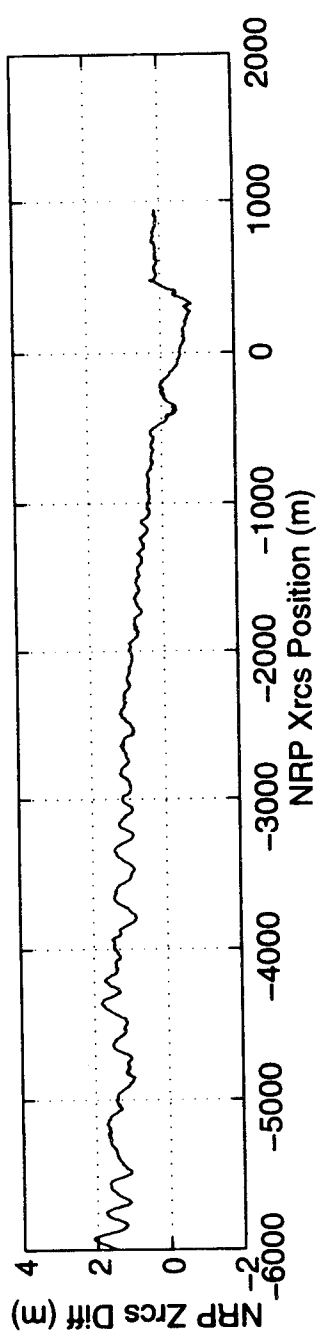
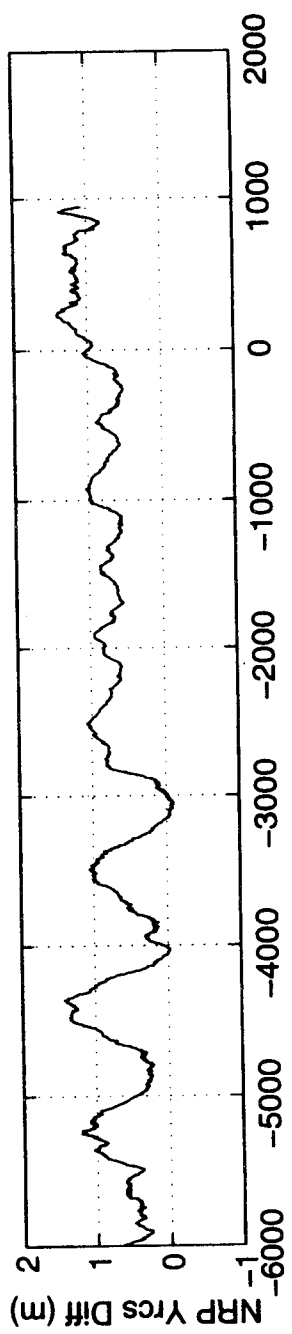
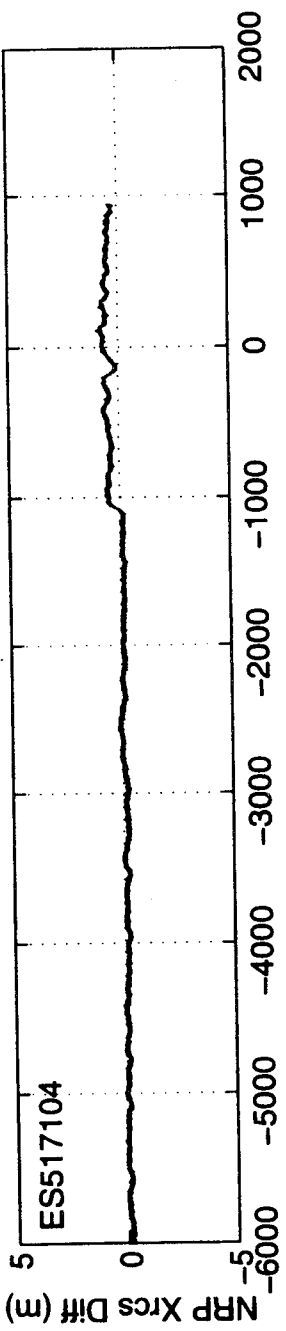
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 382.541  
LGRP Yrcs POSITION (m): -0.378





NRP LONGITUDINAL, LATERAL AND VERTICAL POSITION DIFFERENCES





APPROACH #: ES517105  
START TIME: 232084.330  
STOP TIME: 232240.990

MINIMUM HDOP: 0.6  
MAXIMUM HDOP: 0.6  
AVERAGE HDOP: 0.6

MINIMUM VDOP: 2.0  
MAXIMUM VDOP: 2.1  
AVERAGE VDOP: 2.1

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

-----  
TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
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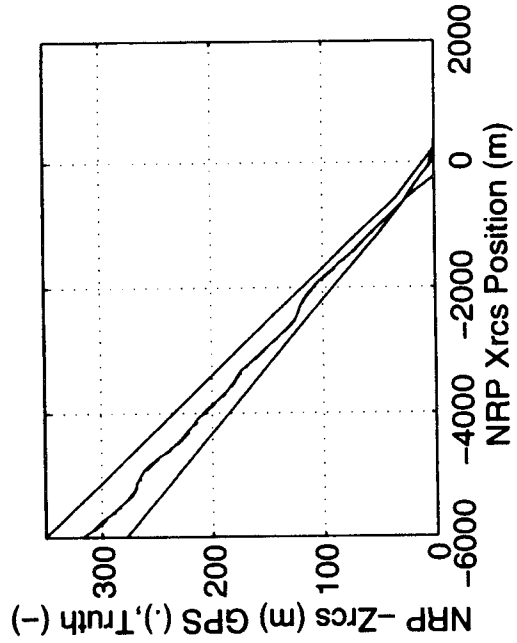
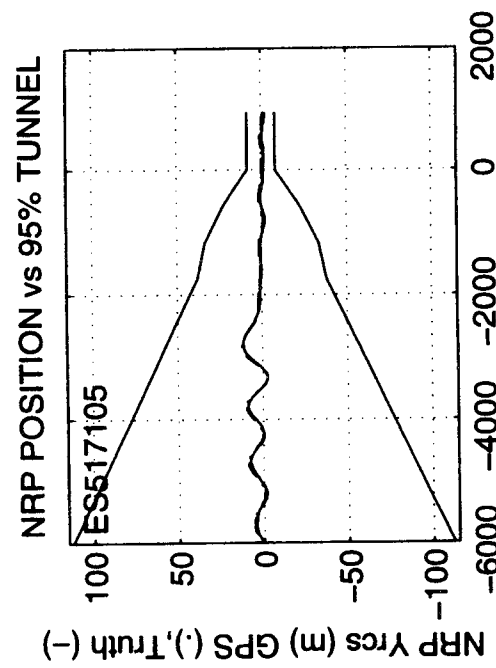
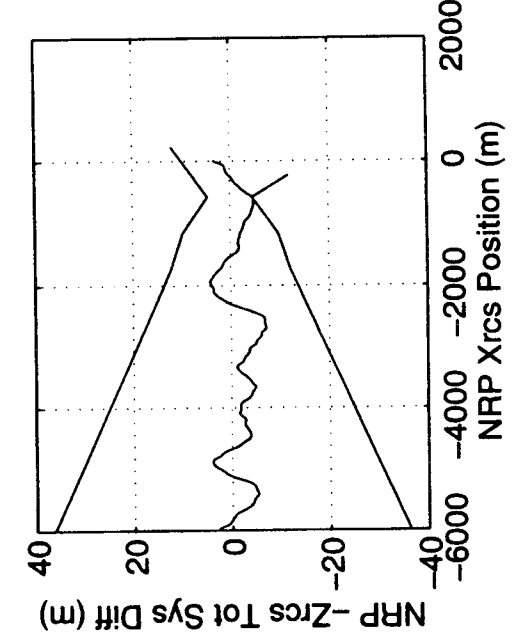
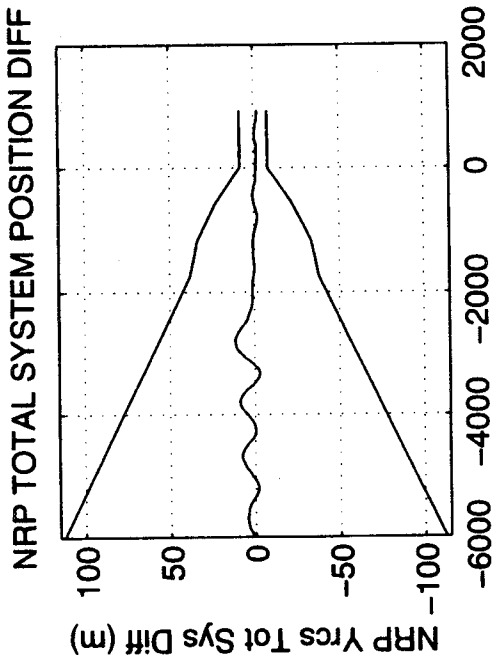
NRP Xrcs MEAN DIFFERENCE (m): 0.703  
NRP Yrcs MEAN DIFFERENCE (m): 1.103  
NRP Zrcs MEAN DIFFERENCE (m): 0.028

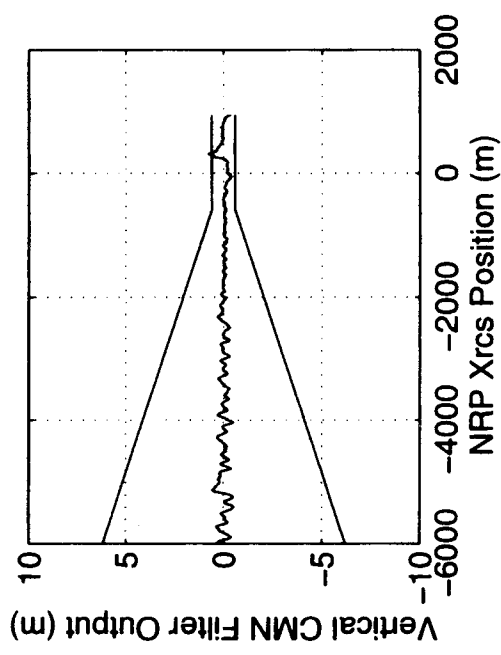
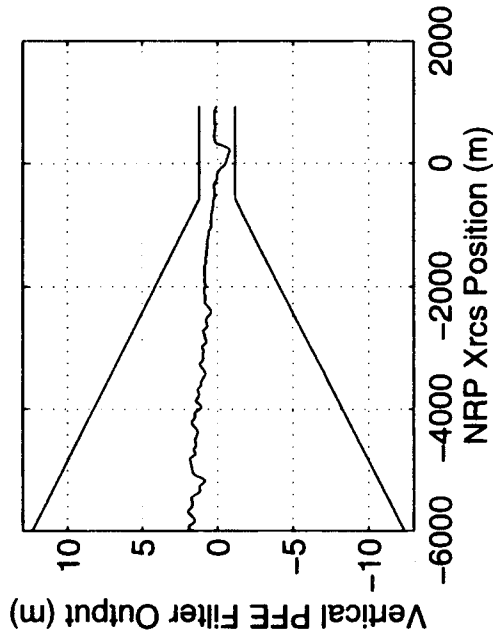
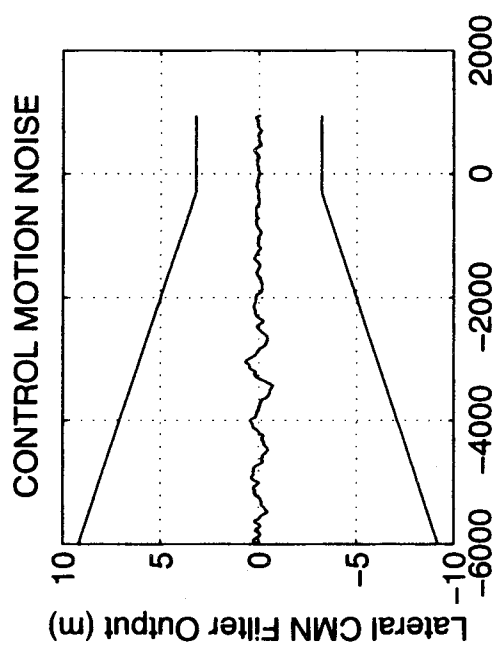
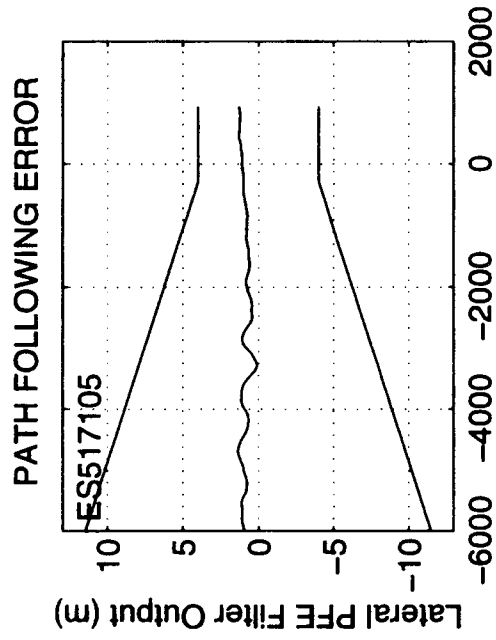
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.299  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.375  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.734

NRP Xrcs 2-RMS DIFFERENCE (m): 1.437  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.238  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.736

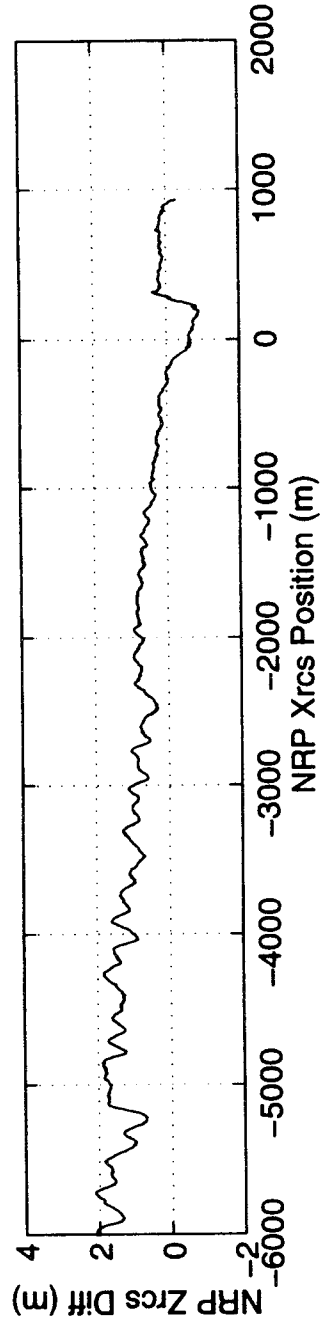
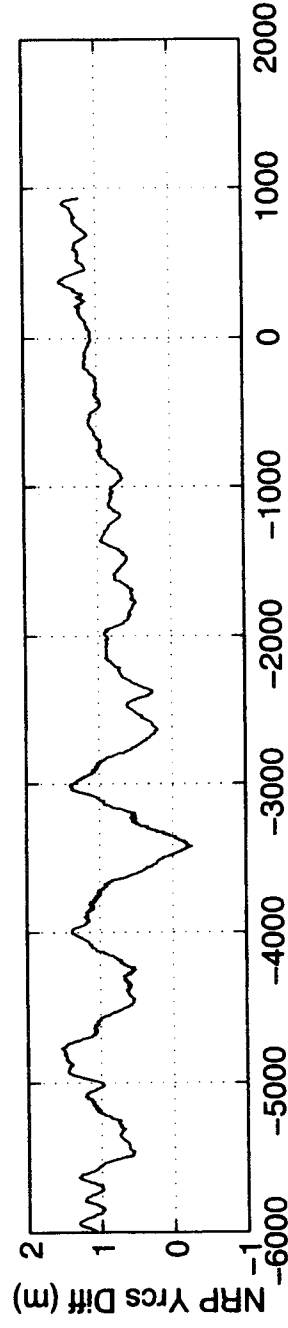
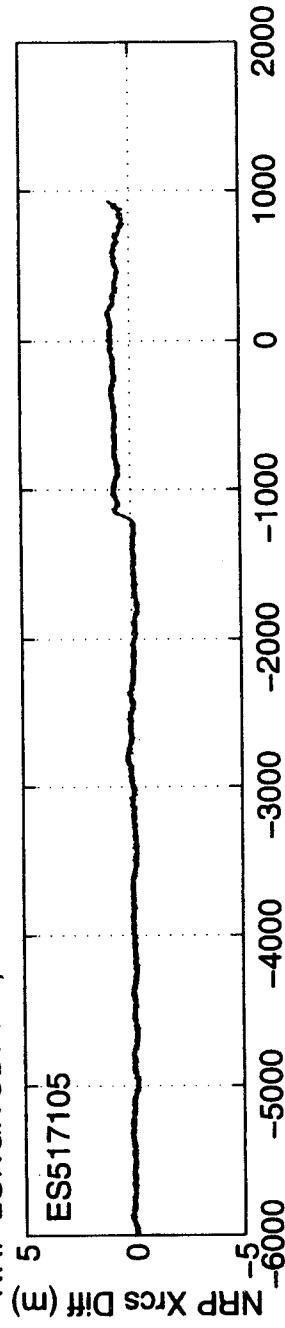
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----

LGRP Xrcs POSITION (m): 195.974  
LGRP Yrcs POSITION (m): -1.270





NRP LONGITUDINAL, LATERAL AND VERTICAL POSITION DIFFERENCES



APPROACH #: ES517106  
START TIME: 232676.660  
STOP TIME: 232835.264

MINIMUM HDOP: 0.6  
MAXIMUM HDOP: 0.6  
AVERAGE HDOP: 0.6

MINIMUM VDOP: 2.2  
MAXIMUM VDOP: 2.2  
AVERAGE VDOP: 2.2

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

-----  
TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
-----

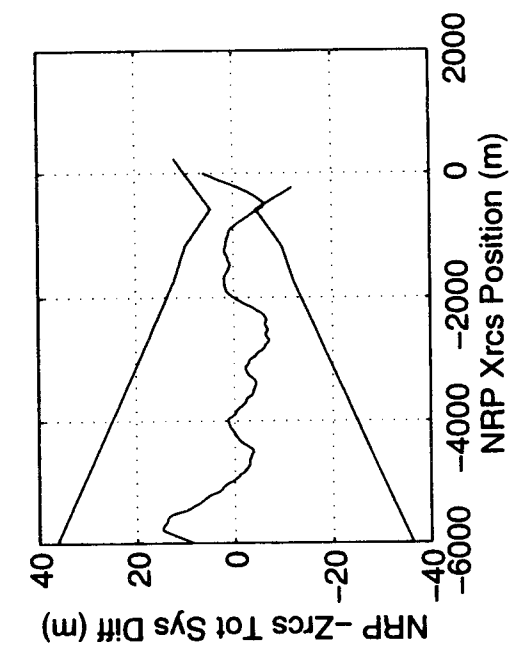
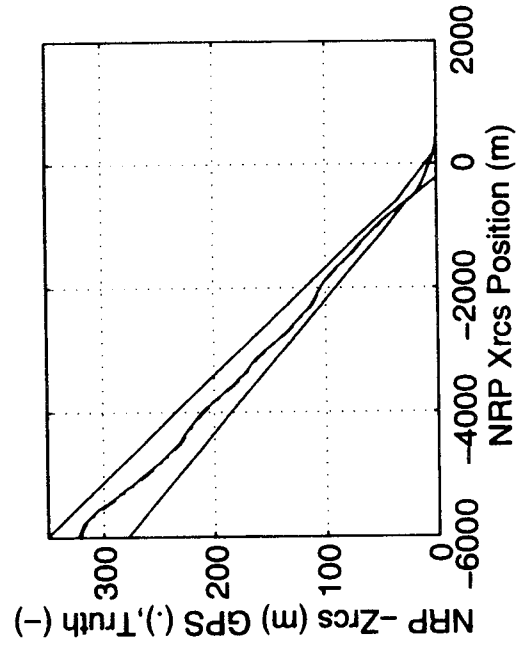
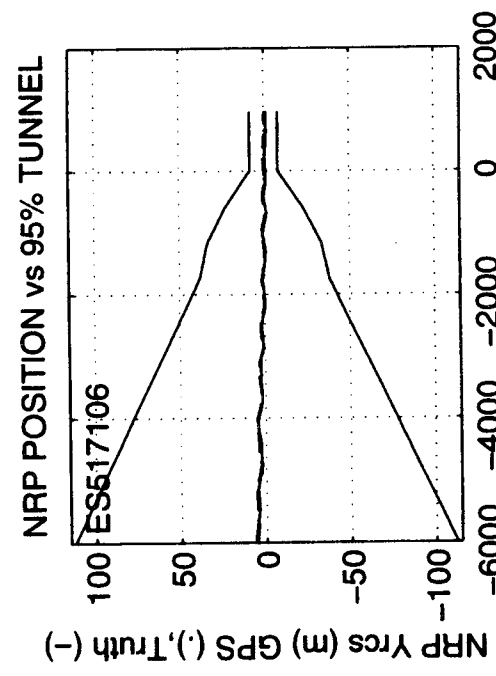
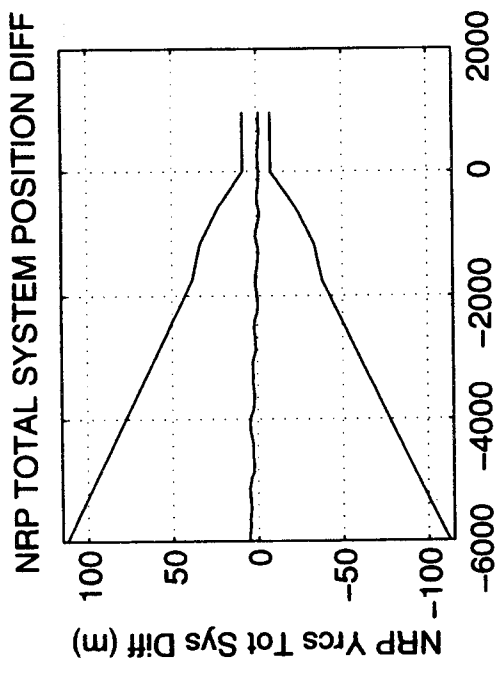
NRP Xrcs MEAN DIFFERENCE (m): 0.644  
NRP Yrcs MEAN DIFFERENCE (m): 1.041  
NRP Zrcs MEAN DIFFERENCE (m): 0.051

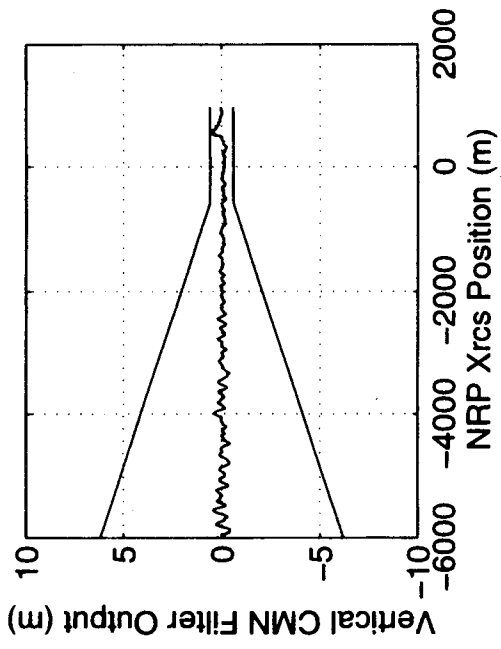
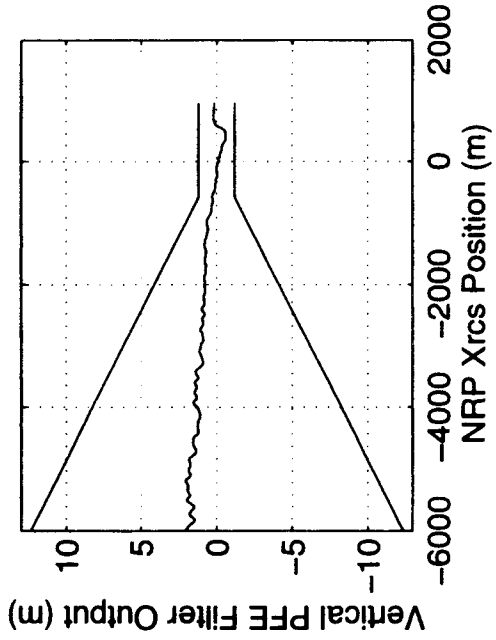
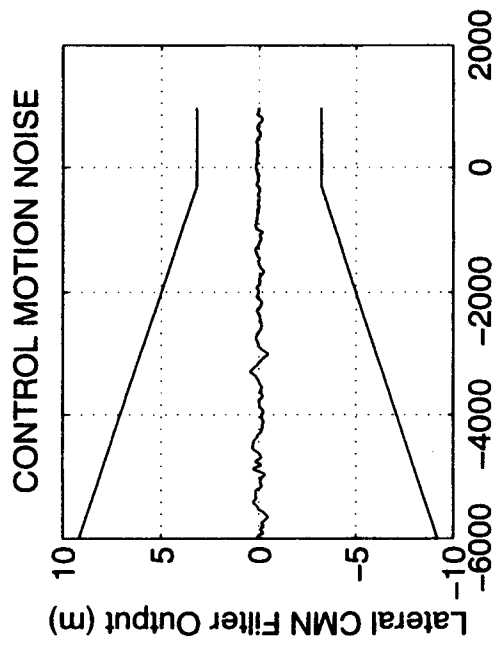
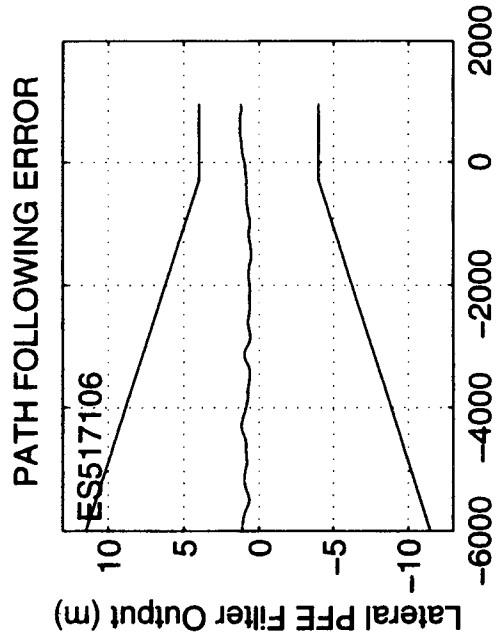
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.414  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.461  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.696

NRP Xrcs 2-RMS DIFFERENCE (m): 1.354  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.133  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.704

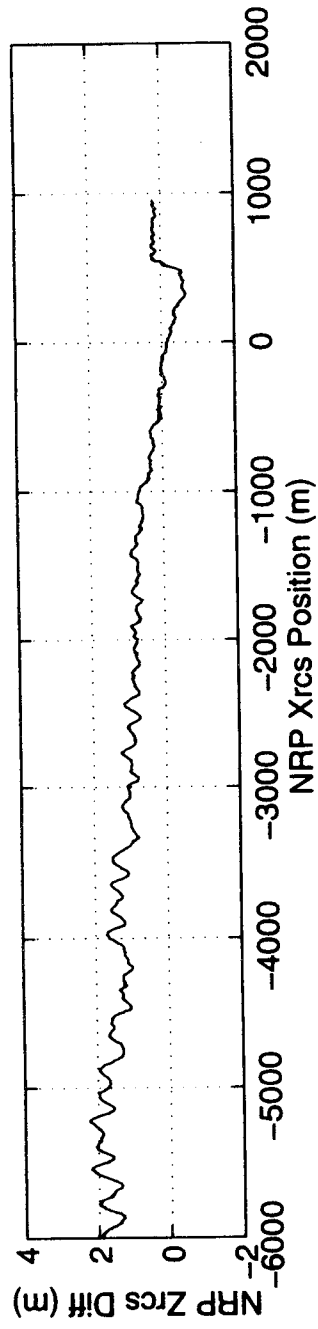
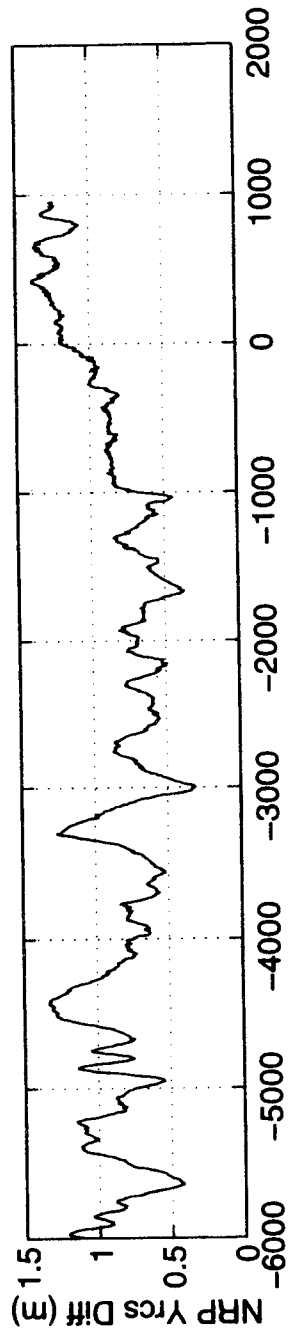
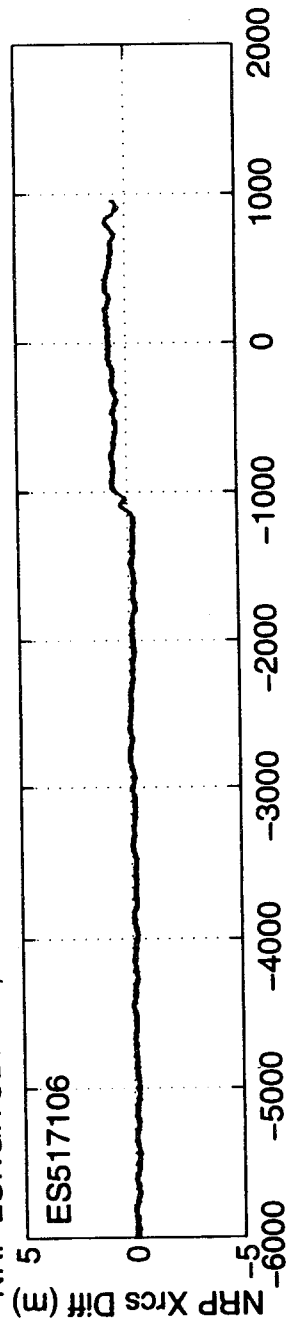
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----

LGRP Xrcs POSITION (m): 504.372  
LGRP Yrcs POSITION (m): -0.785





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES





APPROACH #: ES517107  
START TIME: 233294.111  
STOP TIME: 233457.781

MINIMUM HDOP: 0.4  
MAXIMUM HDOP: 1.1  
AVERAGE HDOP: 0.6

MINIMUM VDOP: 1.5  
MAXIMUM VDOP: 3.8  
AVERAGE VDOP: 2.3

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 9  
AVERAGE NUMBER OF SVs: 9

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

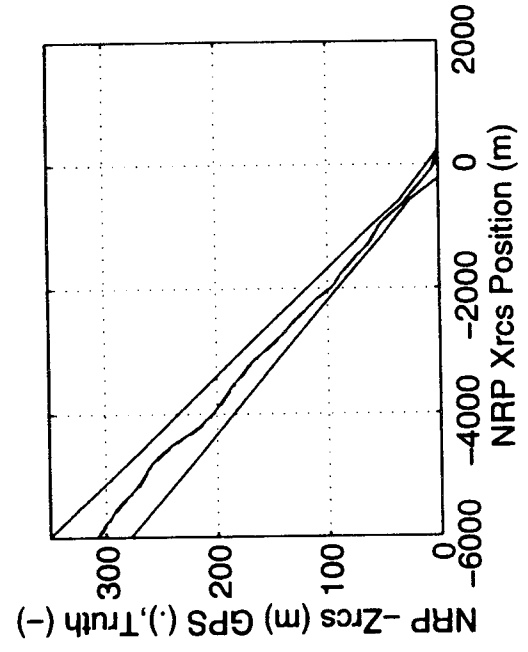
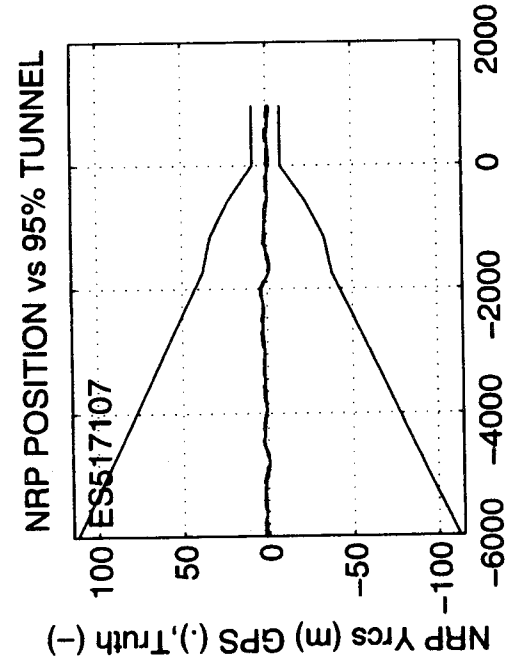
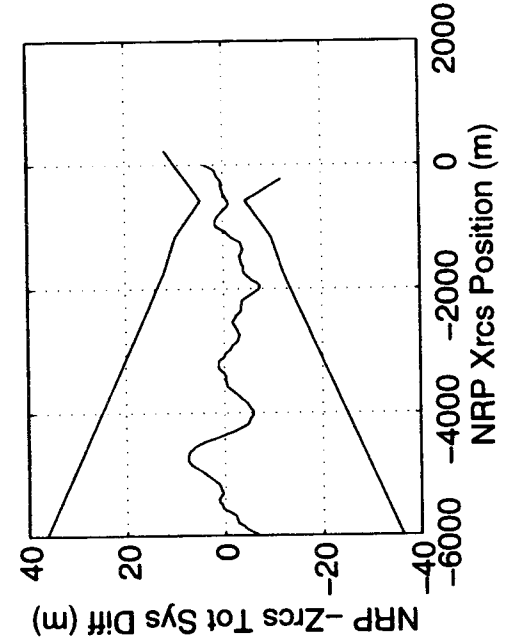
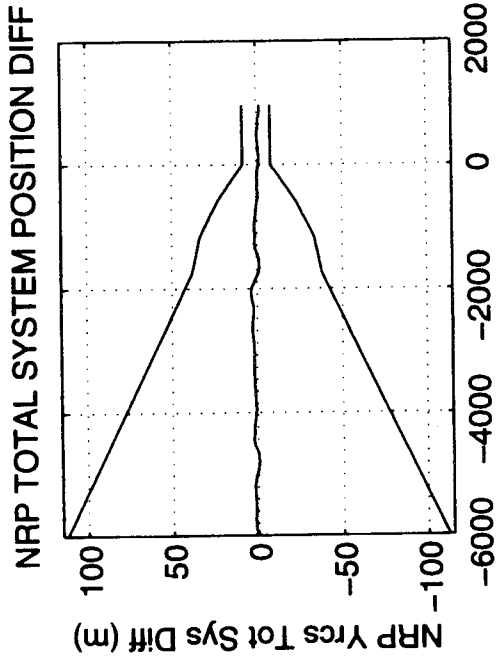
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.517  
NRP Yrcs MEAN DIFFERENCE (m): 1.034  
NRP Zrcs MEAN DIFFERENCE (m): 0.040

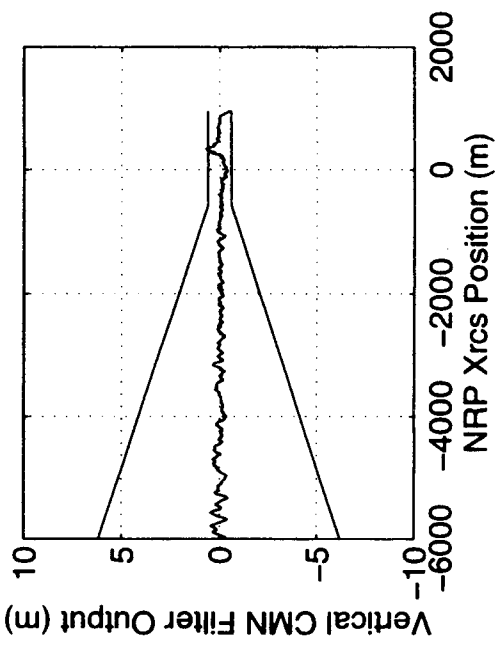
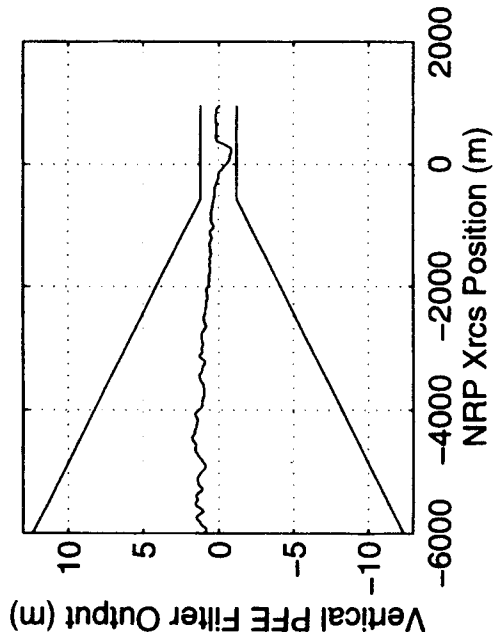
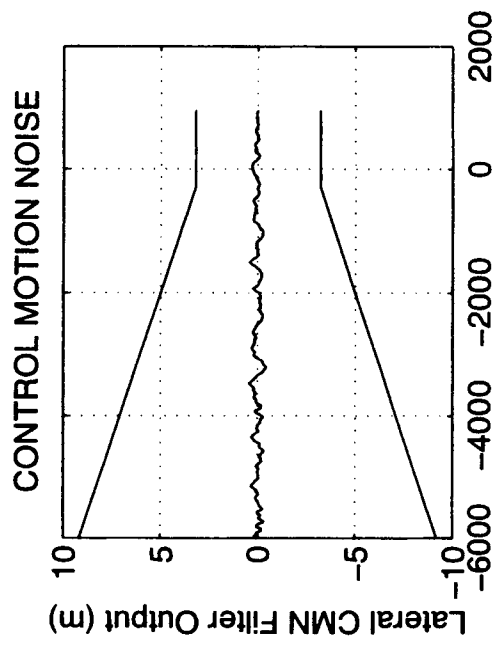
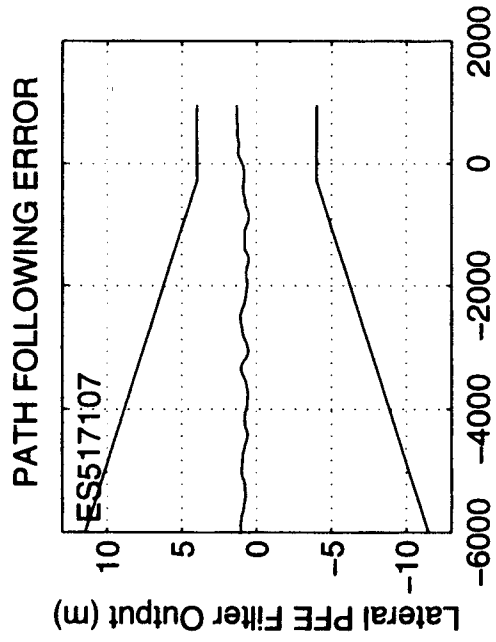
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.531  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.591  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.813

NRP Xrcs 2-RMS DIFFERENCE (m): 1.163  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.150  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.816

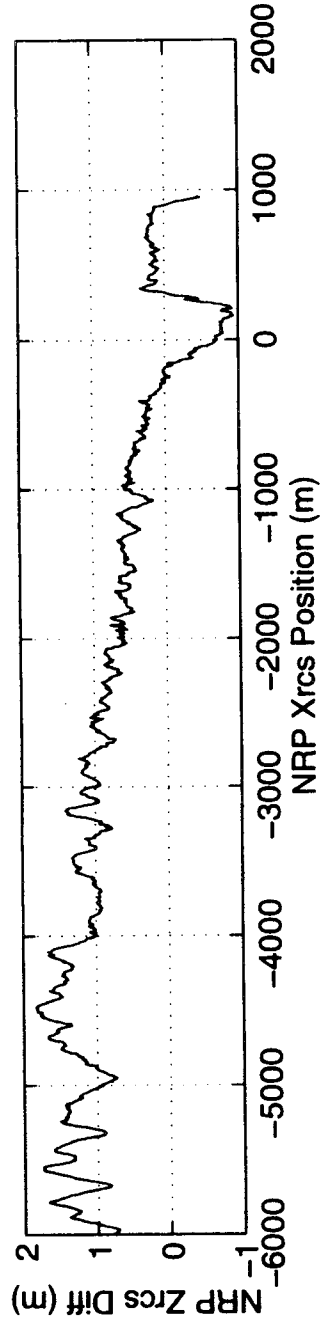
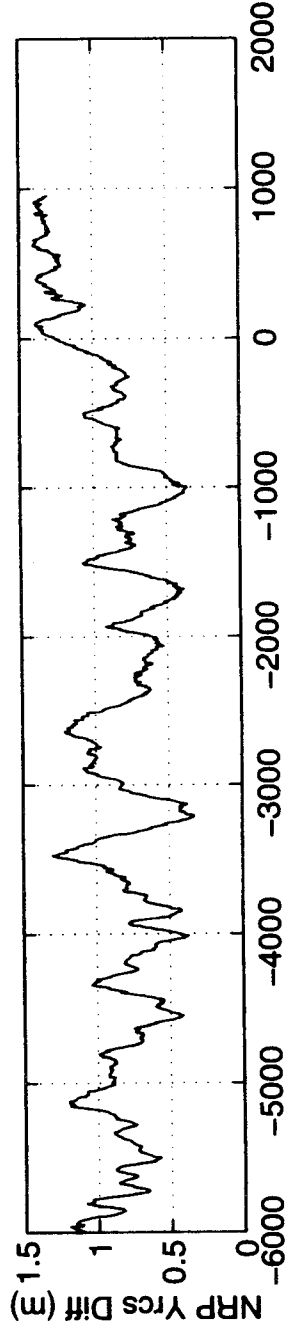
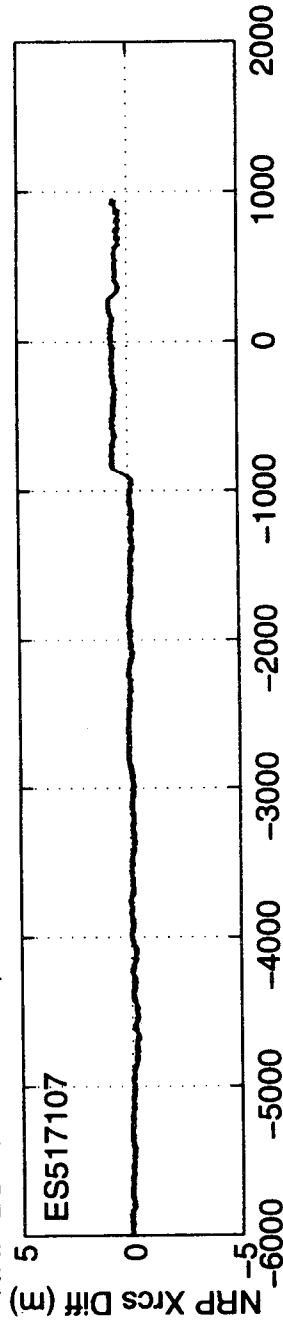
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

-----  
LGRP Xrcs POSITION (m): 250.034  
LGRP Yrcs POSITION (m): -0.560





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517108  
START TIME: 233912.264  
STOP TIME: 234070.319

MINIMUM HDOP: 1.0  
MAXIMUM HDOP: 1.1  
AVERAGE HDOP: 1.0

MINIMUM VDOP: 4.1  
MAXIMUM VDOP: 4.5  
AVERAGE VDOP: 4.4

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

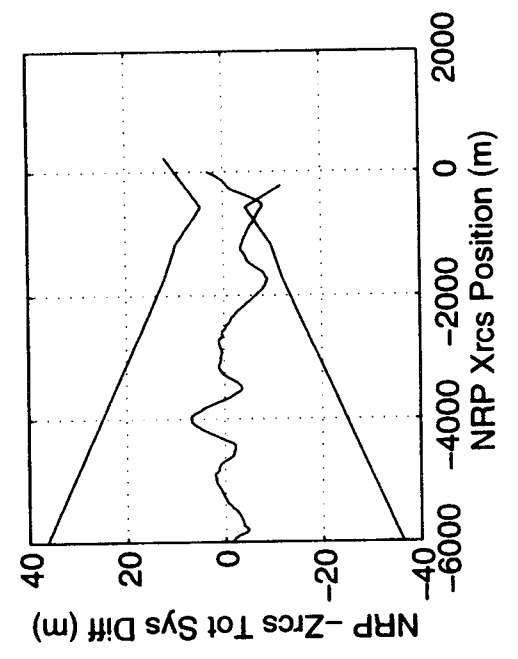
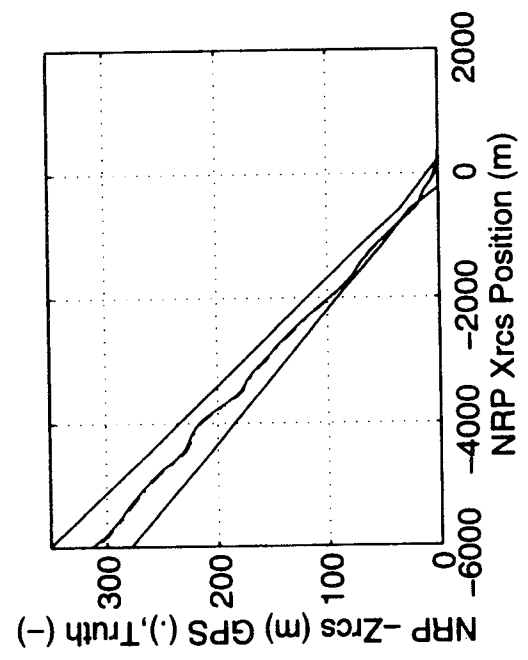
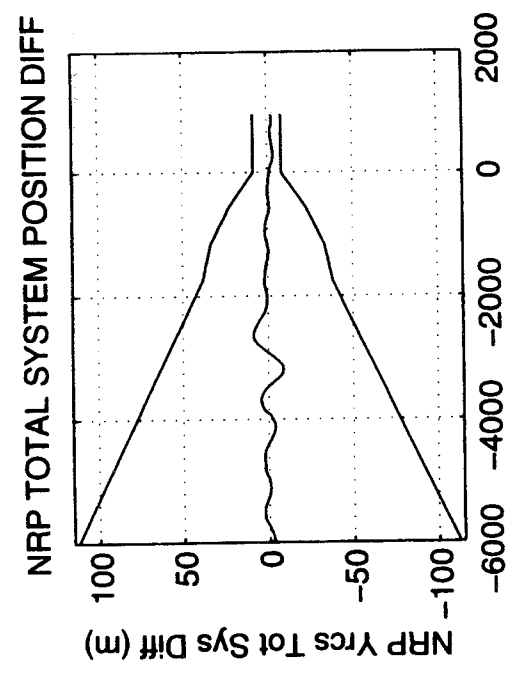
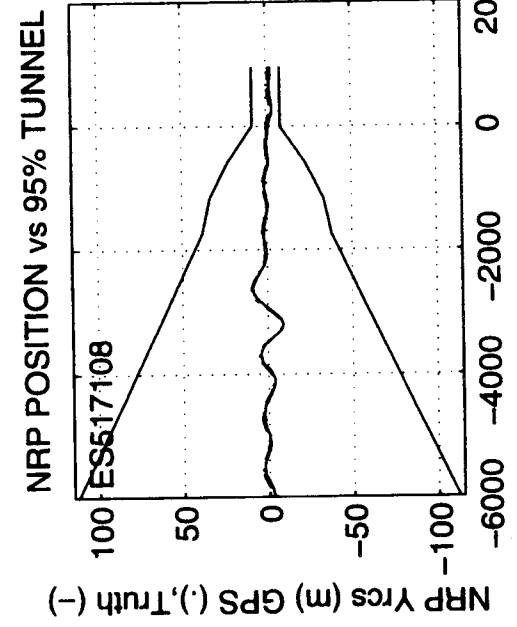
-----  
NRP Xrcs MEAN DIFFERENCE (m) : 0.538  
NRP Yrcs MEAN DIFFERENCE (m) : 1.039  
NRP Zrcs MEAN DIFFERENCE (m) : 0.005

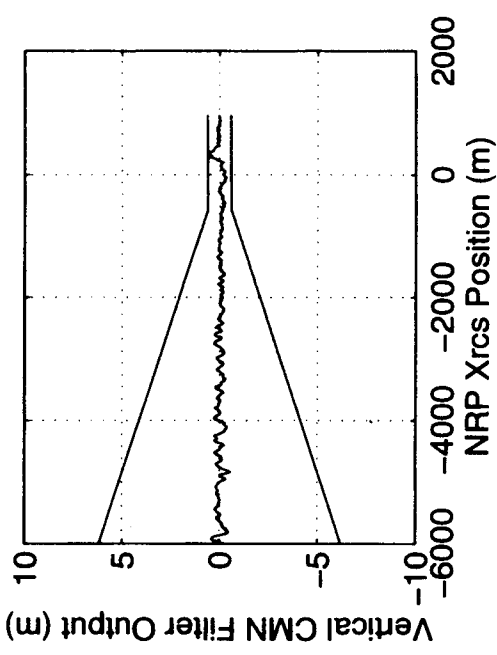
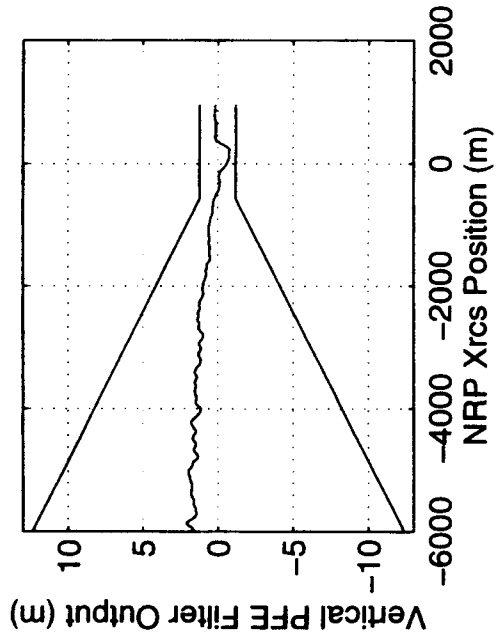
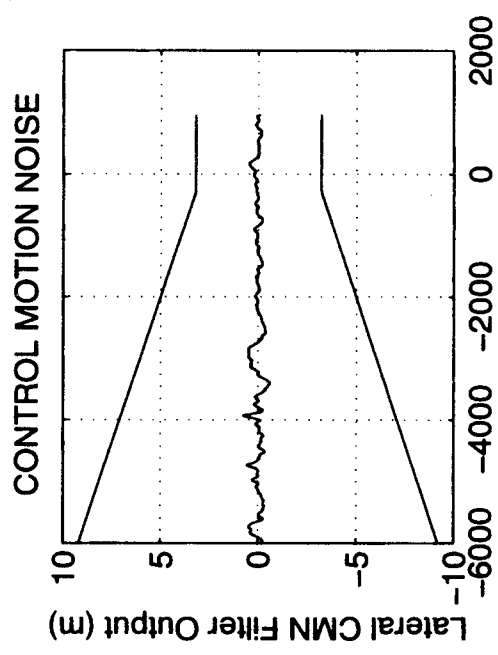
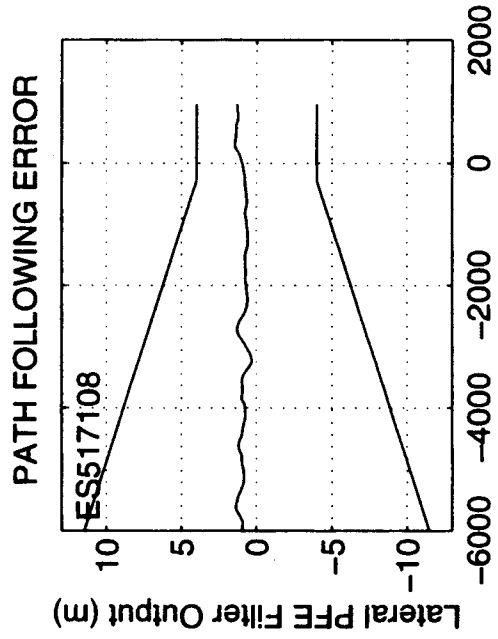
NRP Xrcs 2-SIGMA DIFFERENCE (m) : 0.518  
NRP Yrcs 2-SIGMA DIFFERENCE (m) : 0.620  
NRP Zrcs 2-SIGMA DIFFERENCE (m) : 0.775

NRP Xrcs 2-RMS DIFFERENCE (m) : 1.195  
NRP Yrcs 2-RMS DIFFERENCE (m) : 2.169  
NRP Zrcs 2-RMS DIFFERENCE (m) : 0.775

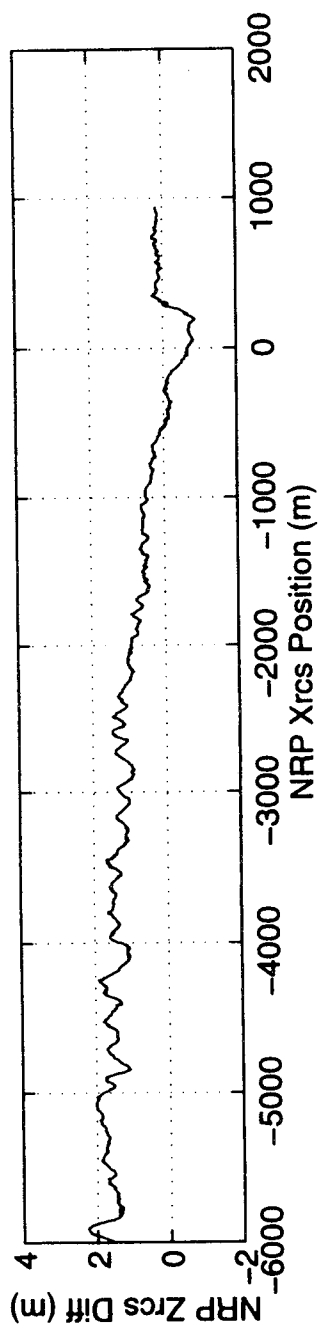
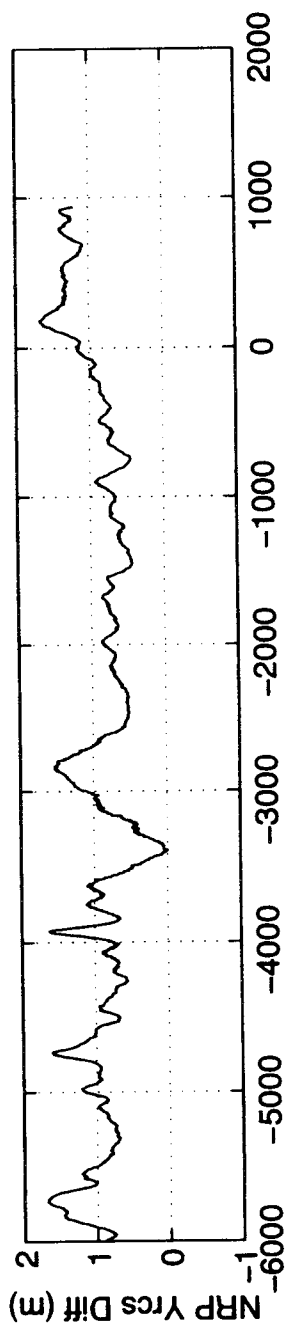
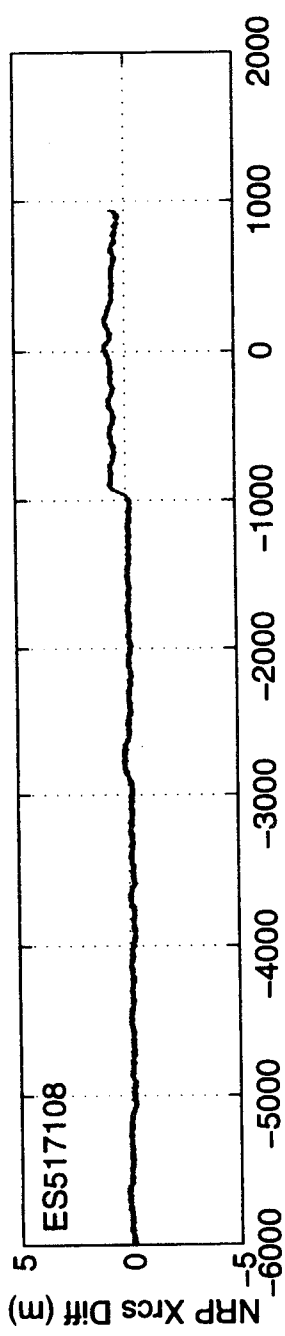
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m) : 263.189  
LGRP Yrcs POSITION (m) : -3.067





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES





APPROACH #: ES517109  
START TIME: 234507.330  
STOP TIME: 234675.396

MINIMUM HDOP: 0.9  
MAXIMUM HDOP: 1.0  
AVERAGE HDOP: 1.0

MINIMUM VDOP: 4.4  
MAXIMUM VDOP: 4.6  
AVERAGE VDOP: 4.5

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

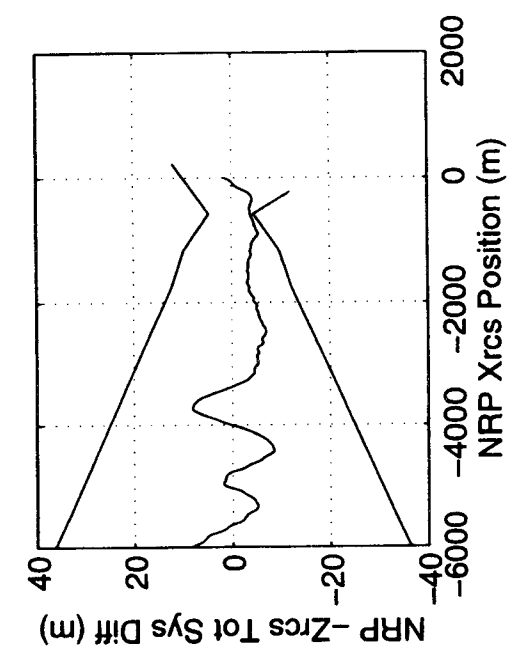
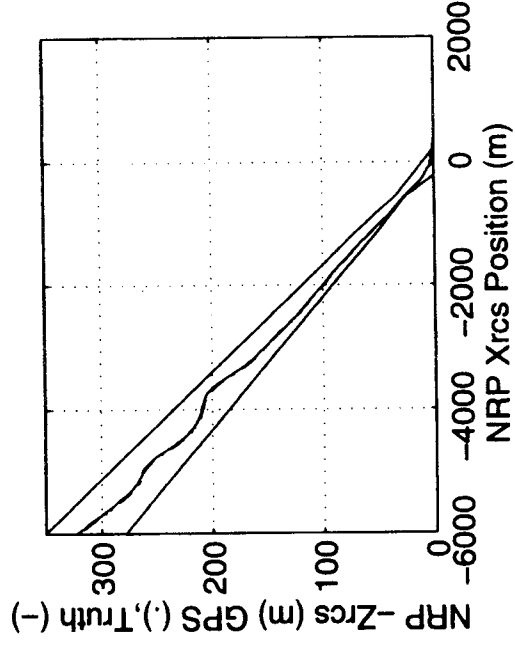
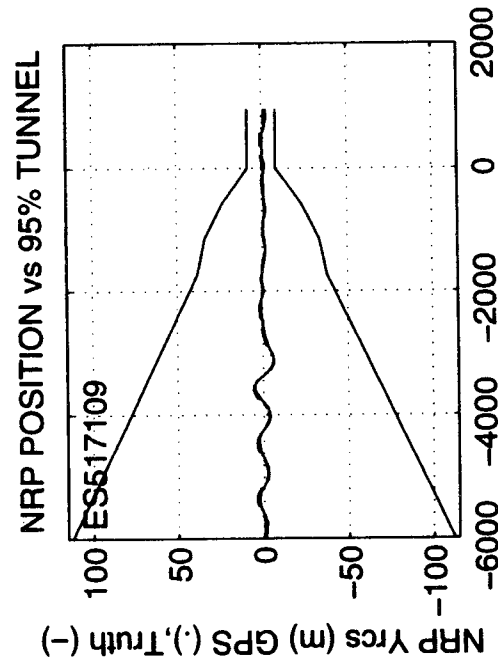
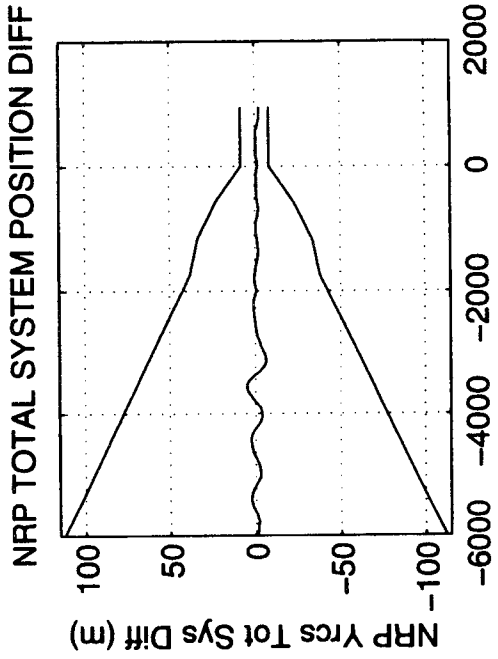
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.604  
NRP Yrcs MEAN DIFFERENCE (m): 0.847  
NRP Zrcs MEAN DIFFERENCE (m): -0.055

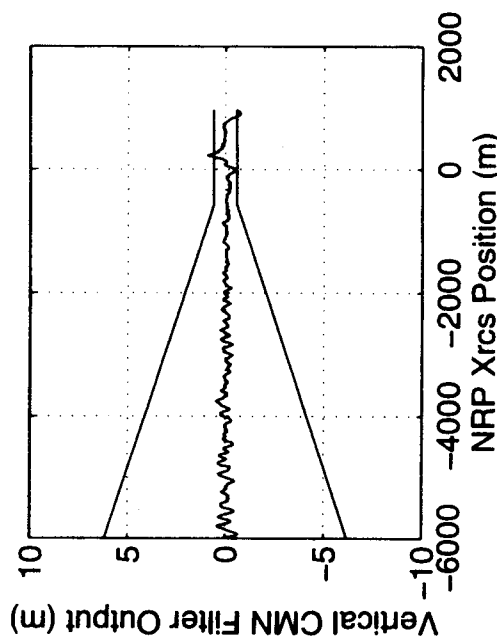
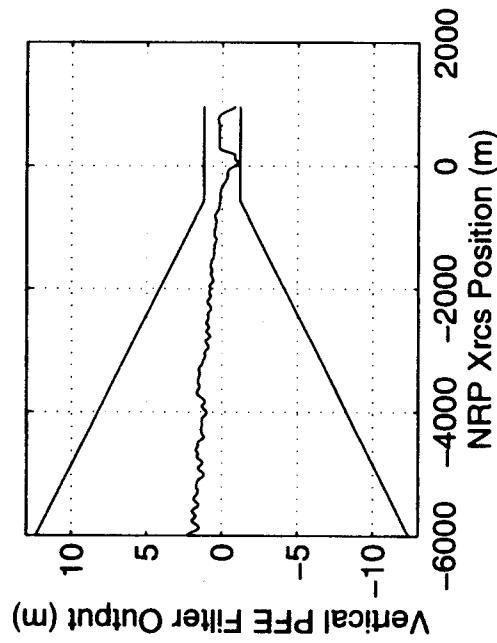
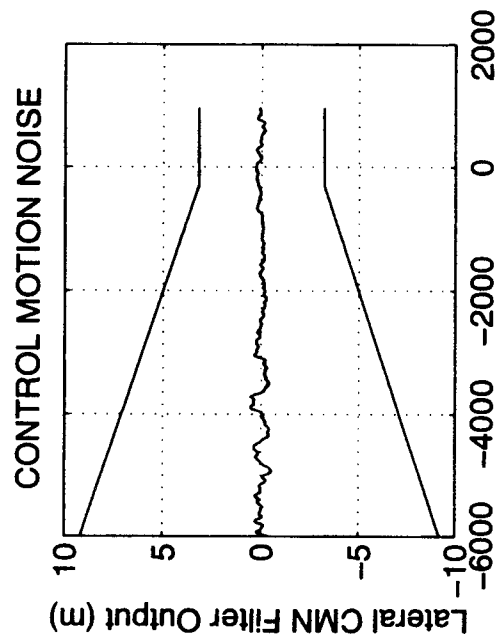
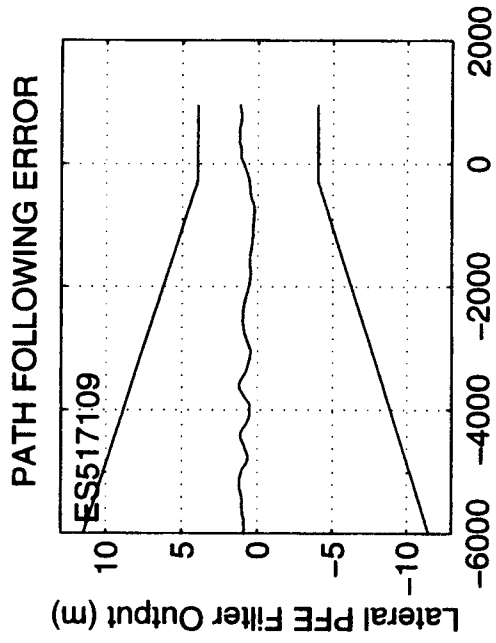
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.823  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.769  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.915

NRP Xrcs 2-RMS DIFFERENCE (m): 1.461  
NRP Yrcs 2-RMS DIFFERENCE (m): 1.860  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.922

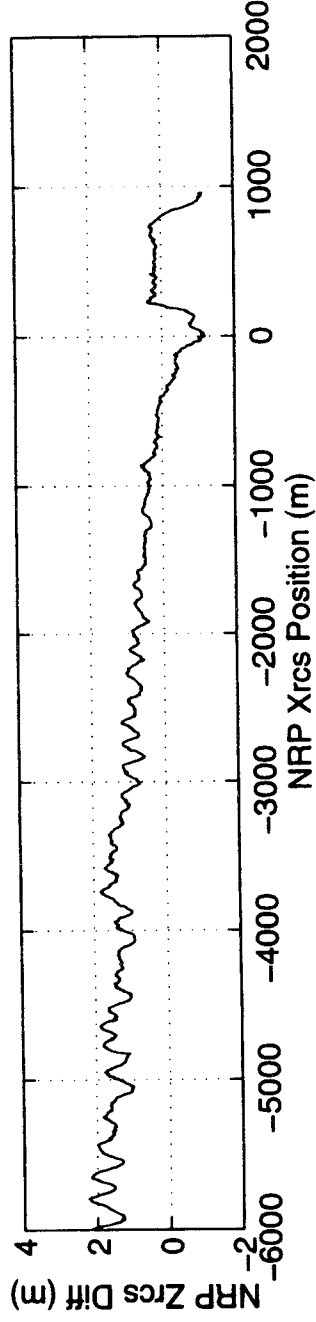
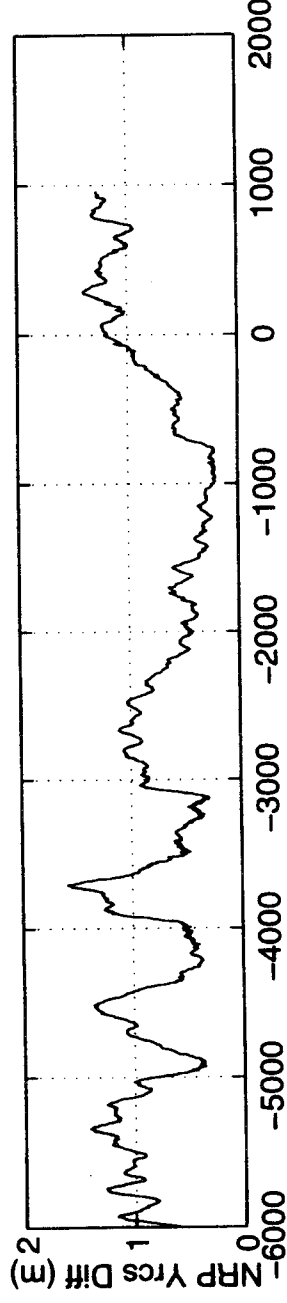
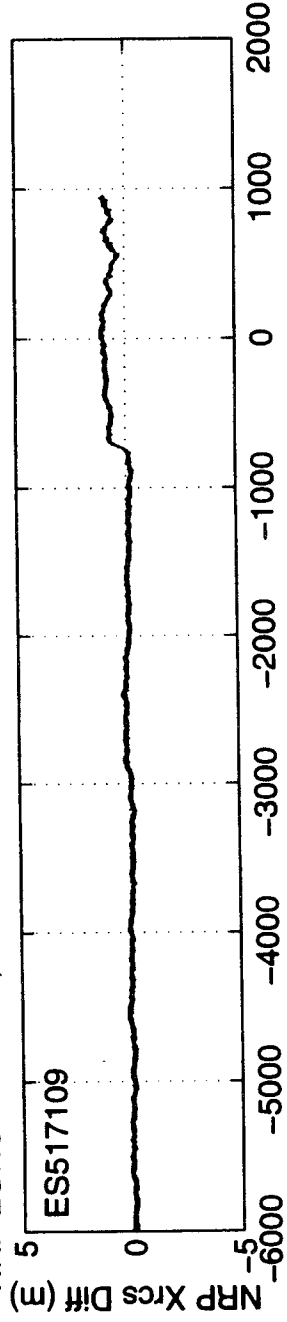
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

-----  
LGRP Xrcs POSITION (m): 146.038  
LGRP Yrcs POSITION (m): -0.443





NRP LONGITUDINAL, LATERAL AND VERTICAL POSITION DIFFERENCES



APPROACH #: ES517110  
START TIME: 235102.649  
STOP TIME: 235267.385

MINIMUM HDOP: 0.8  
MAXIMUM HDOP: 0.9  
AVERAGE HDOP: 0.9

MINIMUM VDOP: 3.9  
MAXIMUM VDOP: 4.2  
AVERAGE VDOP: 4.1

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* UNSUCCESSFUL APPROACH (MOS 1) DUE TO LESS THAN\*  
\* 95 PERCENT OF ALL OF THE DATA POINTS WITHIN \*  
\* THE VERTICAL FILTER REQUIREMENTS \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

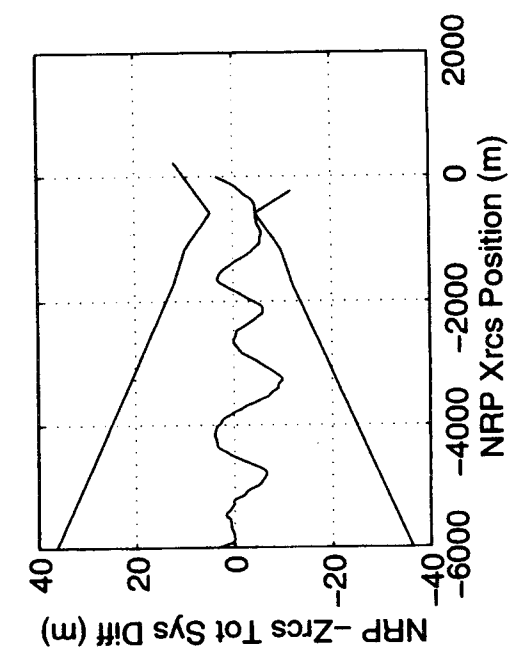
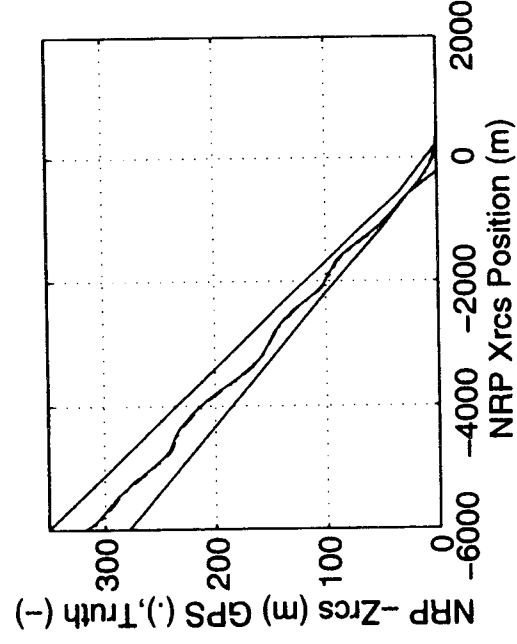
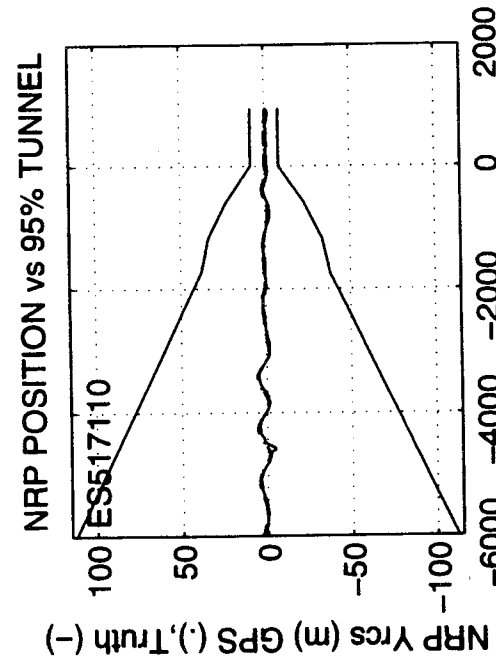
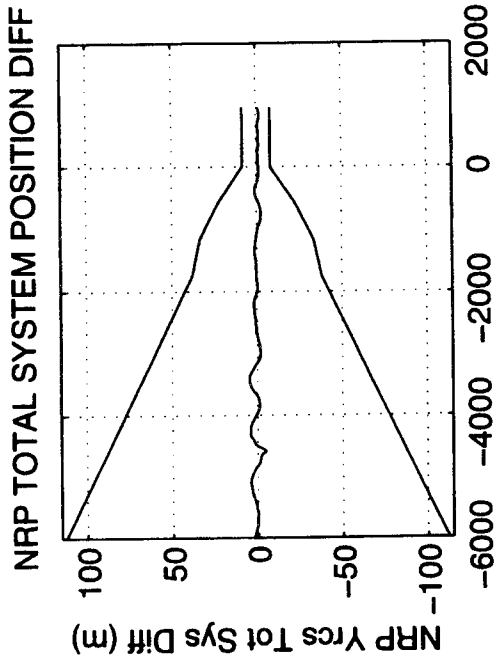
-----  
NRP Xrcs MEAN DIFFERENCE (m) : 0.692  
NRP Yrcs MEAN DIFFERENCE (m) : 1.184  
NRP Zrcs MEAN DIFFERENCE (m) : 0.282

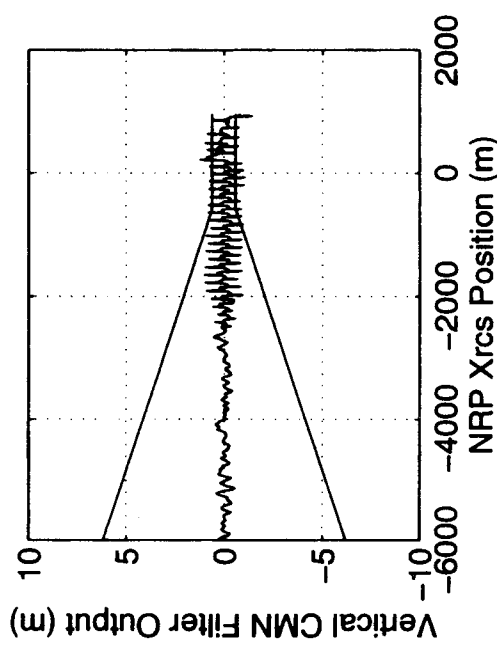
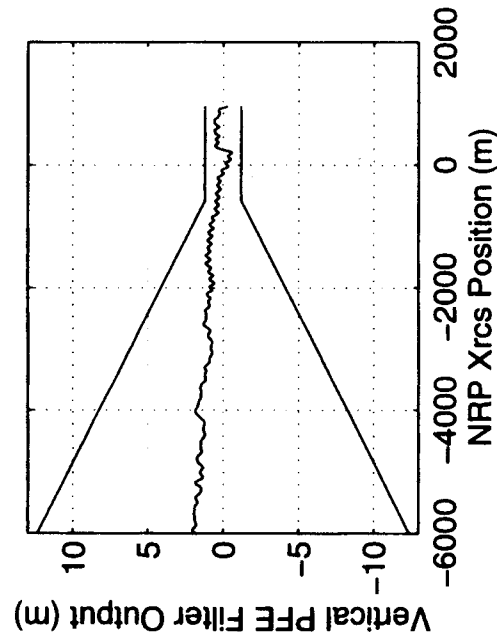
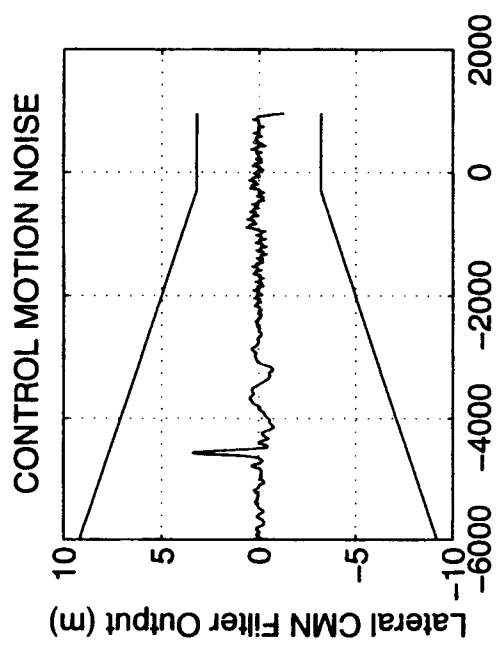
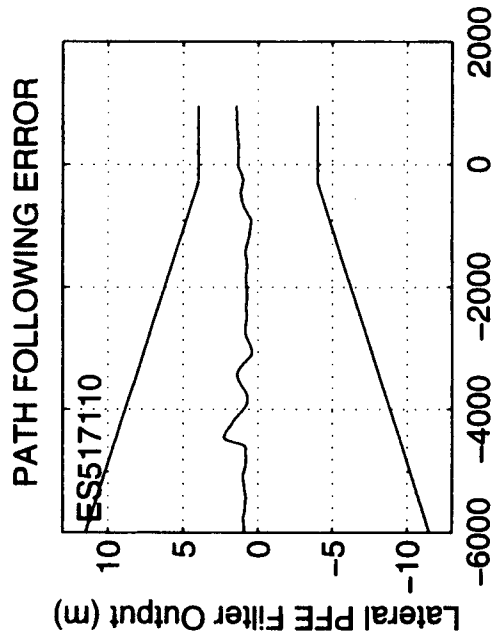
NRP Xrcs 2-SIGMA DIFFERENCE (m) : 0.585  
NRP Yrcs 2-SIGMA DIFFERENCE (m) : 0.668  
NRP Zrcs 2-SIGMA DIFFERENCE (m) : 1.002

NRP Xrcs 2-RMS DIFFERENCE (m) : 1.502  
NRP Yrcs 2-RMS DIFFERENCE (m) : 2.461  
NRP Zrcs 2-RMS DIFFERENCE (m) : 1.150

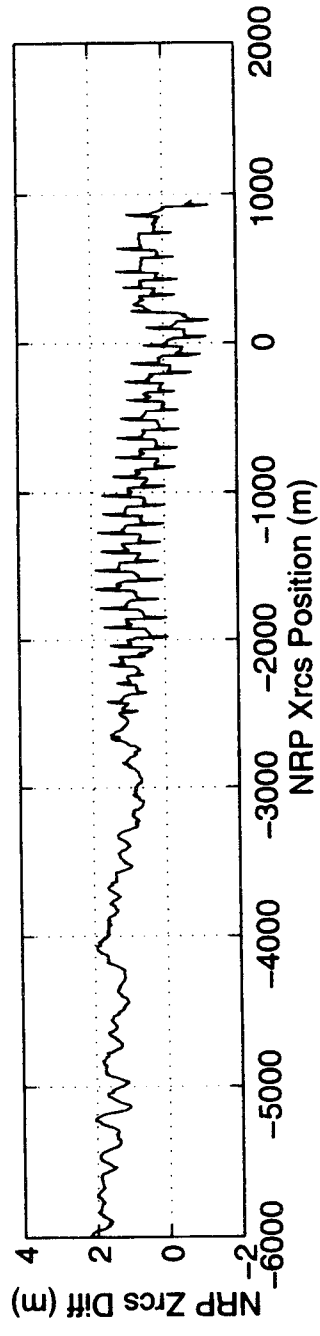
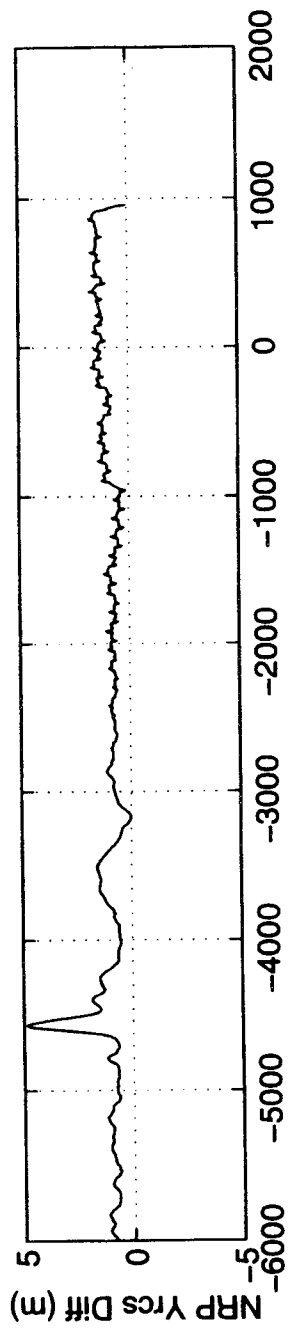
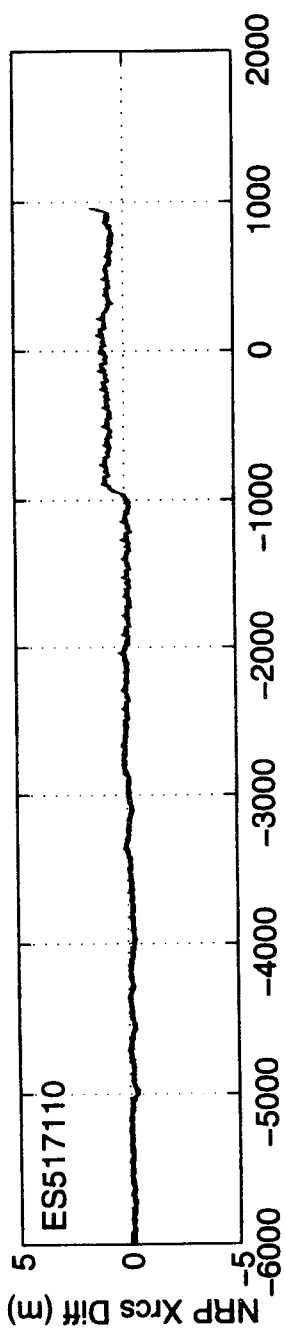
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

-----  
LGRP Xrcs POSITION (m) : 237.857  
LGRP Yrcs POSITION (m) : -0.353





NRP LONGITUDINAL, LATERAL AND VERTICAL POSITION DIFFERENCES





APPROACH #: ES517111  
START TIME: 235697.122  
STOP TIME: 235861.122

MINIMUM HDOP: 0.9  
MAXIMUM HDOP: 1.0  
AVERAGE HDOP: 1.0  
  
MINIMUM VDOP: 7.4  
MAXIMUM VDOP: 8.3  
AVERAGE VDOP: 7.8

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

-----  
TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
-----

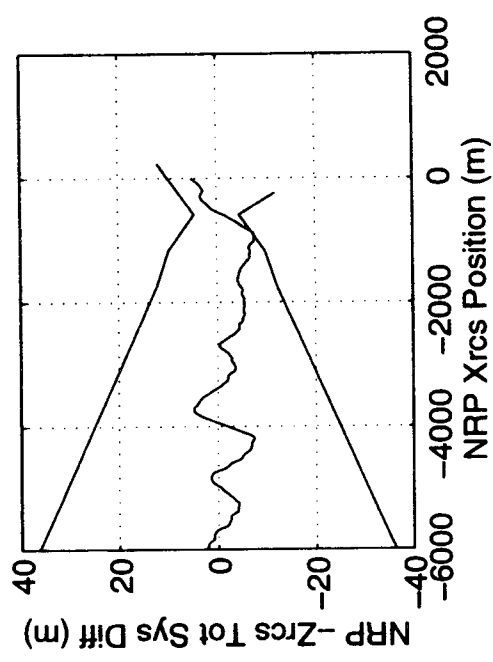
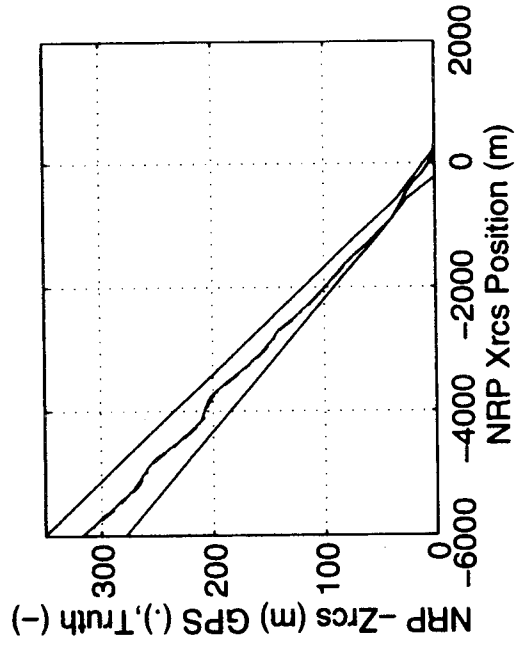
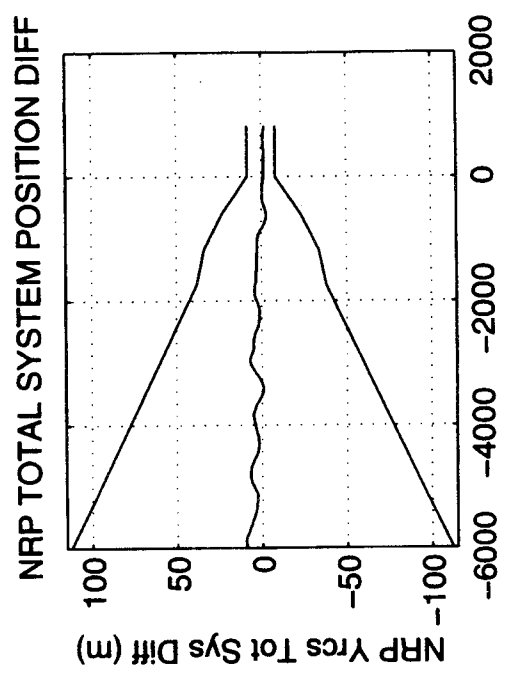
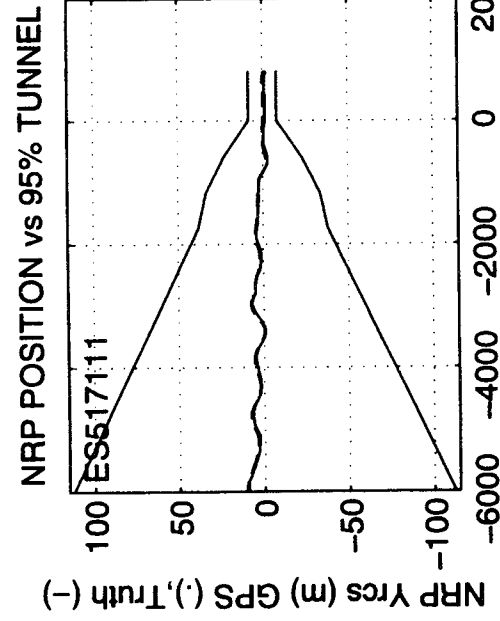
NRP Xrcs MEAN DIFFERENCE (m): 0.590  
NRP Yrcs MEAN DIFFERENCE (m): 1.020  
NRP Zrcs MEAN DIFFERENCE (m): 0.088

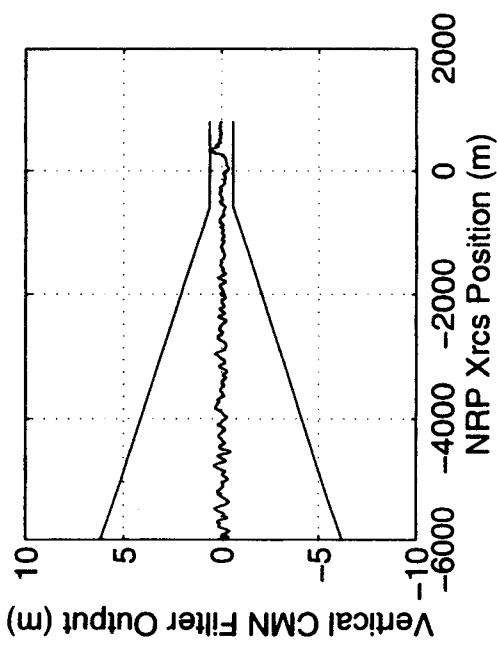
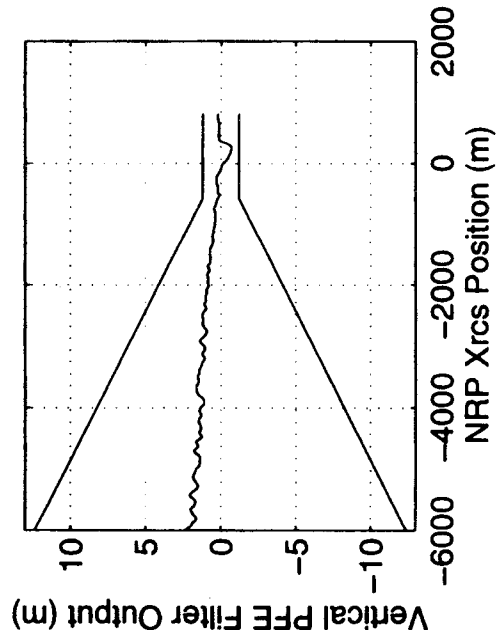
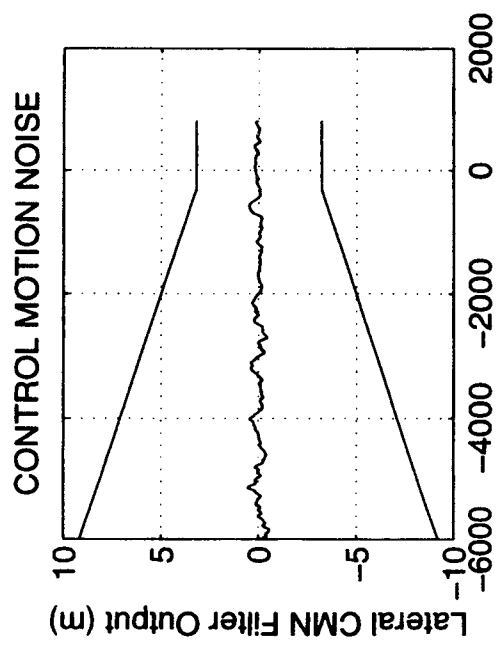
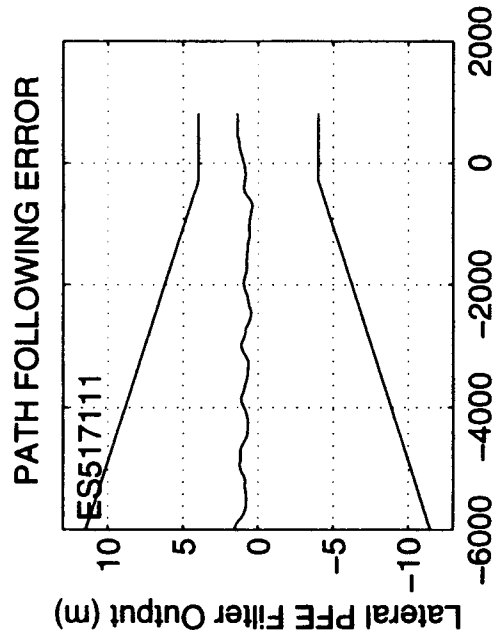
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.796  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.725  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.660

NRP Xrcs 2-RMS DIFFERENCE (m): 1.423  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.165  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.683

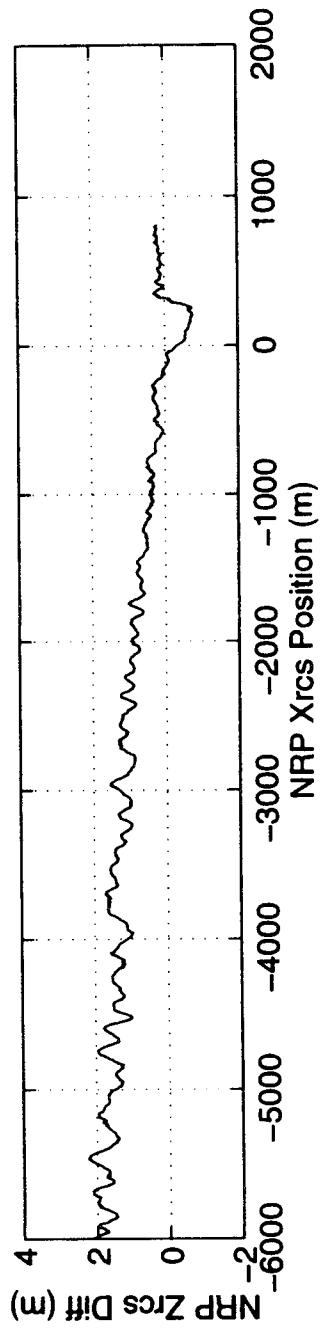
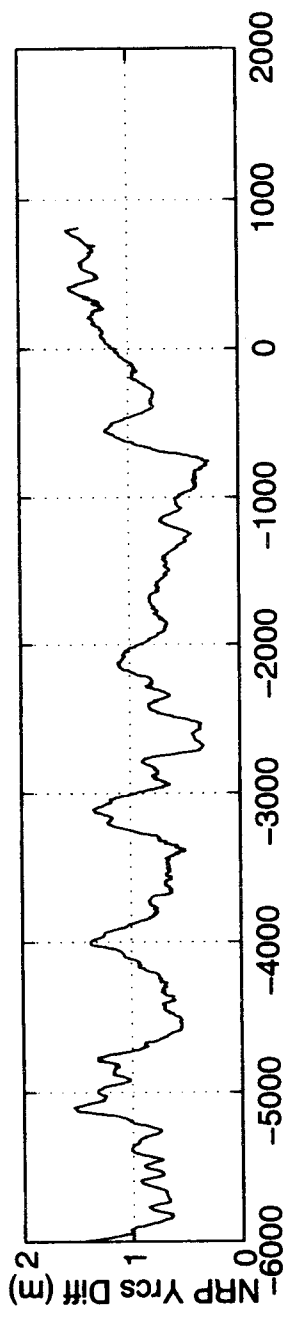
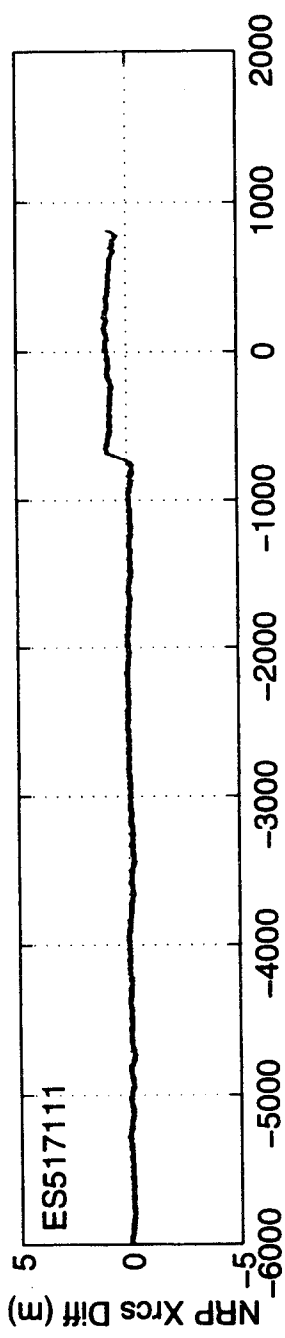
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----

LGRP Xrcs POSITION (m): 222.842  
LGRP Yrcs POSITION (m): -1.139





# NRP LONGITUDINAL, LATERAL AND VERTICAL POSITION DIFFERENCES



APPROACH #: ES517112  
START TIME: 236298.451  
STOP TIME: 236466.330

MINIMUM HDOP: 0.8  
MAXIMUM HDOP: 0.8  
AVERAGE HDOP: 0.8

MINIMUM VDOP: 6.0  
MAXIMUM VDOP: 6.5  
AVERAGE VDOP: 6.3

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

-----  
TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
-----

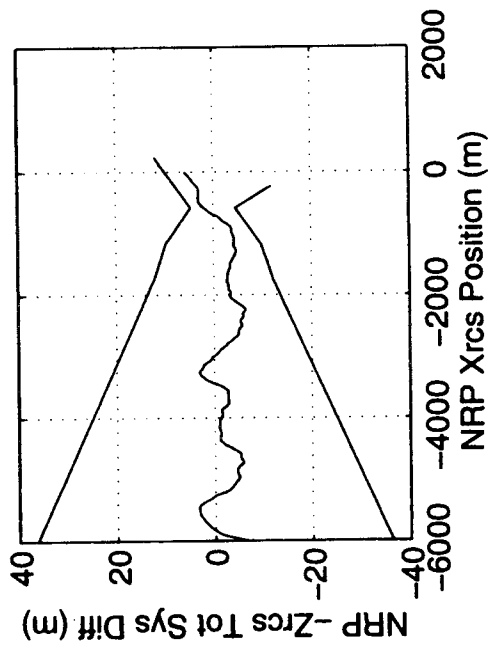
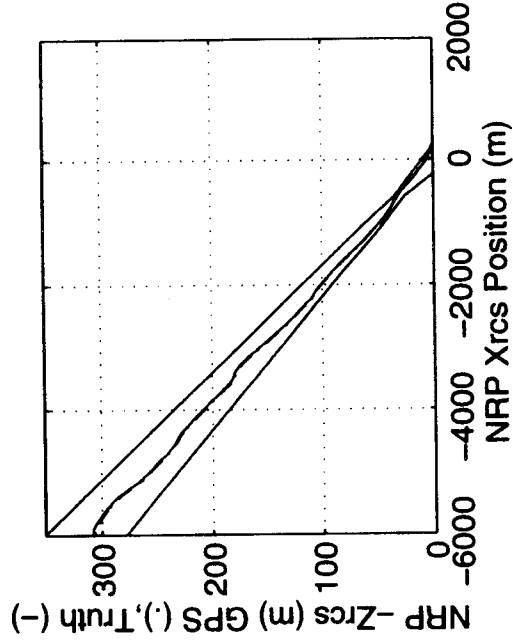
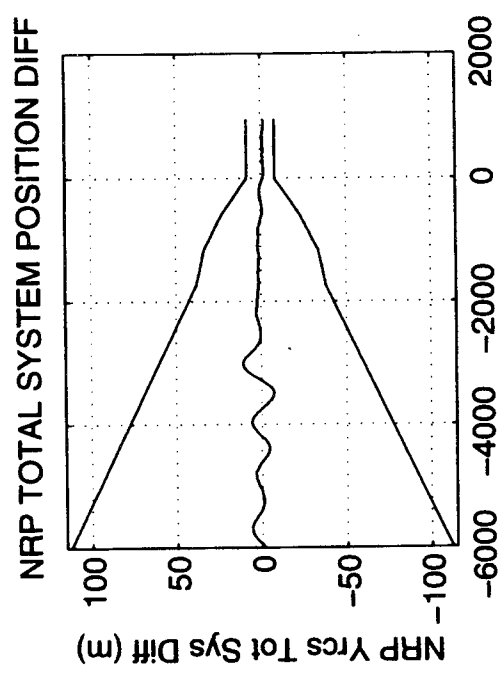
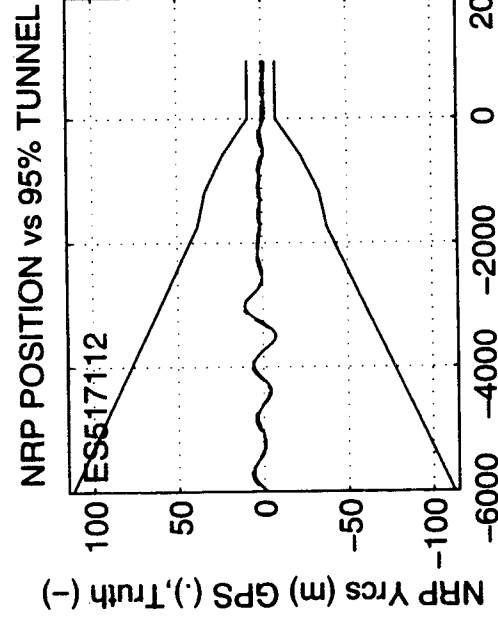
NRP Xrcs MEAN DIFFERENCE (m): 0.727  
NRP Yrcs MEAN DIFFERENCE (m): 1.217  
NRP Zrcs MEAN DIFFERENCE (m): 0.079

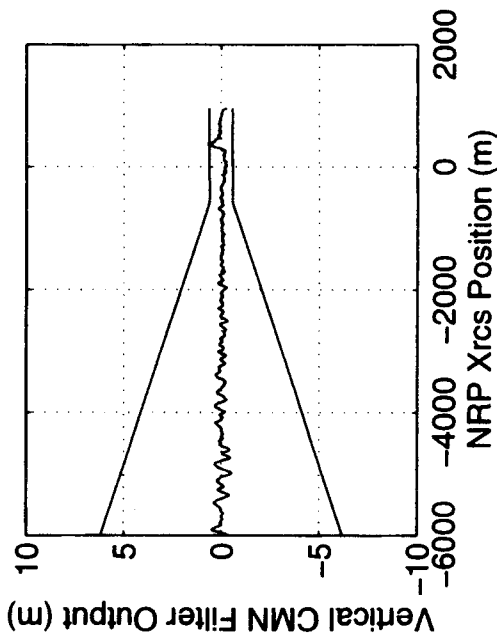
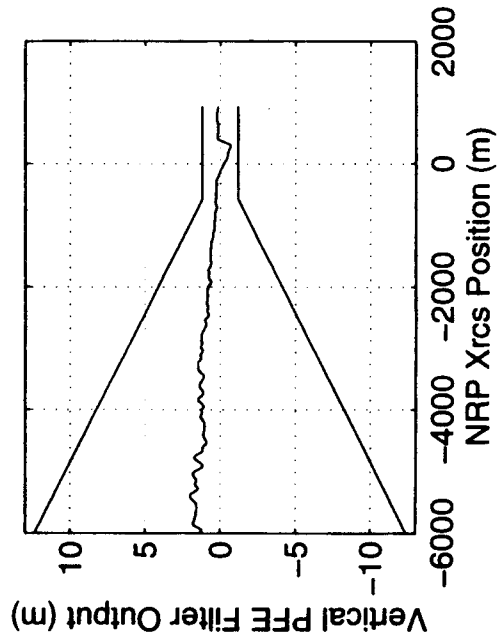
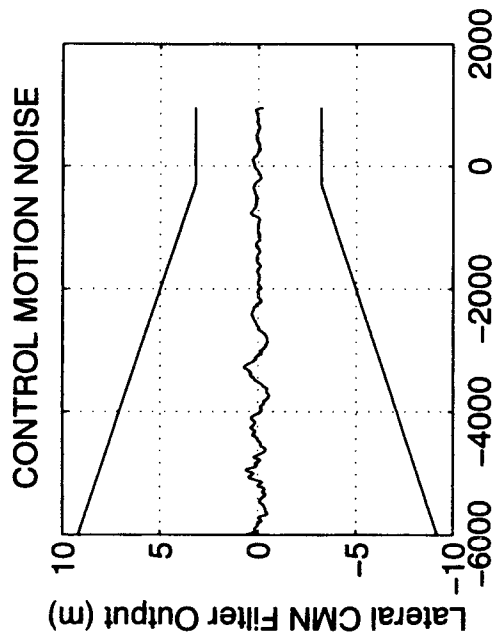
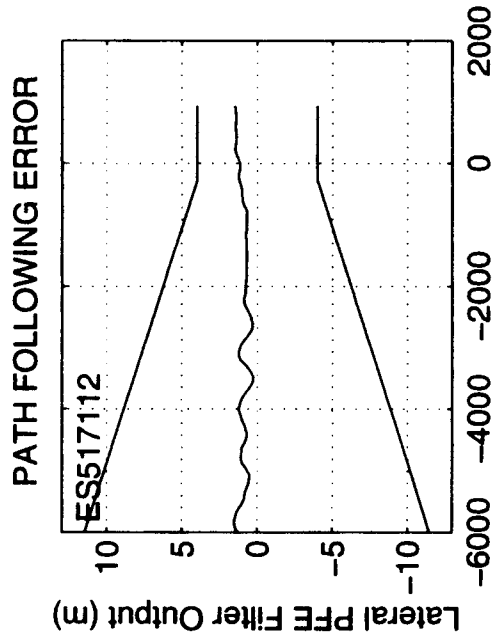
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.725  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.566  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.639

NRP Xrcs 2-RMS DIFFERENCE (m): 1.625  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.499  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.658

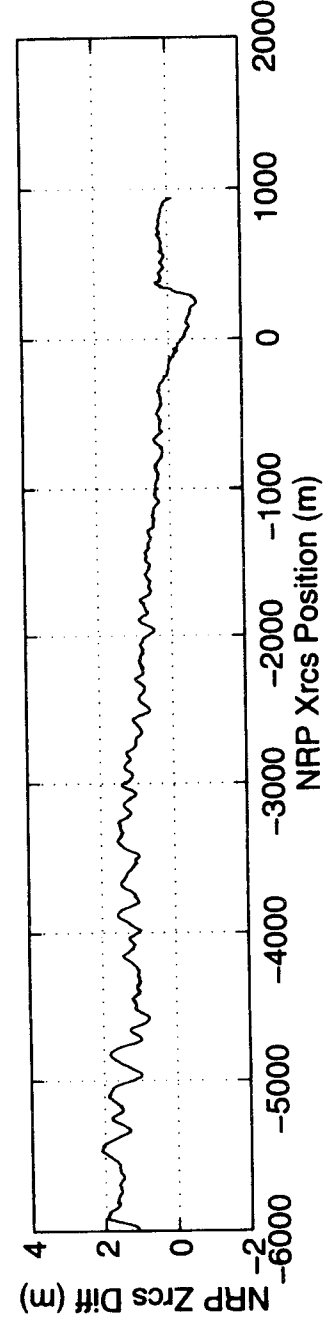
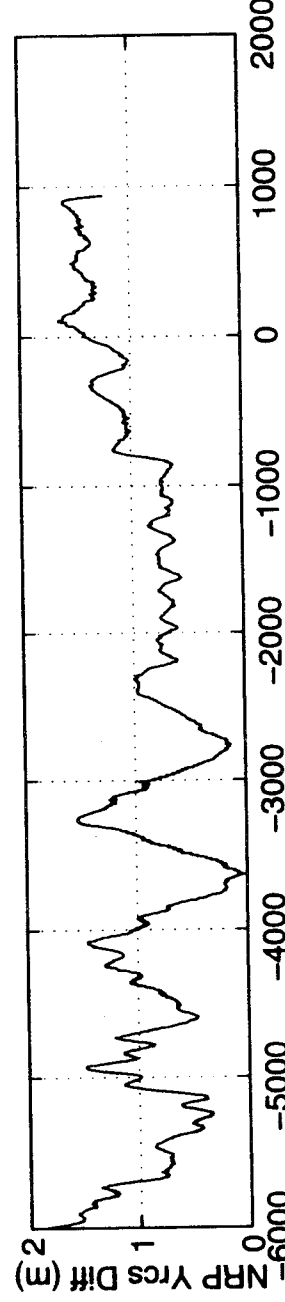
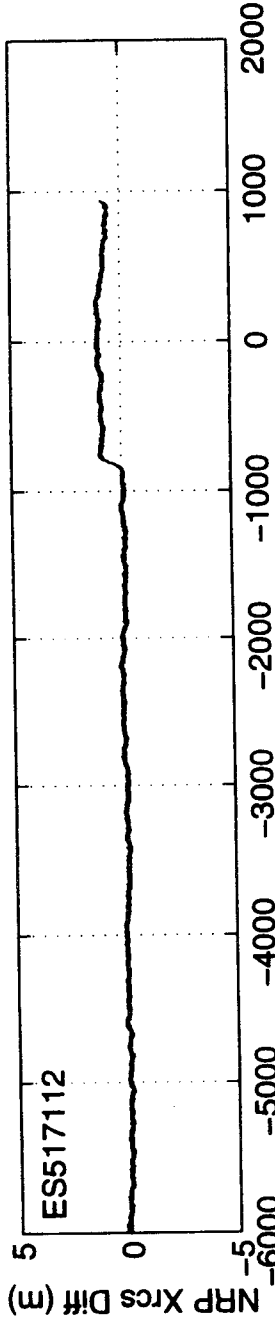
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----

LGRP Xrcs POSITION (m): 265.179  
LGRP Yrcs POSITION (m): -0.926





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES





APPROACH #: ES517113  
START TIME: 236890.990  
STOP TIME: 237055.045

MINIMUM HDOP: 0.8  
MAXIMUM HDOP: 0.8  
AVERAGE HDOP: 0.8

MINIMUM VDOP: 4.4  
MAXIMUM VDOP: 4.9  
AVERAGE VDOP: 4.6

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
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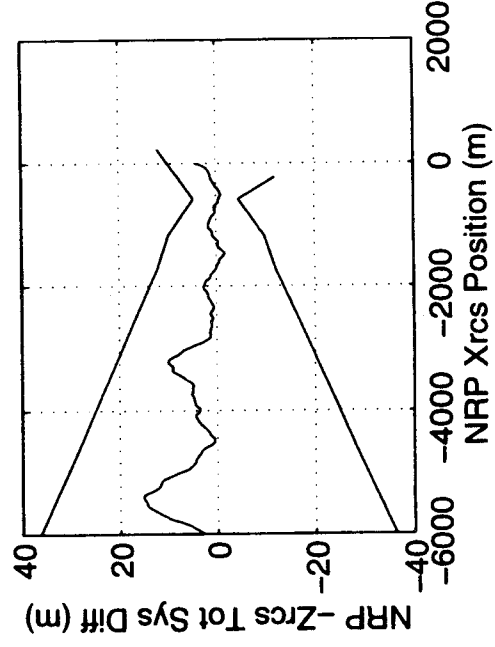
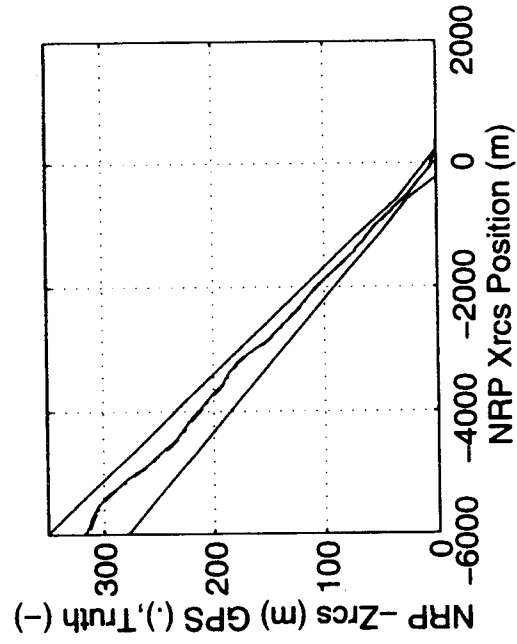
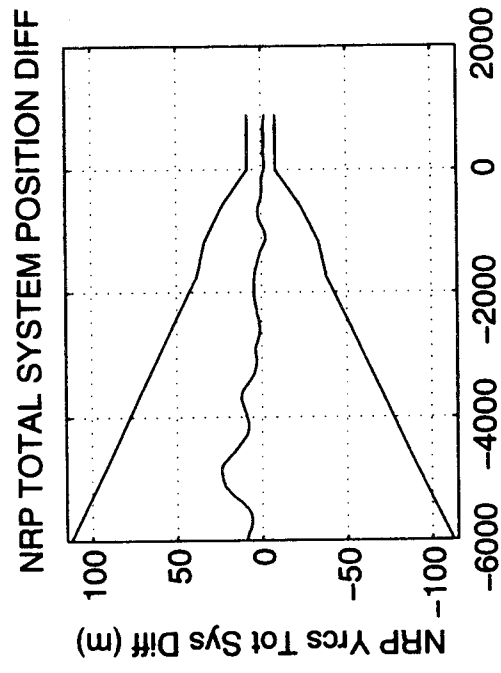
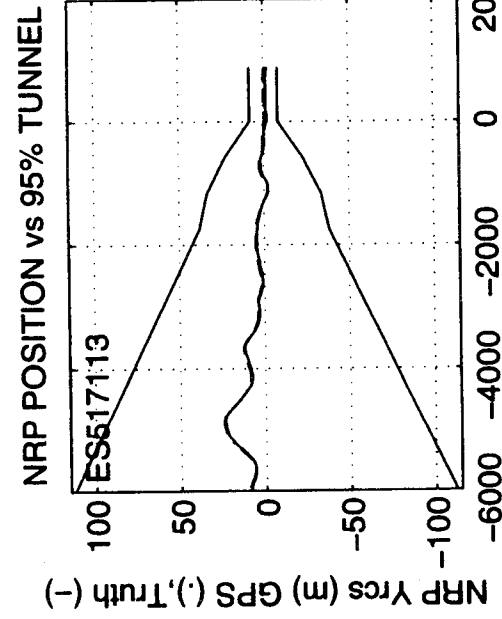
NRP Xrcs MEAN DIFFERENCE (m): 0.668  
NRP Yrcs MEAN DIFFERENCE (m): 1.021  
NRP Zrcs MEAN DIFFERENCE (m): 0.095

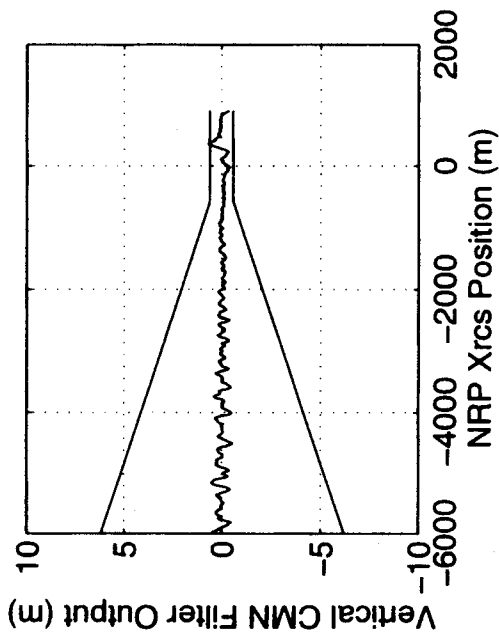
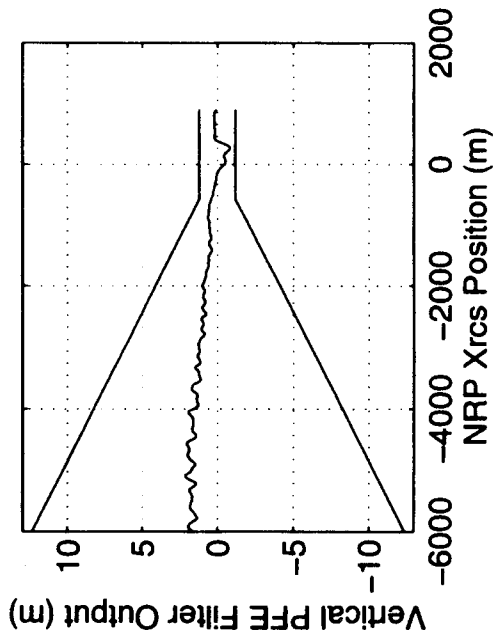
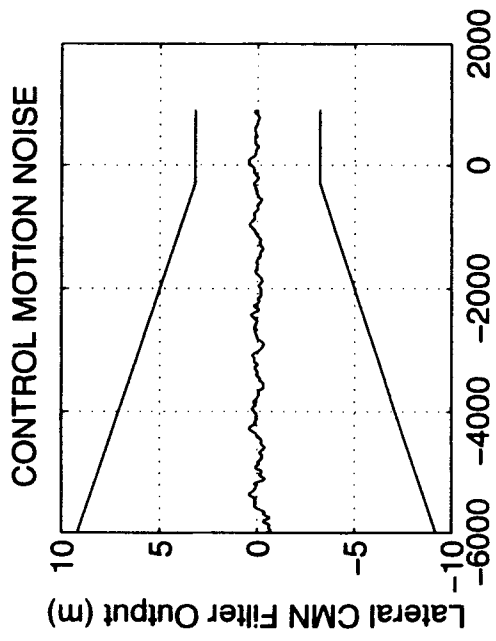
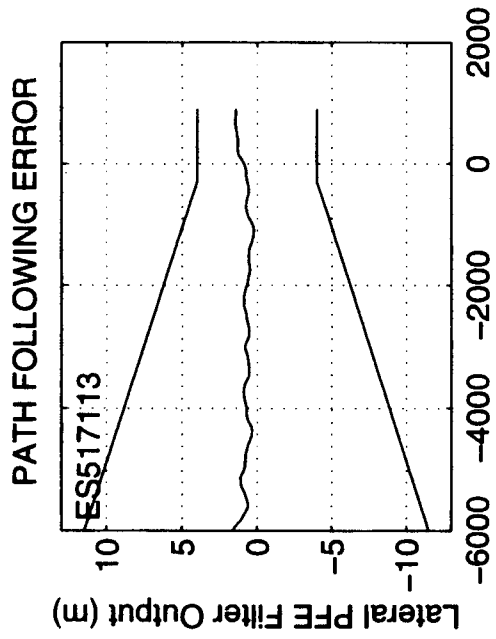
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.889  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.766  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.812

NRP Xrcs 2-RMS DIFFERENCE (m): 1.605  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.181  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.834

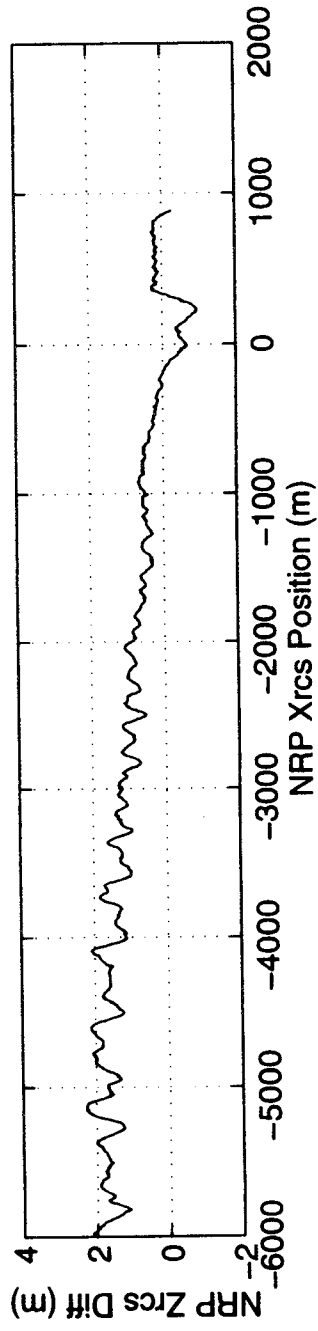
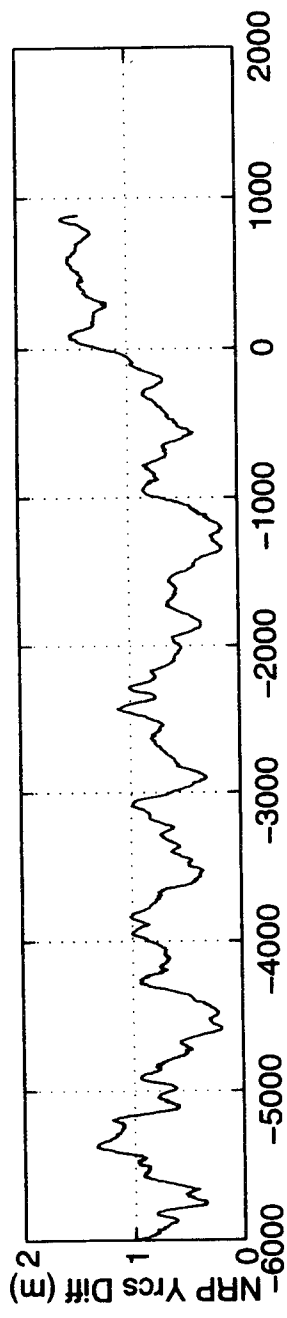
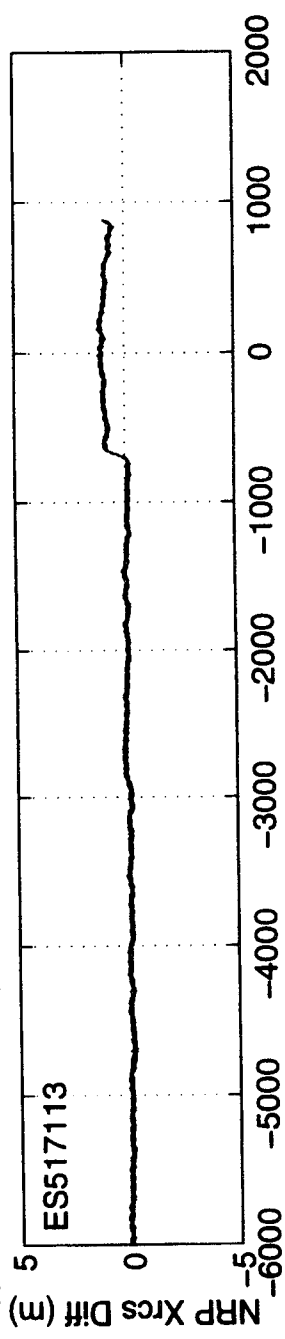
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----

LGRP Xrcs POSITION (m): 342.721  
LGRP Yrcs POSITION (m): -0.929





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517114  
START TIME: 237498.121  
STOP TIME: 237664.319

MINIMUM HDOP: 0.7  
MAXIMUM HDOP: 0.8  
AVERAGE HDOP: 0.7

MINIMUM VDOP: 3.3  
MAXIMUM VDOP: 3.6  
AVERAGE VDOP: 3.4

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

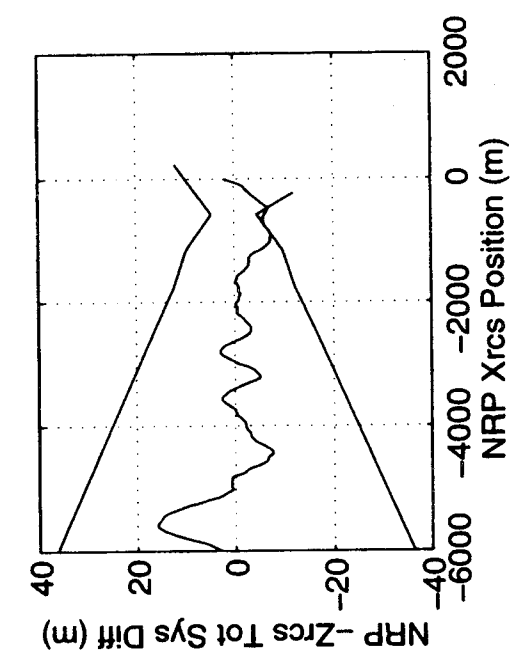
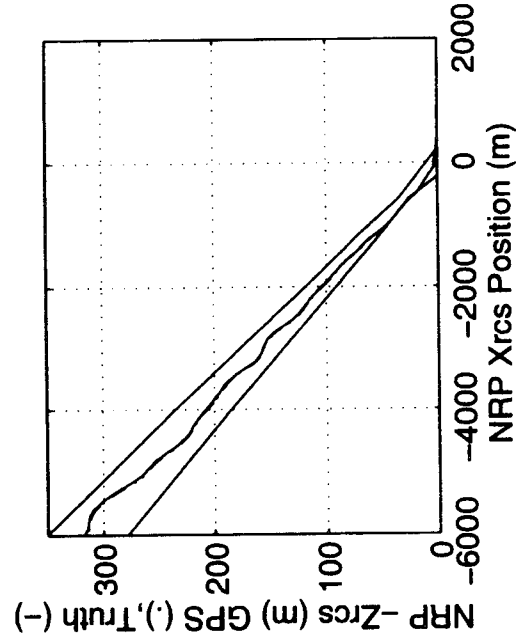
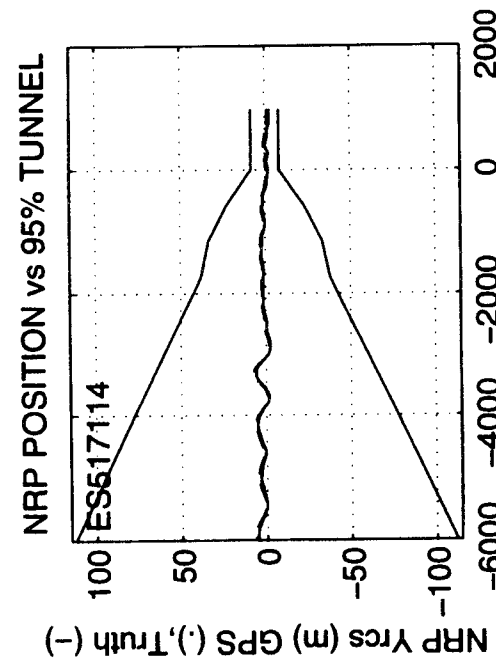
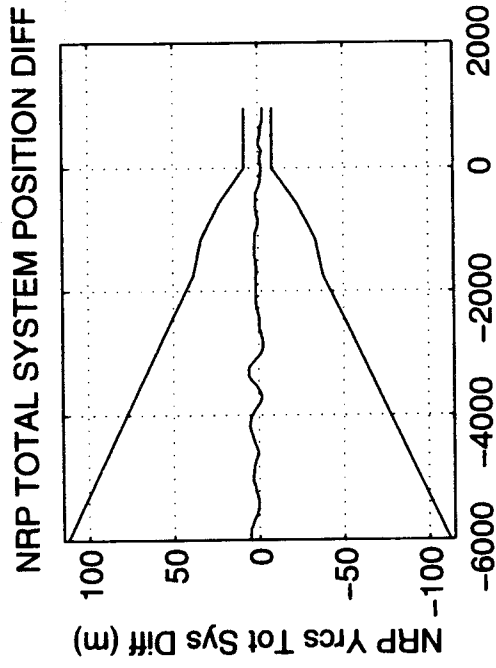
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.597  
NRP Yrcs MEAN DIFFERENCE (m): 1.118  
NRP Zrcs MEAN DIFFERENCE (m): -0.009

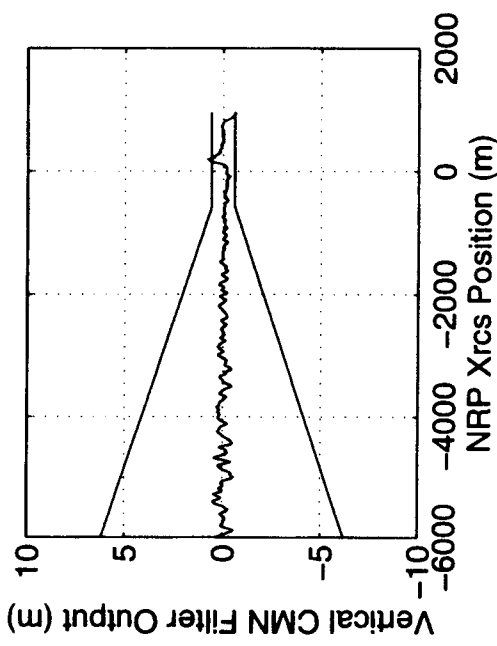
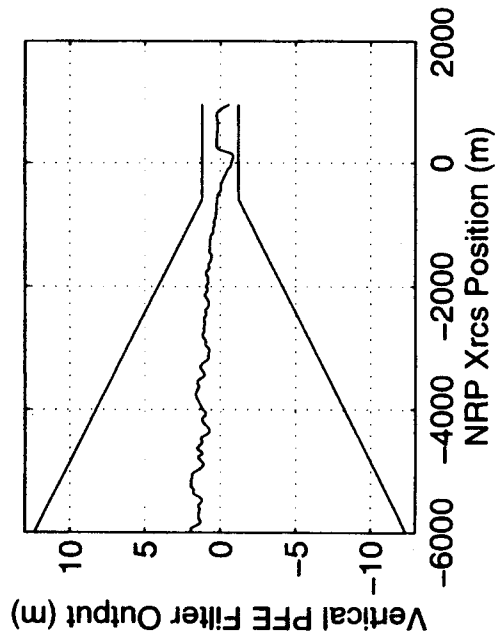
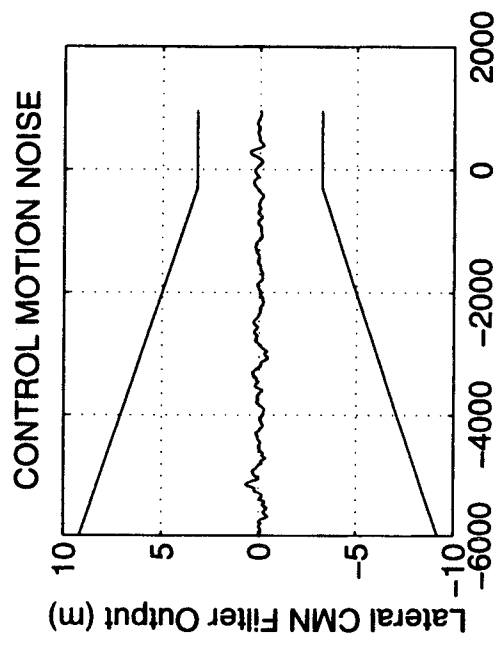
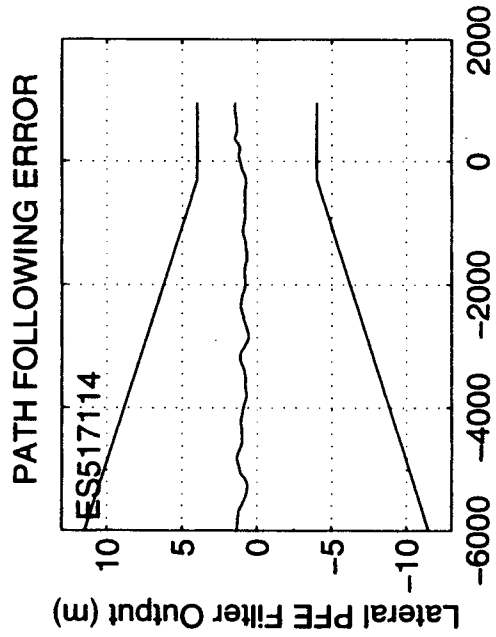
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.762  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.601  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.786

NRP Xrcs 2-RMS DIFFERENCE (m): 1.416  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.315  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.786

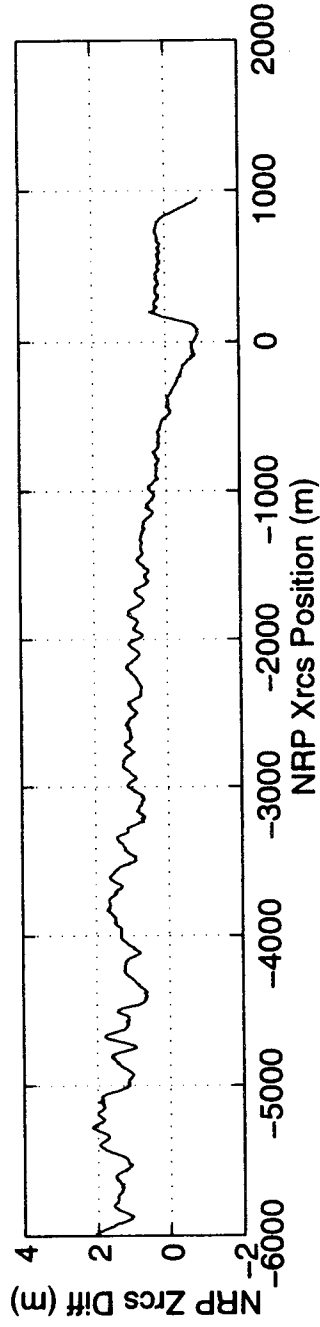
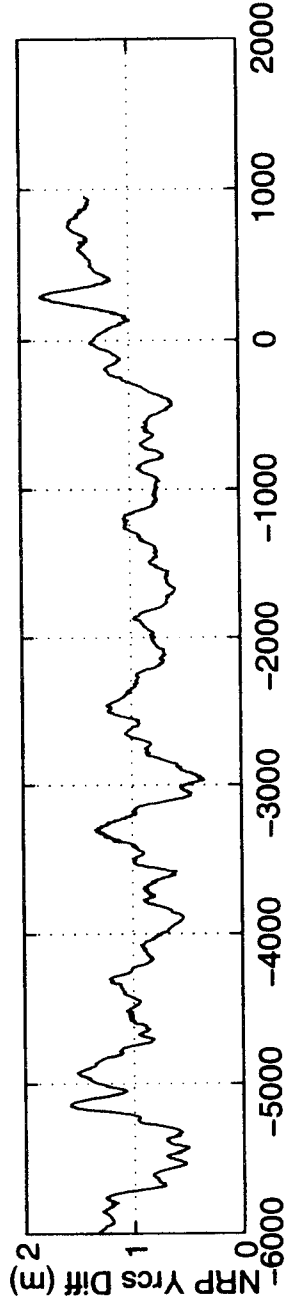
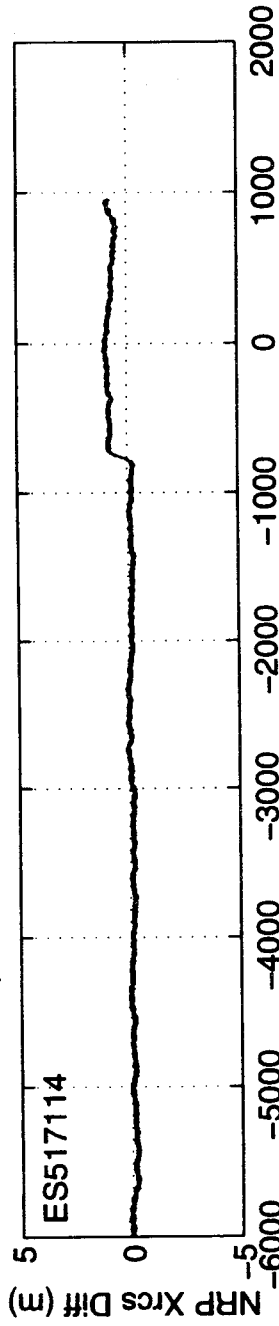
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 177.299  
LGRP Yrcs POSITION (m): -0.674





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES





APPROACH #: ES517115  
START TIME: 238070.792  
STOP TIME: 238240.188

MINIMUM HDOP: 0.8  
MAXIMUM HDOP: 1.2  
AVERAGE HDOP: 1.0

MINIMUM VDOP: 2.5  
MAXIMUM VDOP: 6.2  
AVERAGE VDOP: 4.4

MINIMUM NUMBER OF SVs: 6  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 6

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

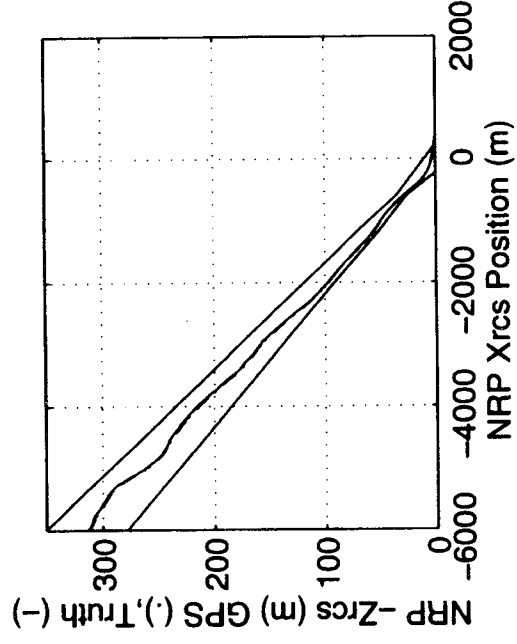
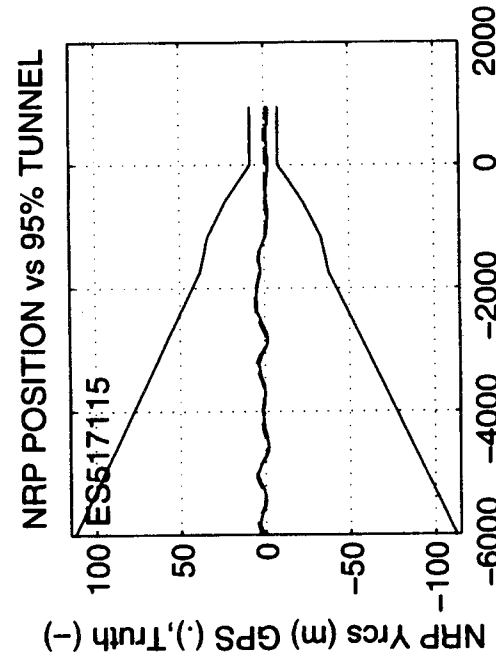
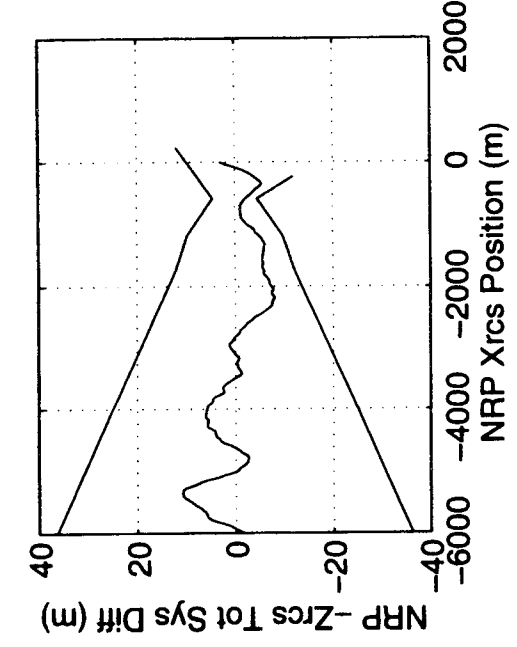
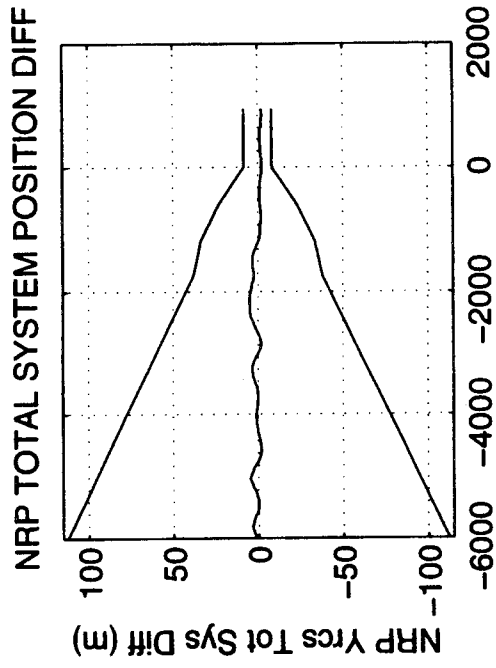
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.762  
NRP Yrcs MEAN DIFFERENCE (m): 1.200  
NRP Zrcs MEAN DIFFERENCE (m): 0.039

NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.603  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.645  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.654

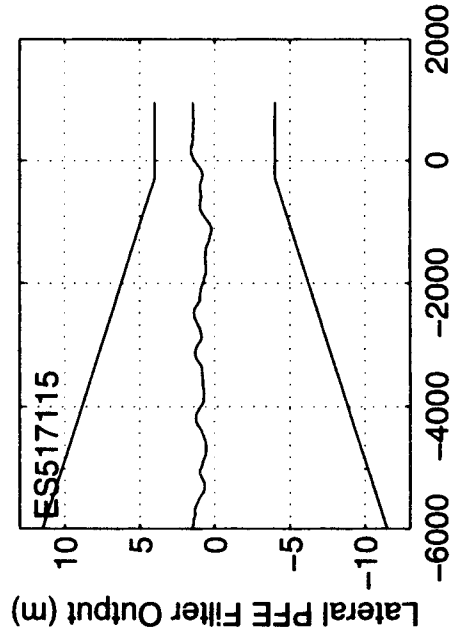
NRP Xrcs 2-RMS DIFFERENCE (m): 1.638  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.484  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.659

-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

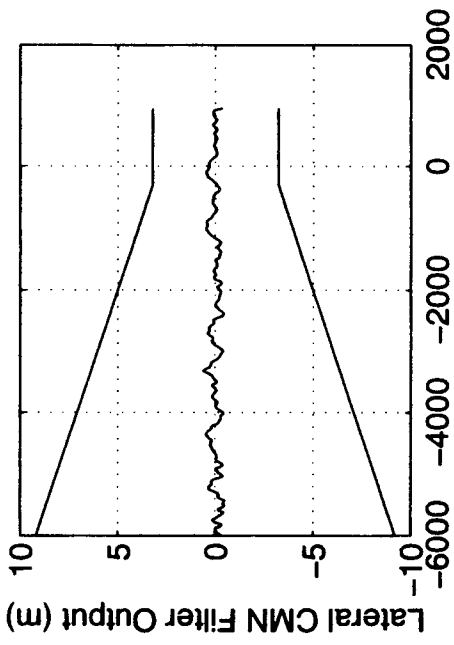
-----  
LGRP Xrcs POSITION (m): 254.801  
LGRP Yrcs POSITION (m): -1.163



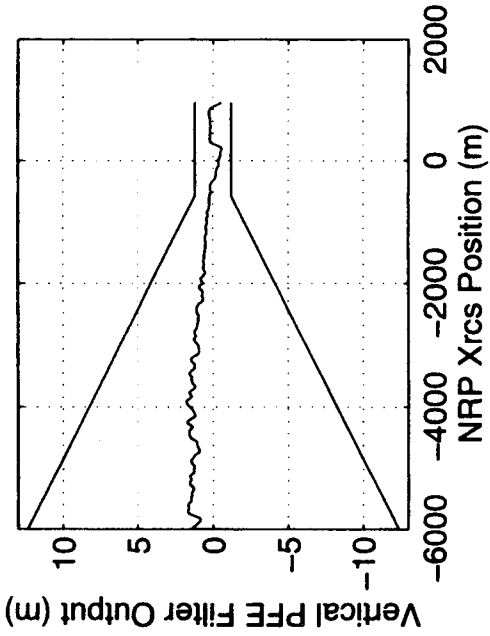
PATH FOLLOWING ERROR



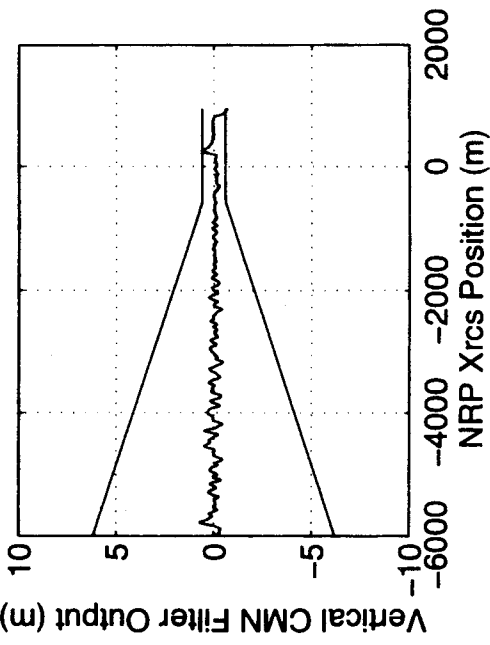
CONTROL MOTION NOISE



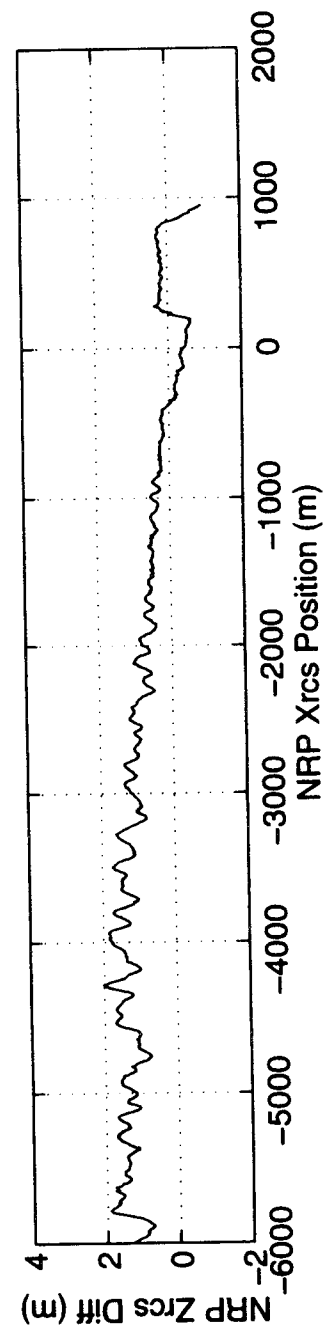
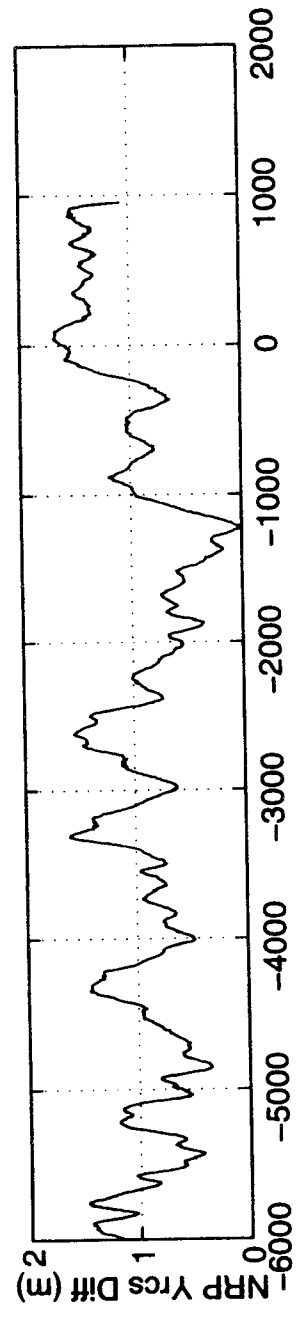
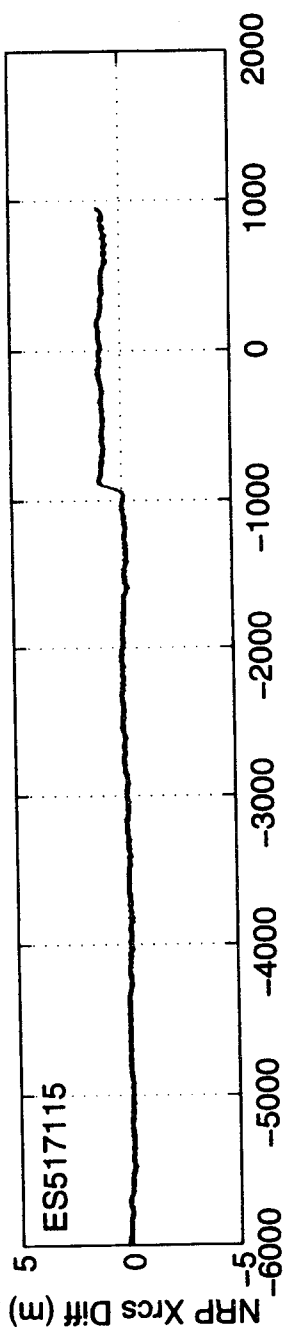
Vertical PFE Filter Output (m)



Vertical CMN Filter Output (m)



NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517116  
START TIME: 238637.319  
STOP TIME: 238800.253

MINIMUM HDOP: 1.3  
MAXIMUM HDOP: 1.3  
AVERAGE HDOP: 1.3

MINIMUM VDOP: 5.6  
MAXIMUM VDOP: 5.9  
AVERAGE VDOP: 5.8

MINIMUM NUMBER OF SVs: 6  
MAXIMUM NUMBER OF SVs: 6  
AVERAGE NUMBER OF SVs: 6

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

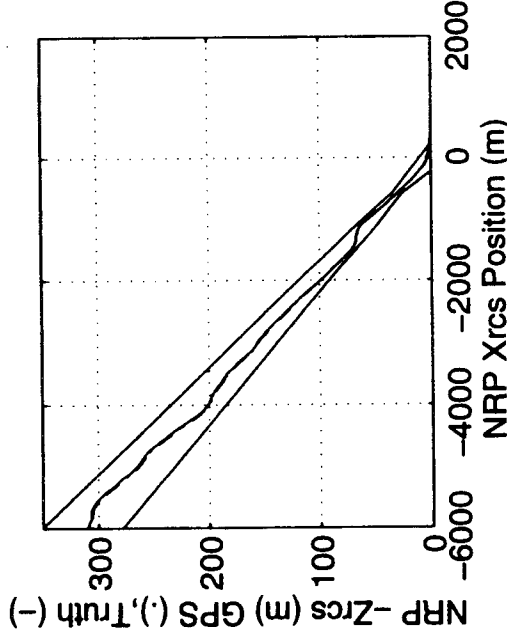
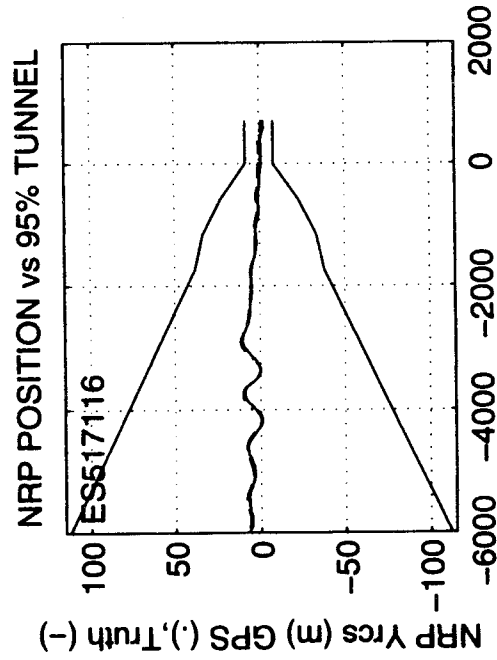
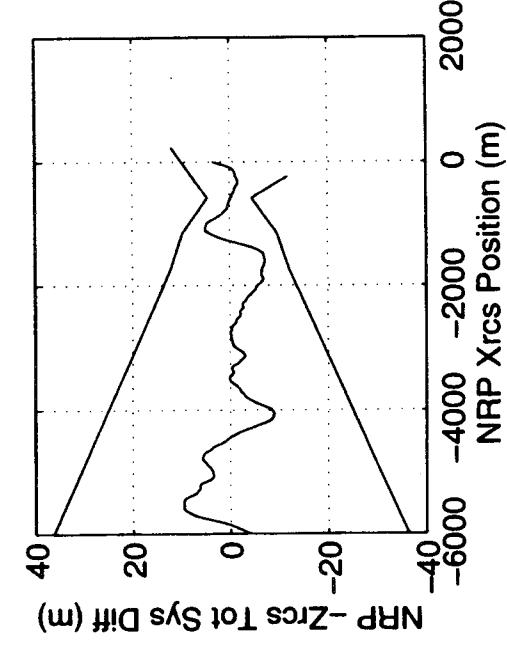
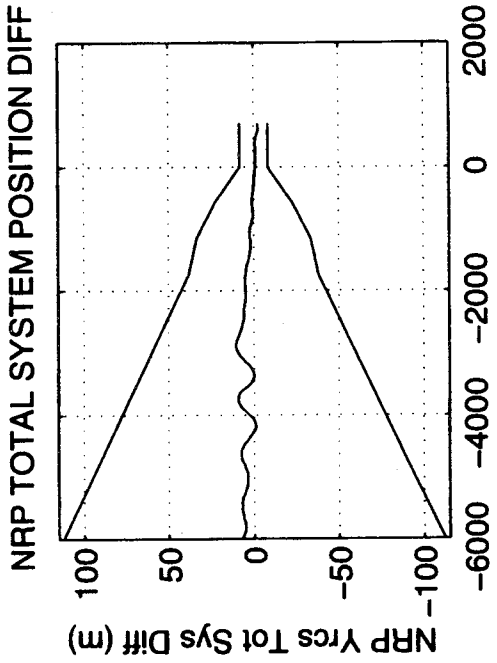
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.630  
NRP Yrcs MEAN DIFFERENCE (m): 1.144  
NRP Zrcs MEAN DIFFERENCE (m): 0.100

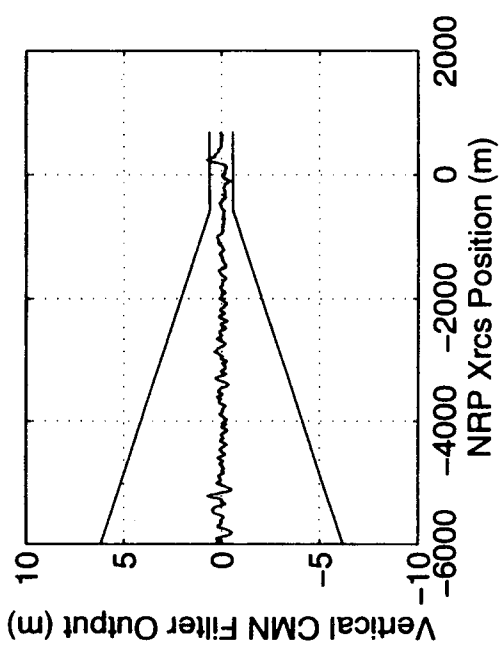
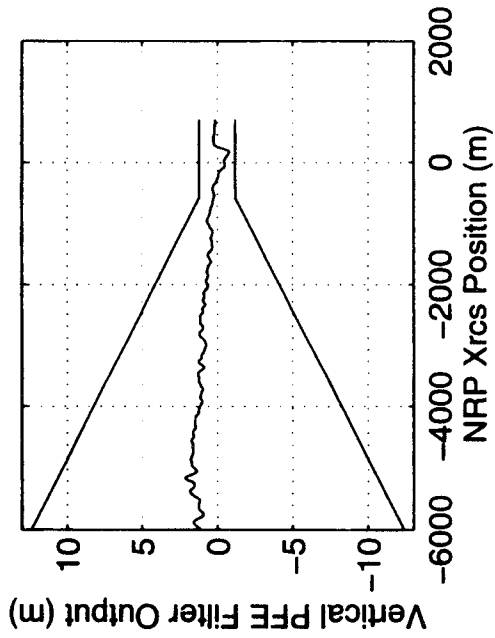
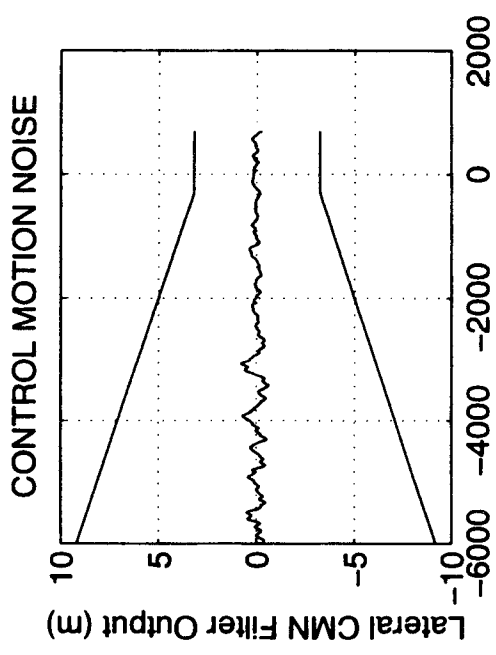
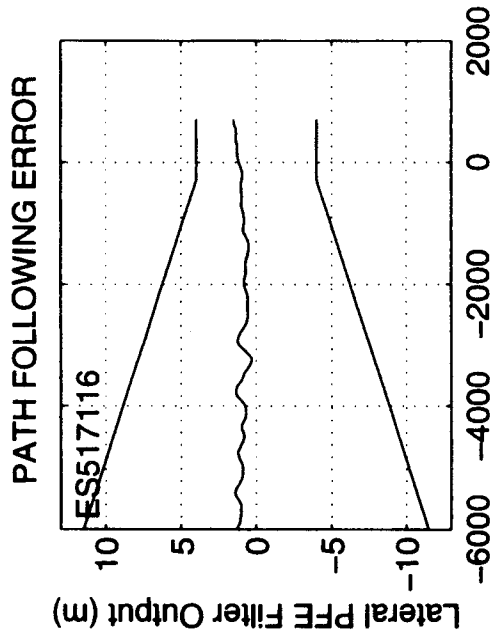
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.700  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.489  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.777

NRP Xrcs 2-RMS DIFFERENCE (m): 1.442  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.340  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.802

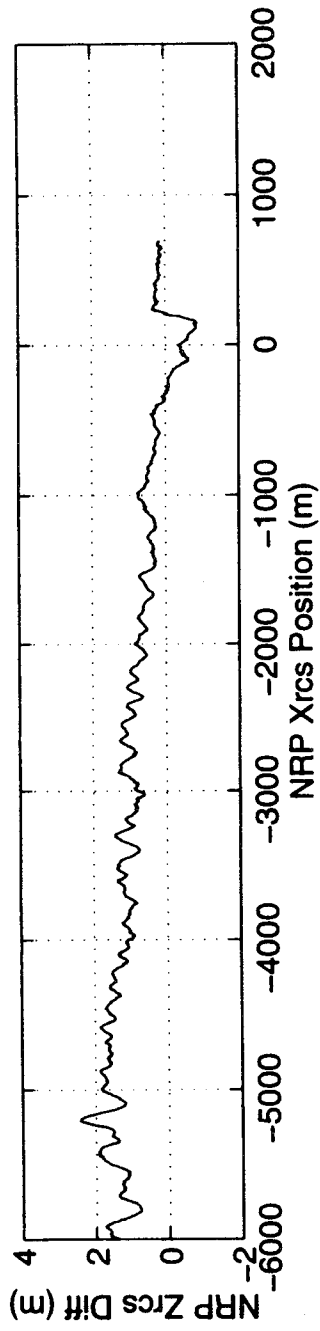
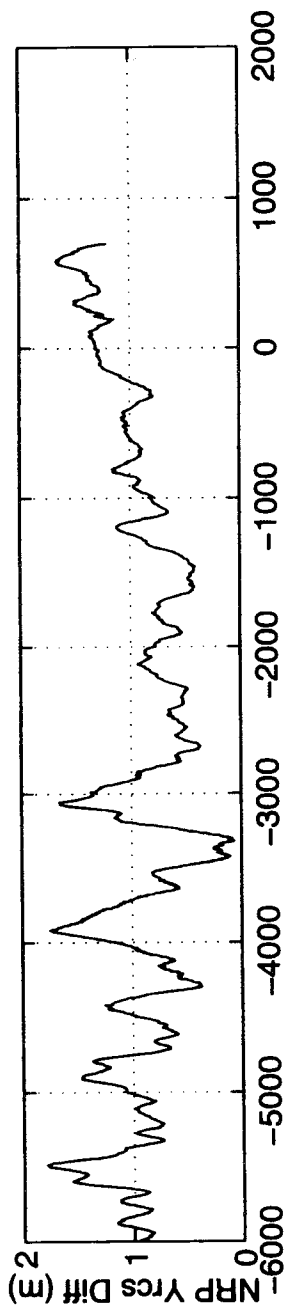
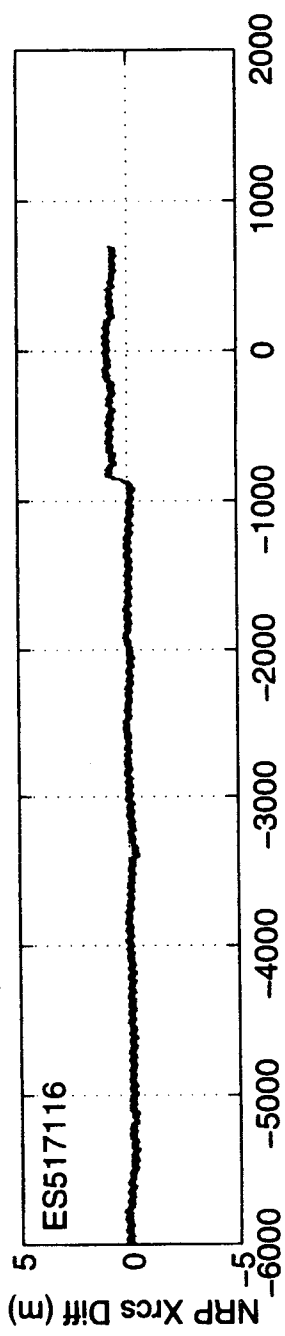
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 191.840  
LGRP Yrcs POSITION (m): -0.482





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES





APPROACH #: ES517117  
START TIME: 239246.122  
STOP TIME: 239410.528

MINIMUM HDOP: 1.4  
MAXIMUM HDOP: 1.5  
AVERAGE HDOP: 1.4

MINIMUM VDOP: 5.0  
MAXIMUM VDOP: 5.3  
AVERAGE VDOP: 5.1

MINIMUM NUMBER OF SVs: 6  
MAXIMUM NUMBER OF SVs: 6  
AVERAGE NUMBER OF SVs: 6

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

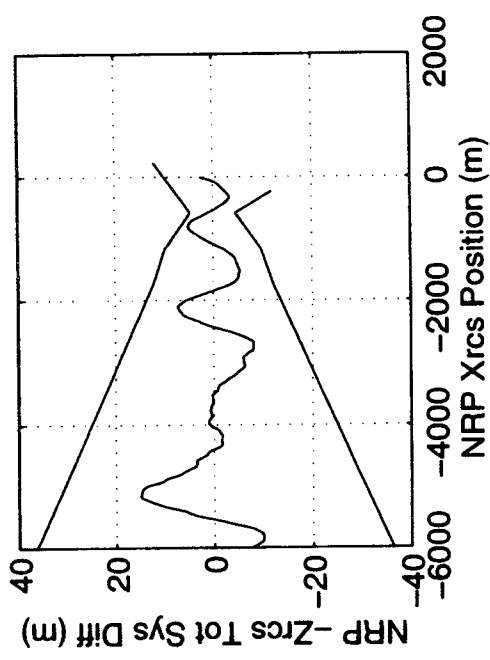
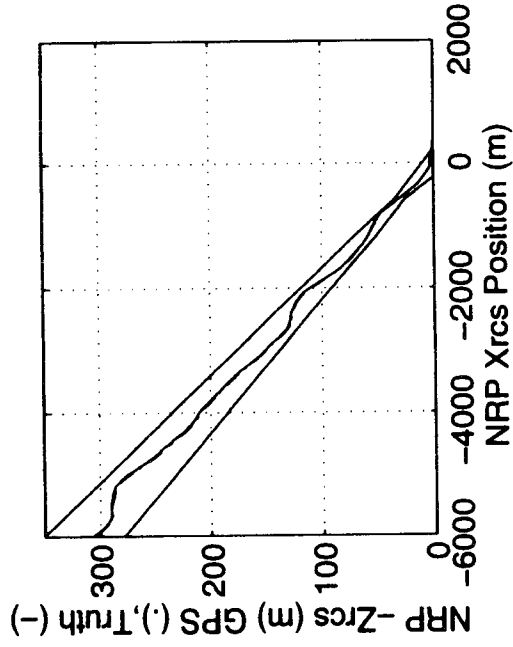
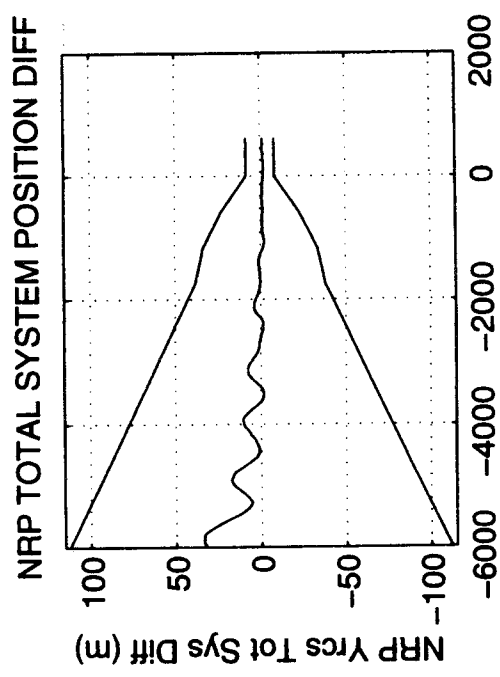
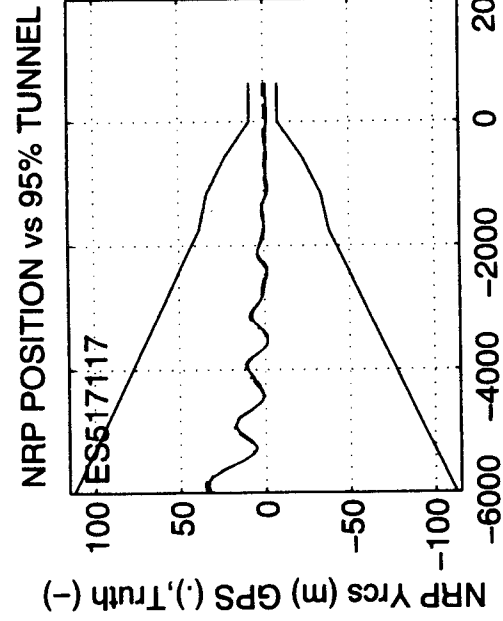
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.618  
NRP Yrcs MEAN DIFFERENCE (m): 1.137  
NRP Zrcs MEAN DIFFERENCE (m): 0.064

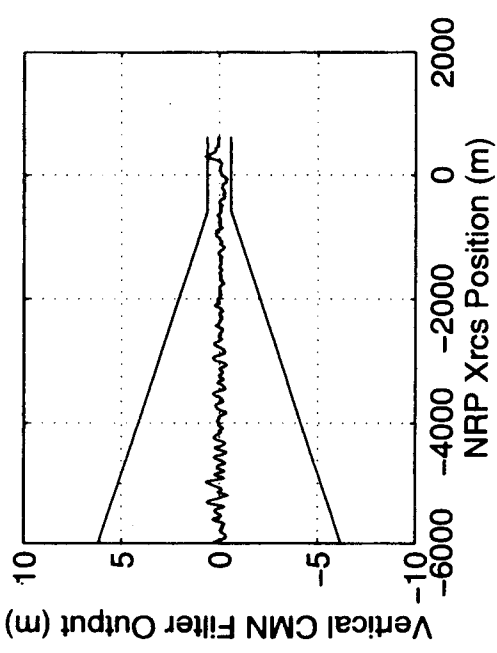
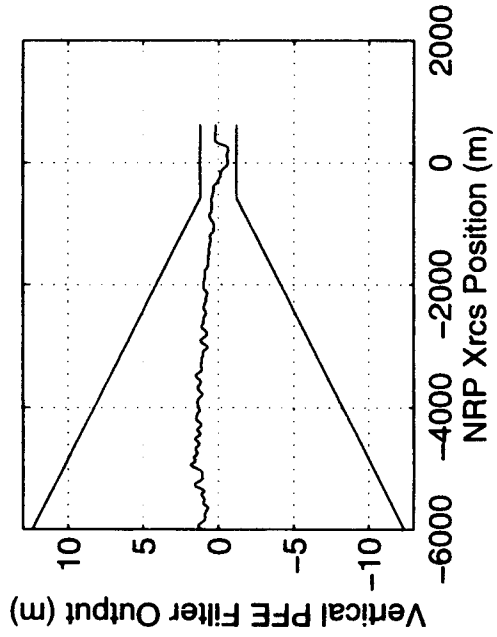
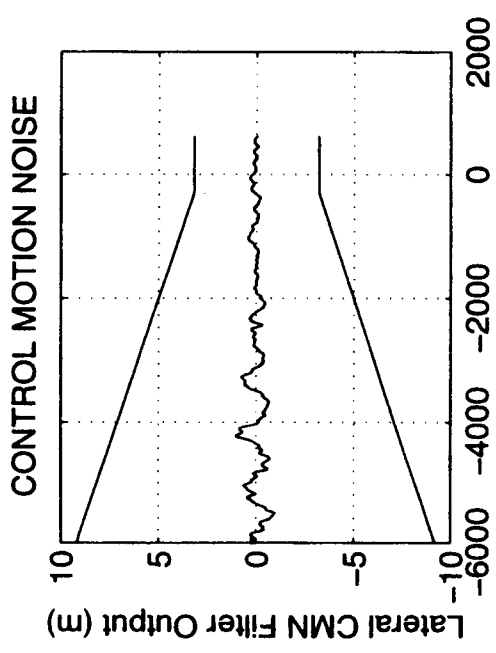
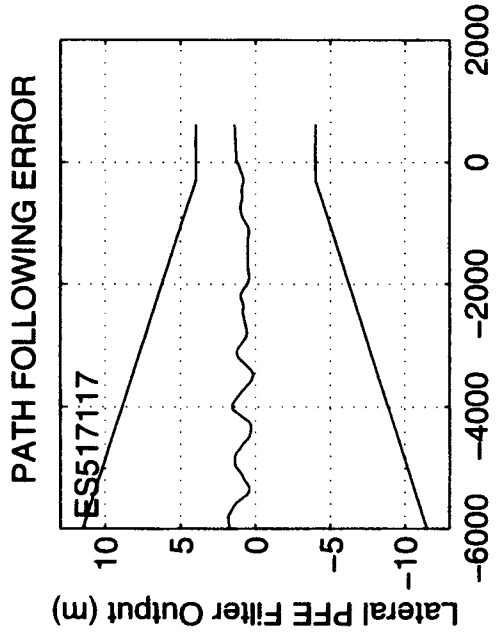
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.687  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.513  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.814

NRP Xrcs 2-RMS DIFFERENCE (m): 1.415  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.331  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.824

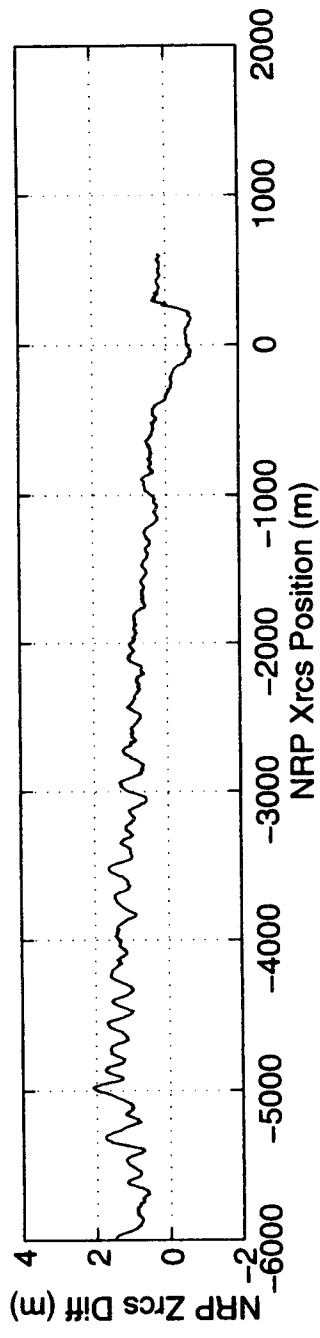
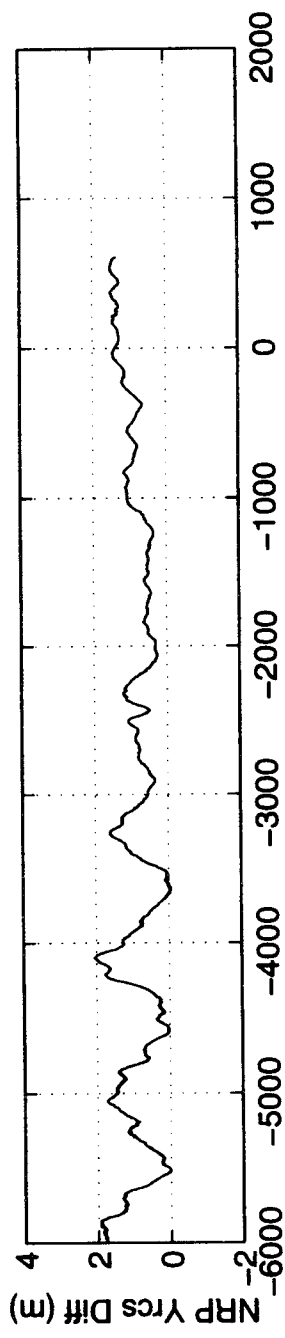
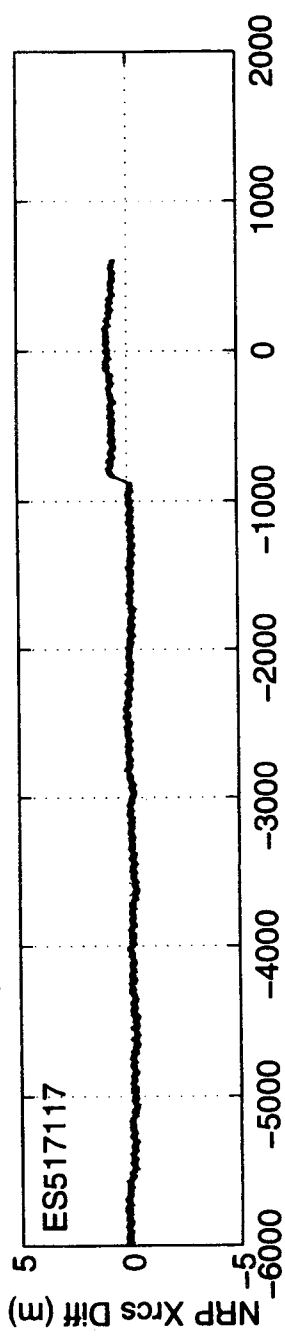
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 202.384  
LGRP Yrcs POSITION (m): -1.419





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517118  
START TIME: 239826.462  
STOP TIME: 239995.187

MINIMUM HDOP: 1.5  
MAXIMUM HDOP: 1.5  
AVERAGE HDOP: 1.5

MINIMUM VDOP: 4.2  
MAXIMUM VDOP: 4.6  
AVERAGE VDOP: 4.3

MINIMUM NUMBER OF SVs: 6  
MAXIMUM NUMBER OF SVs: 6  
AVERAGE NUMBER OF SVs: 6

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

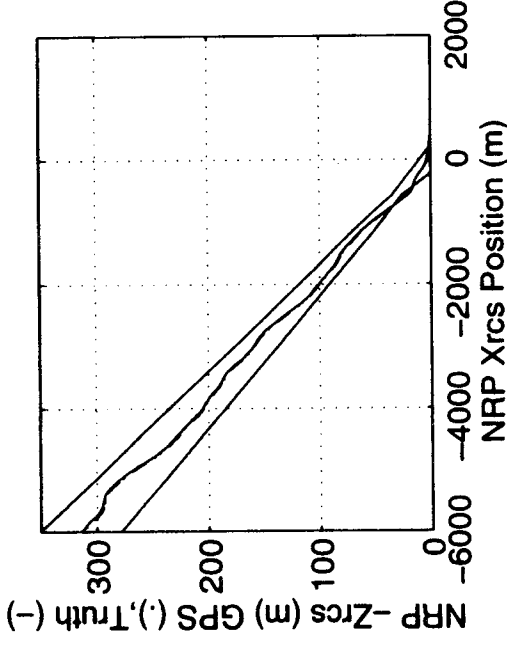
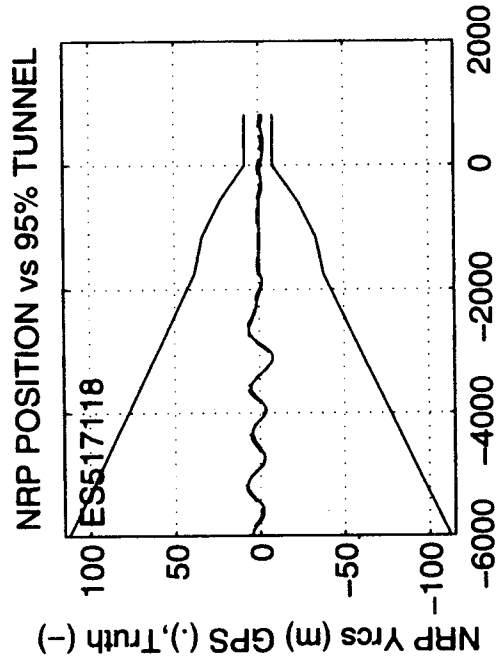
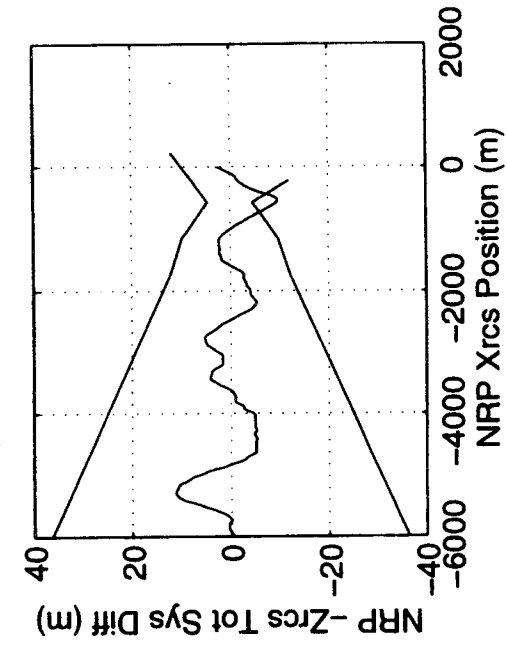
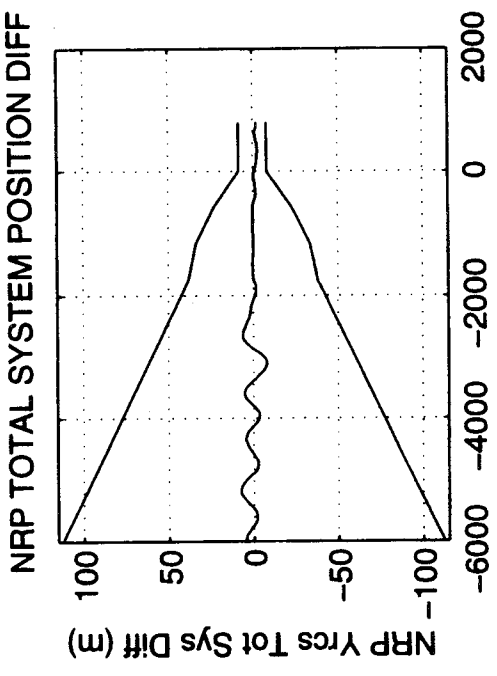
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.581  
NRP Yrcs MEAN DIFFERENCE (m): 1.119  
NRP Zrcs MEAN DIFFERENCE (m): 0.122

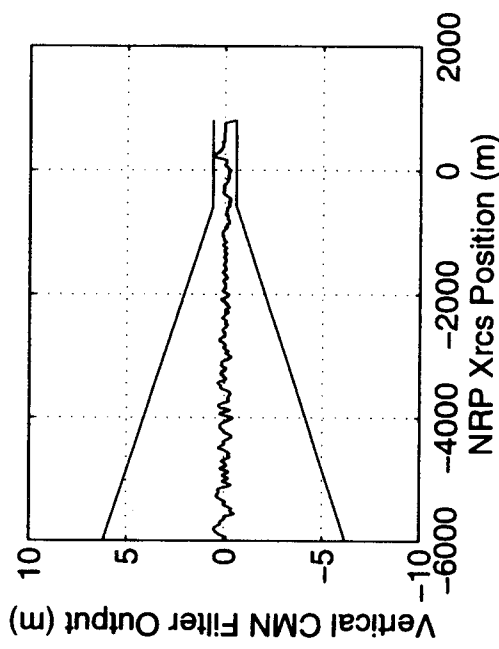
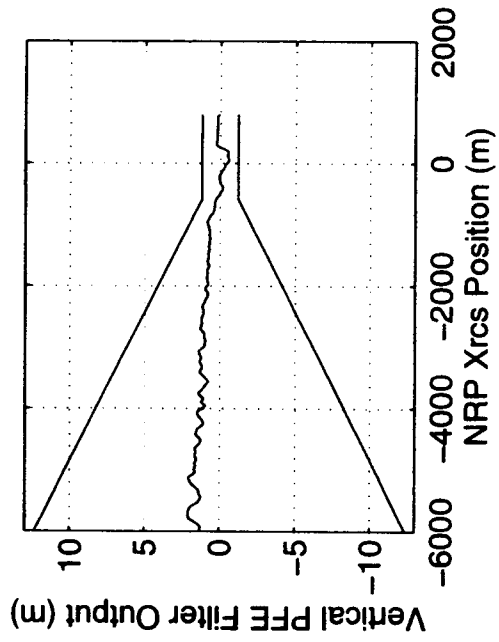
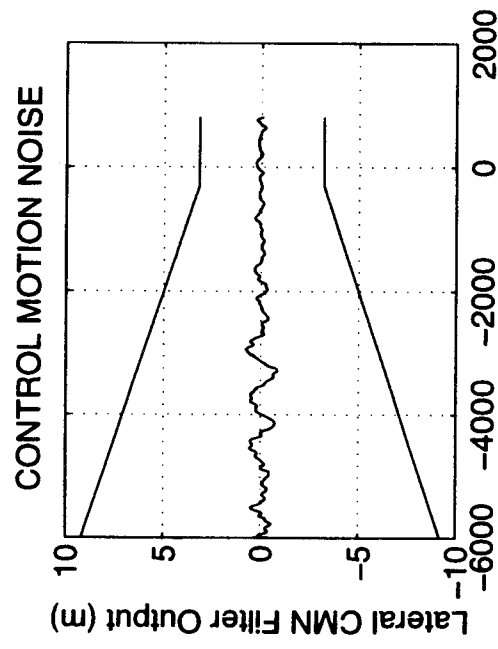
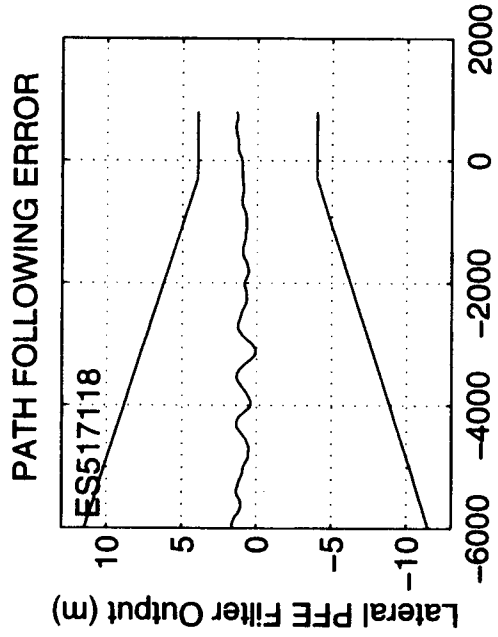
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.702  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.499  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.753

NRP Xrcs 2-RMS DIFFERENCE (m): 1.357  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.293  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.791

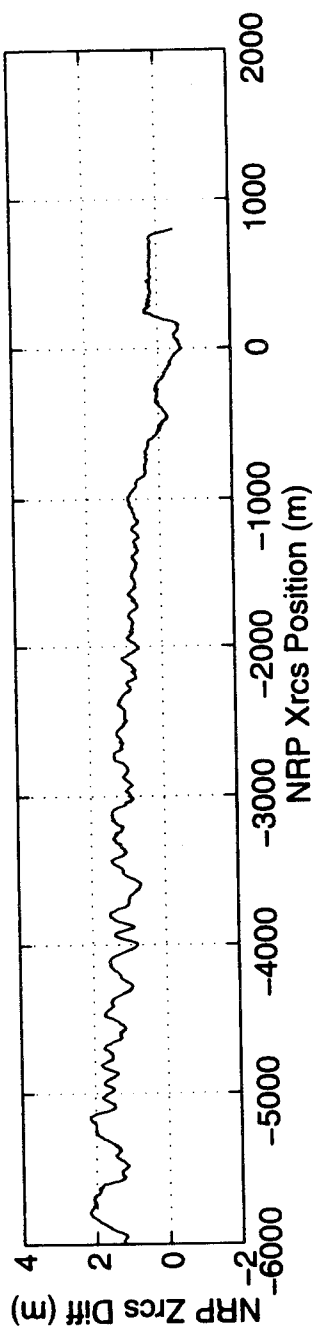
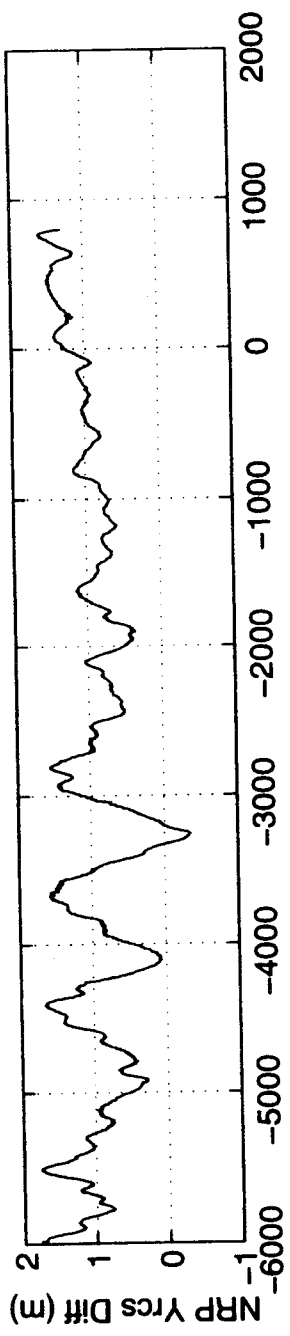
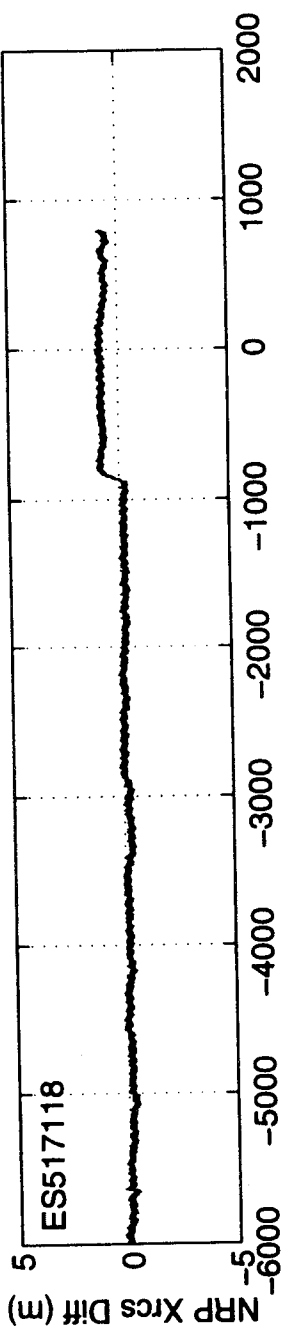
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 204.254  
LGRP Yrcs POSITION (m): -1.795





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES





APPROACH #: ES517119  
START TIME: 243926.056  
STOP TIME: 244085.451

MINIMUM HDOP: 0.7  
MAXIMUM HDOP: 1.0  
AVERAGE HDOP: 0.8

MINIMUM VDOP: 0.0  
MAXIMUM VDOP: 2.6  
AVERAGE VDOP: 1.3

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

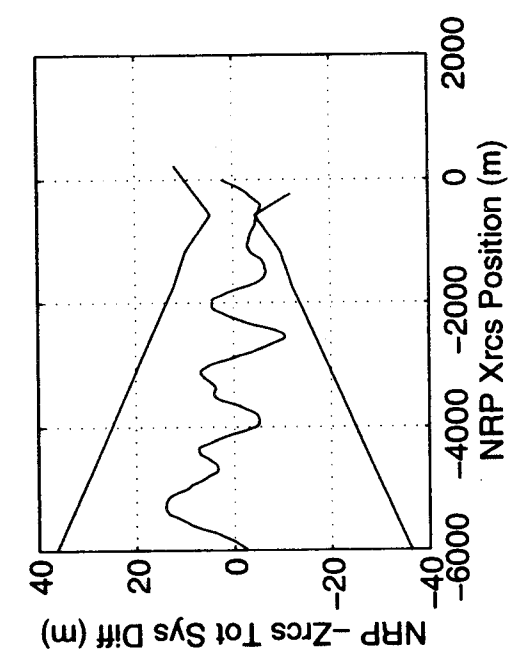
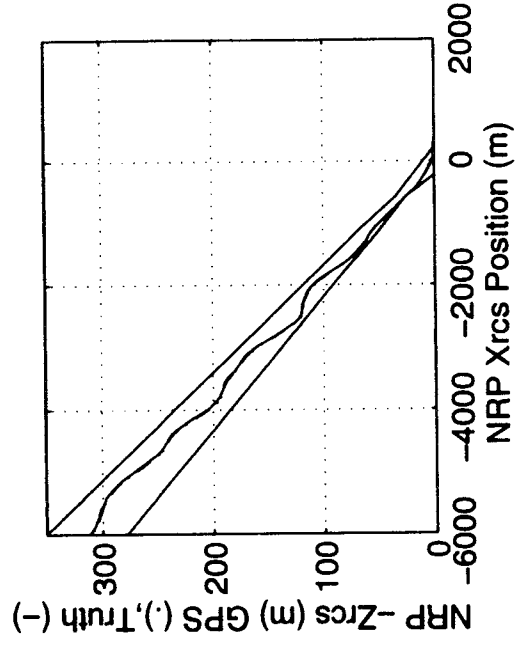
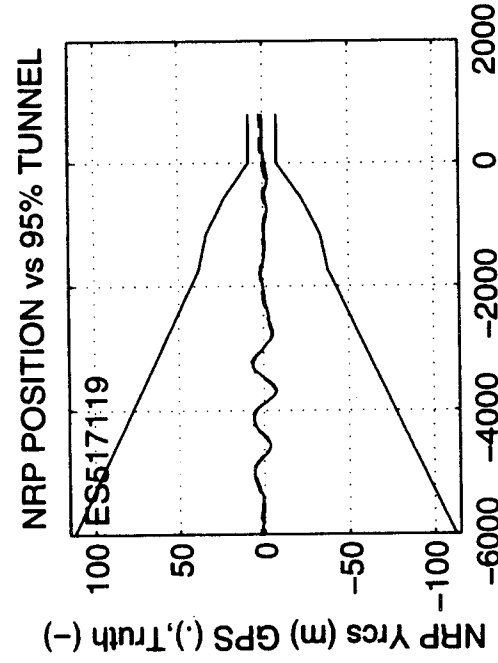
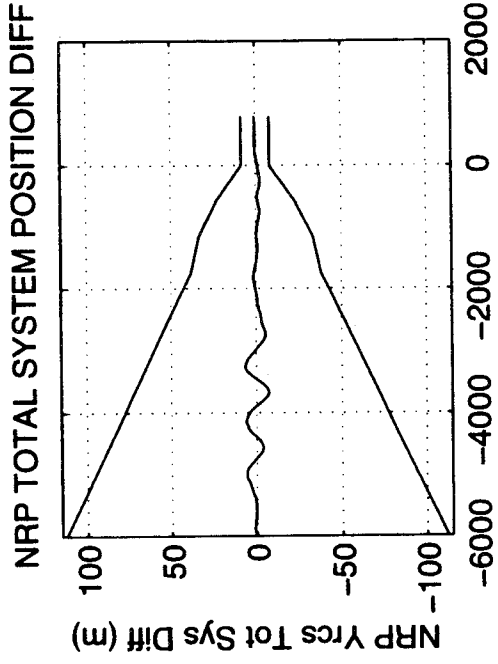
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.707  
NRP Yrcs MEAN DIFFERENCE (m): 1.147  
NRP Zrcs MEAN DIFFERENCE (m): 0.042

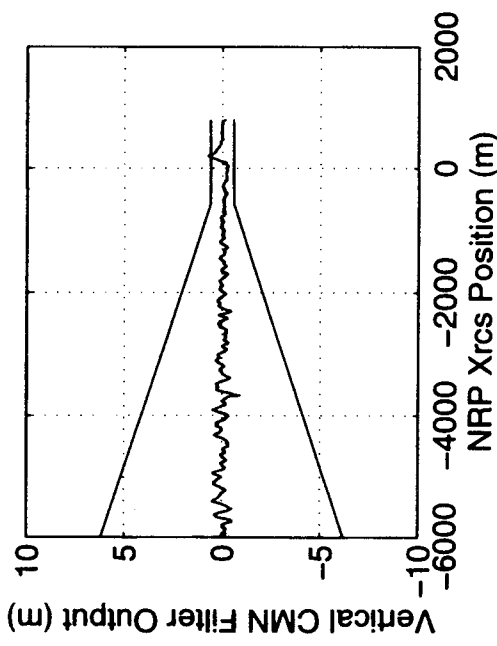
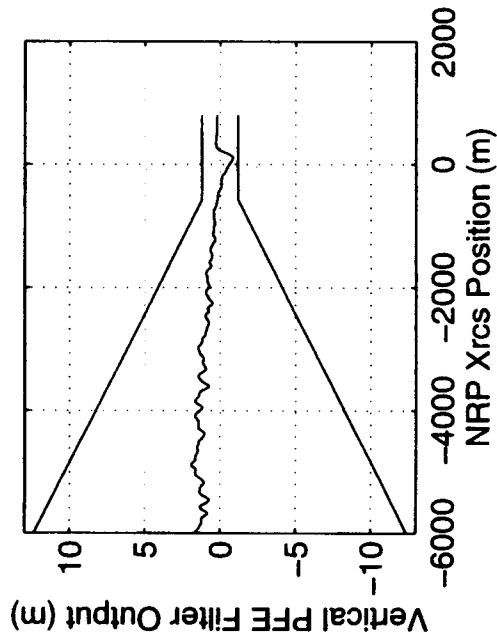
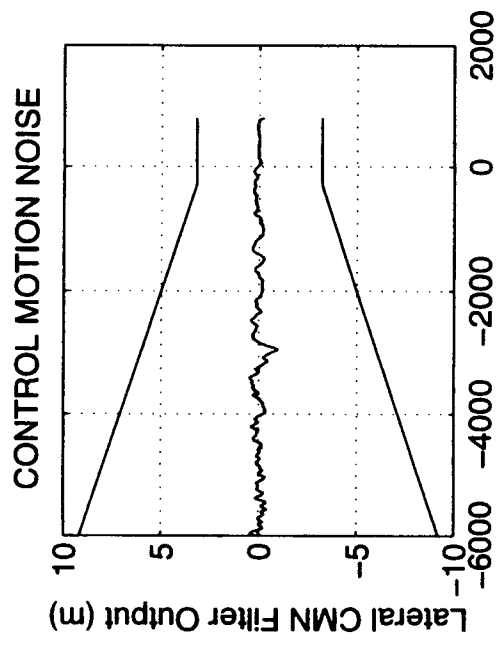
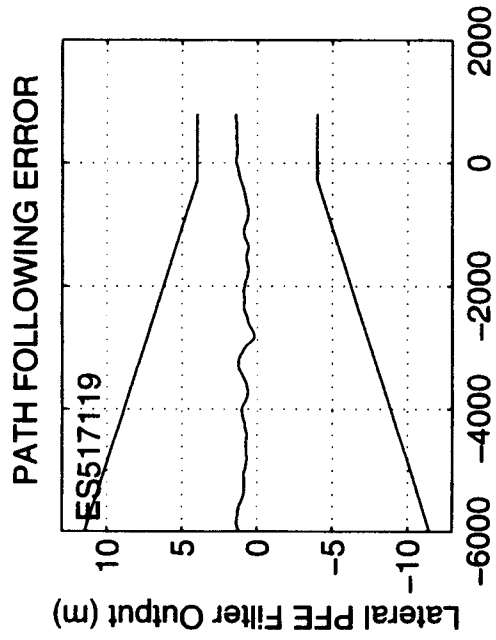
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.812  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.641  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.728

NRP Xrcs 2-RMS DIFFERENCE (m): 1.630  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.381  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.733

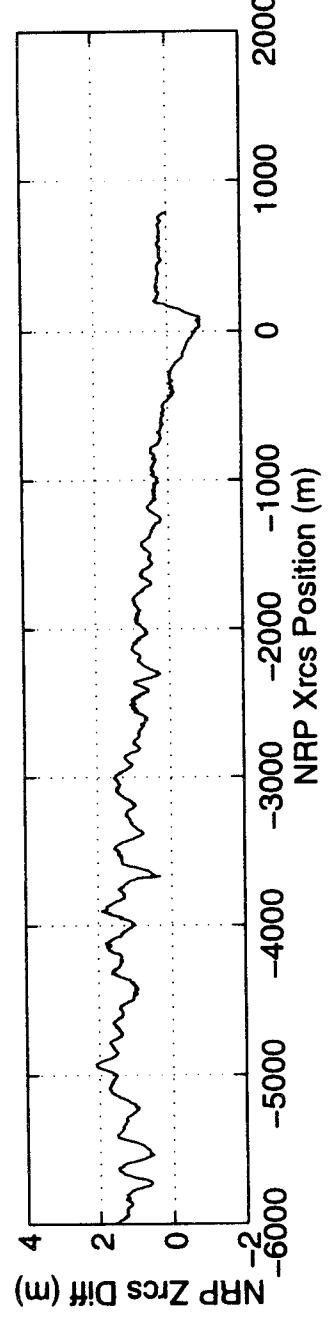
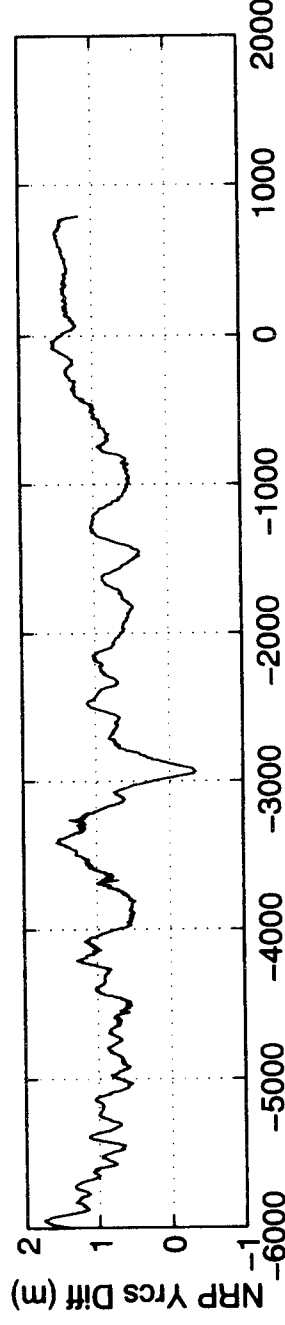
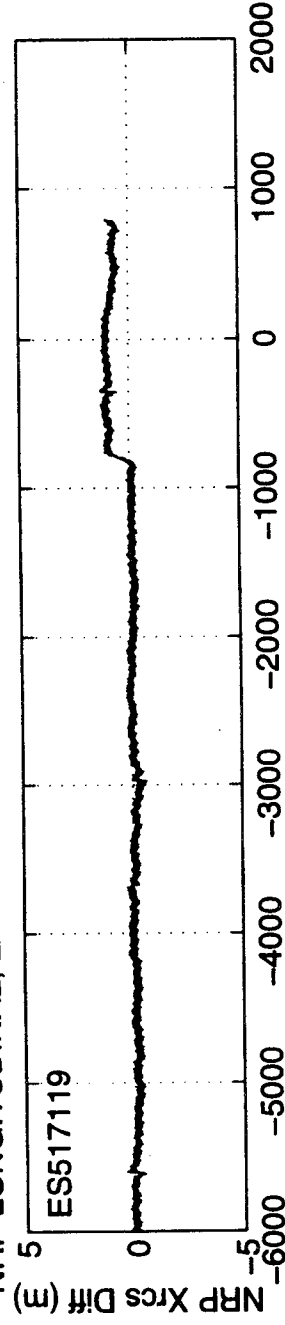
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 124.154  
LGRP Yrcs POSITION (m): 0.031





NRP LONGITUDINAL, LATERAL AND VERTICAL POSITION DIFFERENCES



APPROACH #: ES517120  
START TIME: 244449.583  
STOP TIME: 244611.451

MINIMUM HDOP: 0.9  
MAXIMUM HDOP: 1.0  
AVERAGE HDOP: 1.0

MINIMUM VDOP: 2.8  
MAXIMUM VDOP: 3.0  
AVERAGE VDOP: 2.9

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

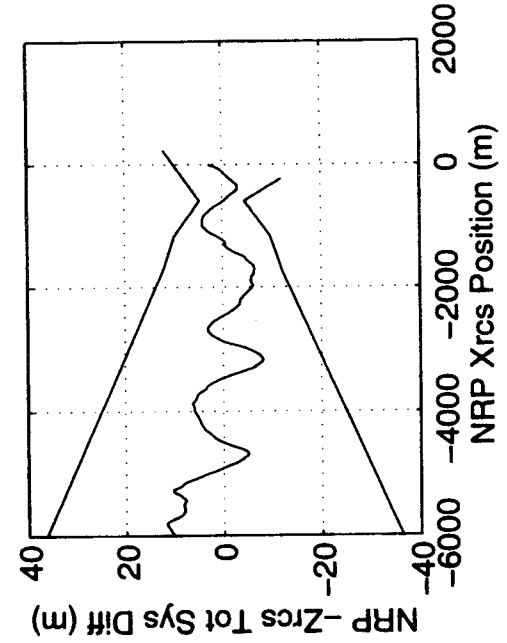
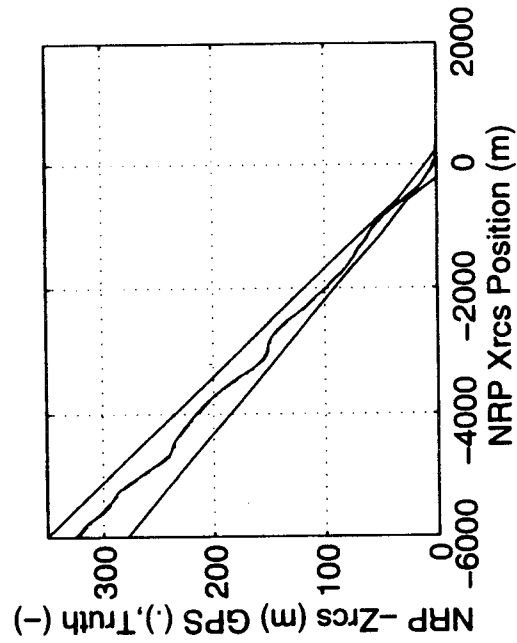
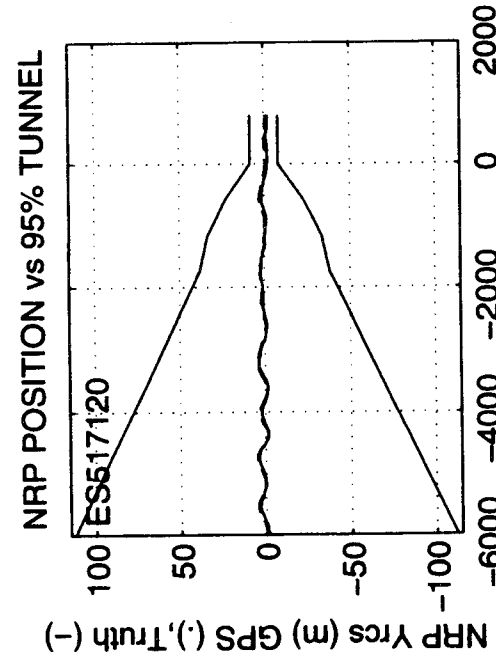
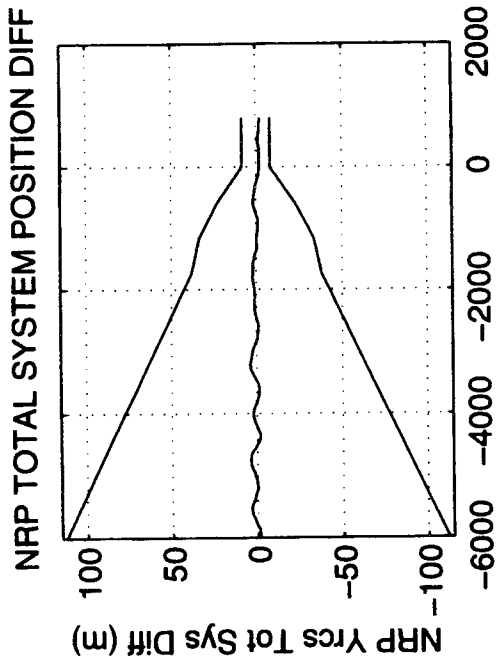
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.790  
NRP Yrcs MEAN DIFFERENCE (m): 1.211  
NRP Zrcs MEAN DIFFERENCE (m): 0.005

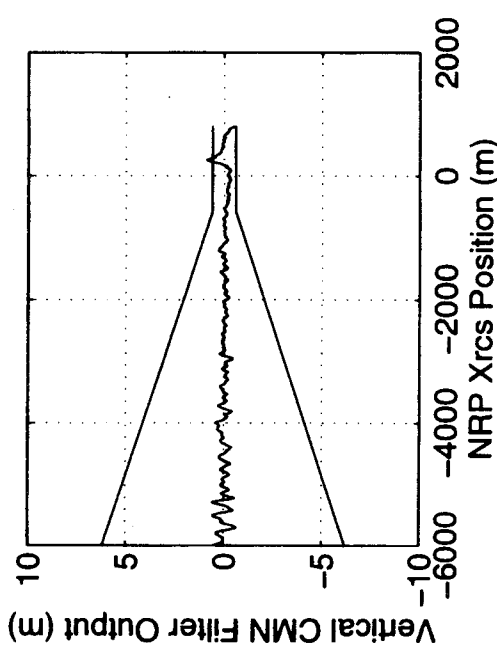
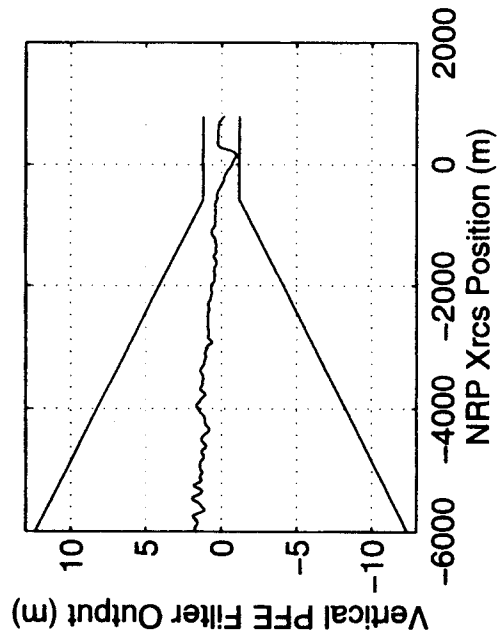
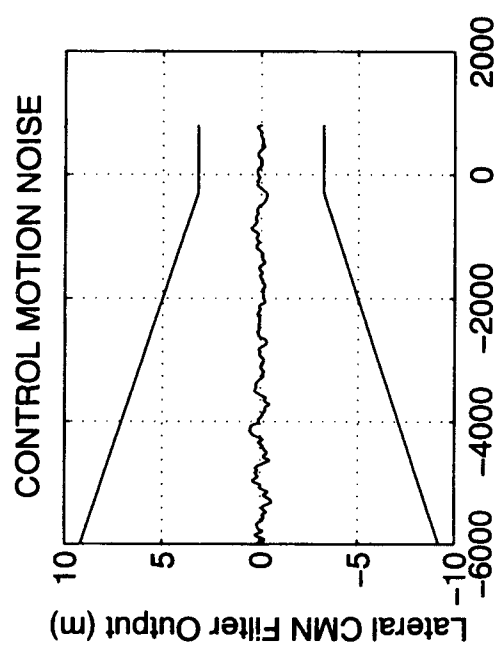
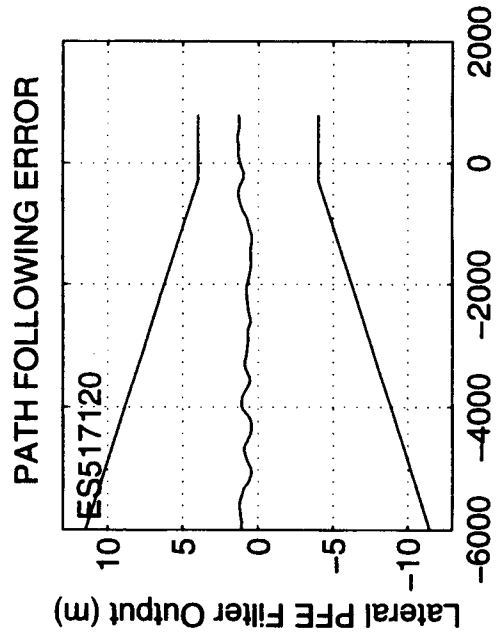
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.694  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.439  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.895

NRP Xrcs 2-RMS DIFFERENCE (m): 1.726  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.462  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.895

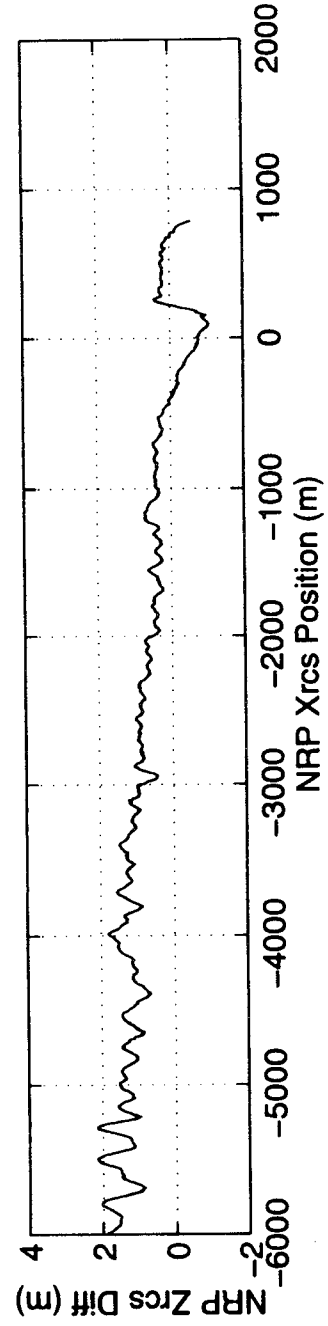
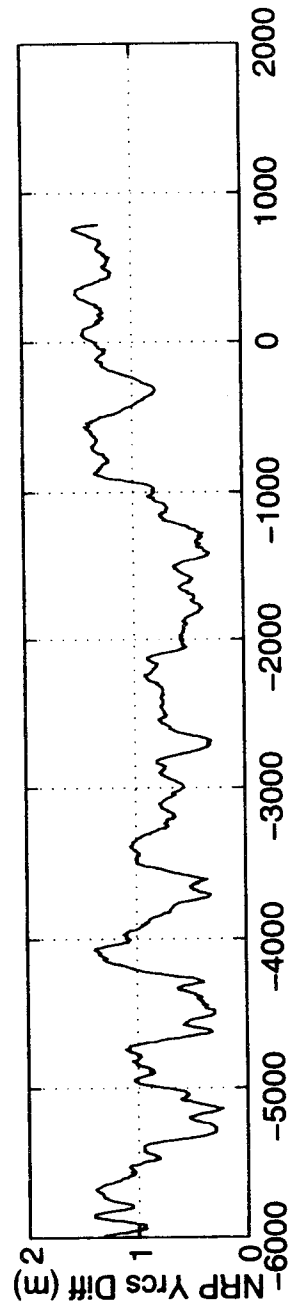
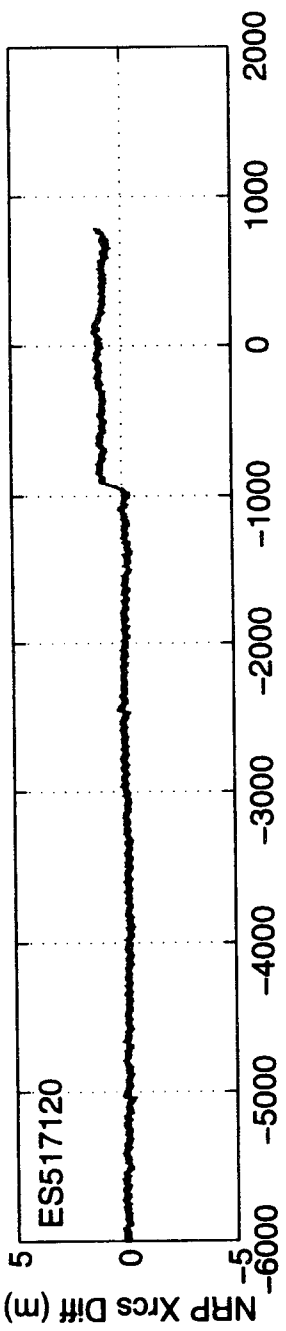
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 164.138  
LGRP Yrcs POSITION (m): -1.474





NRP LONGITUDINAL, LATERAL AND VERTICAL POSITION DIFFERENCES





APPROACH #: ES517121  
START TIME: 244984.111  
STOP TIME: 245135.517

MINIMUM HDOP: 0.9  
MAXIMUM HDOP: 0.9  
AVERAGE HDOP: 0.9

MINIMUM VDOP: 3.2  
MAXIMUM VDOP: 3.2  
AVERAGE VDOP: 3.2

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

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TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
-----

NRP Xrcs MEAN DIFFERENCE (m): 0.749  
NRP Yrcs MEAN DIFFERENCE (m): 1.147  
NRP Zrcs MEAN DIFFERENCE (m): -0.002

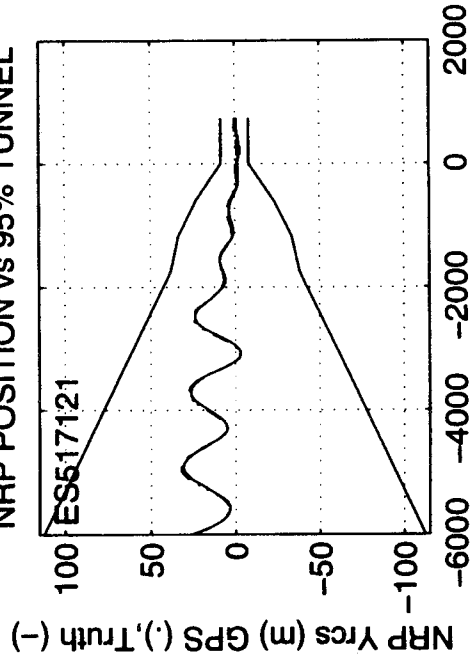
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.737  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.575  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.897

NRP Xrcs 2-RMS DIFFERENCE (m): 1.670  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.365  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.897

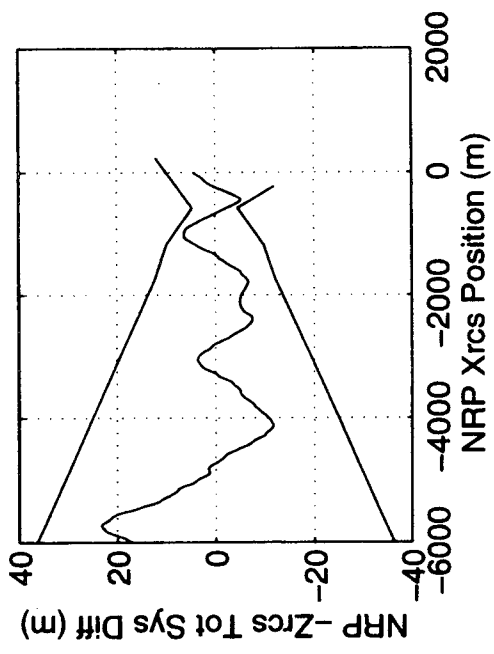
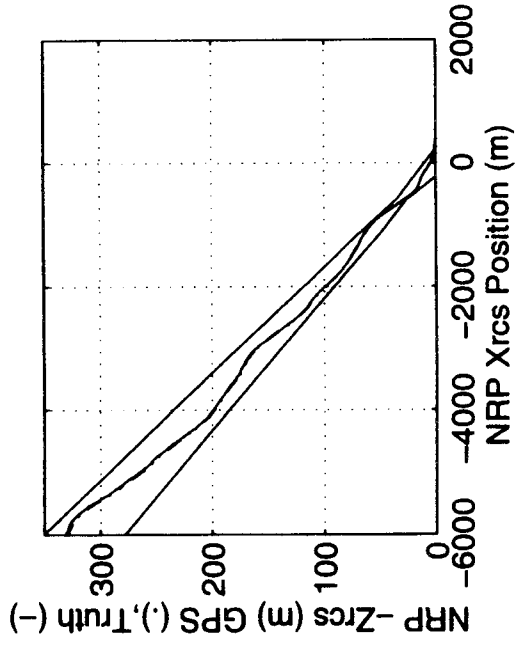
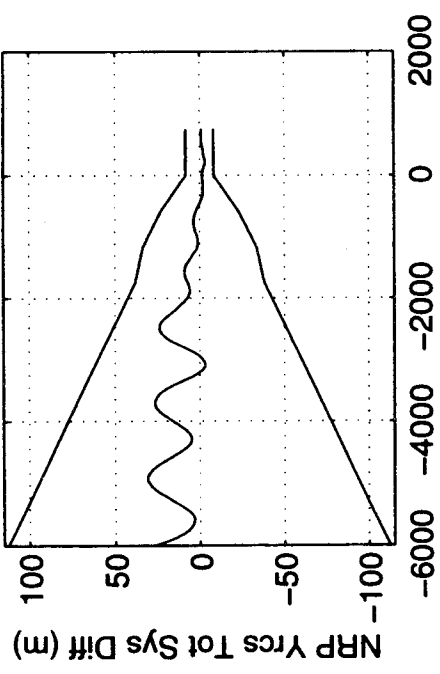
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----

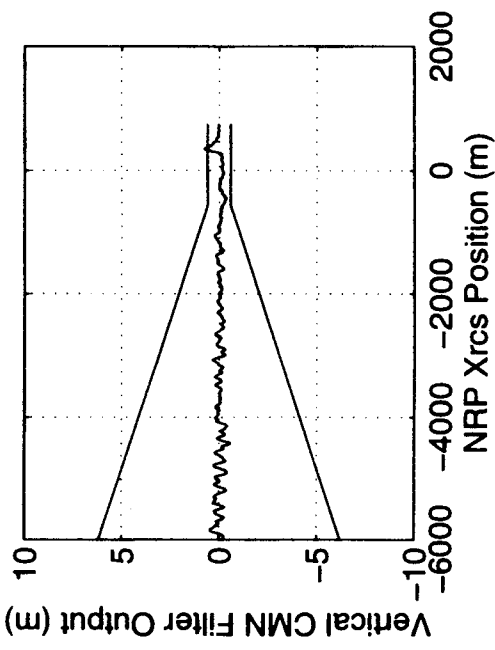
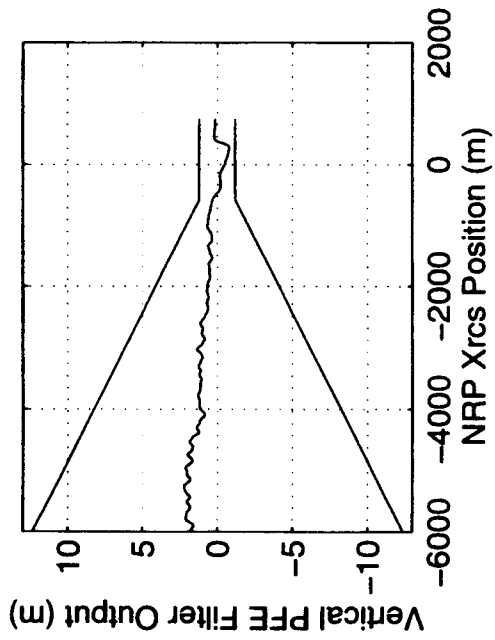
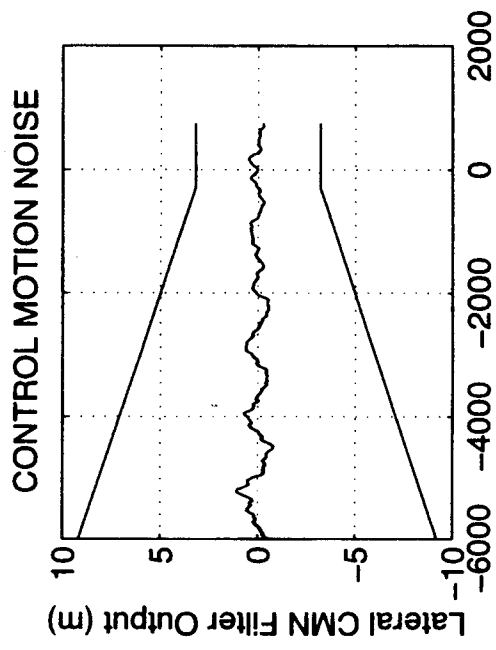
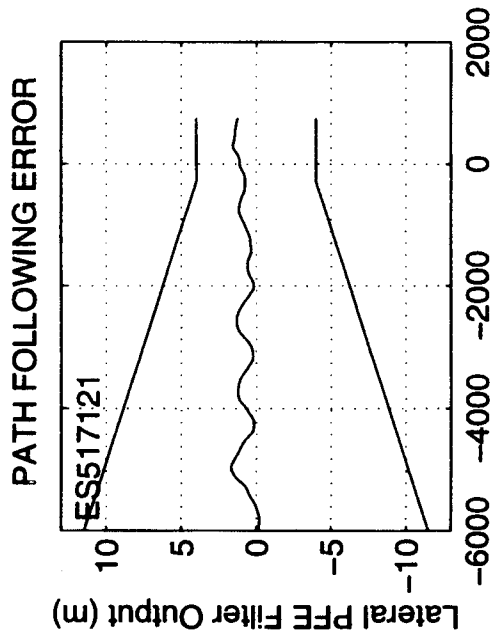
LGRP Xrcs POSITION (m): 234.815  
LGRP Yrcs POSITION (m): -2.708

NRP POSITION vs 95% TUNNEL

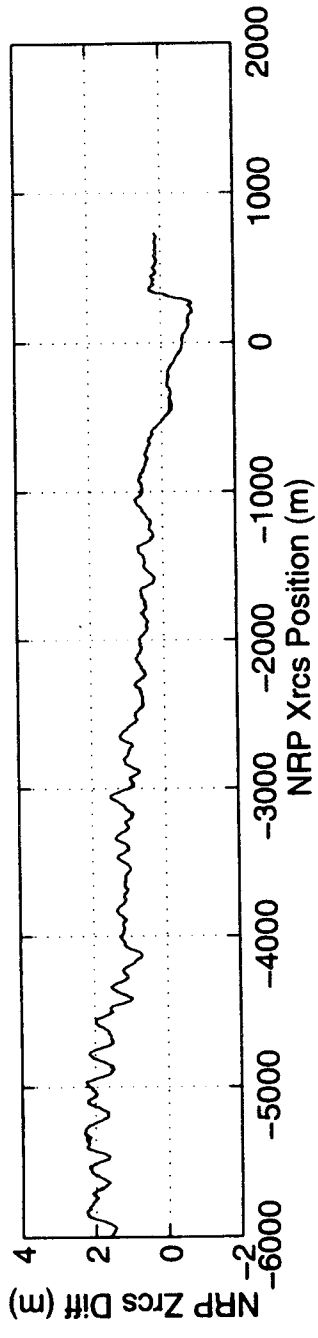
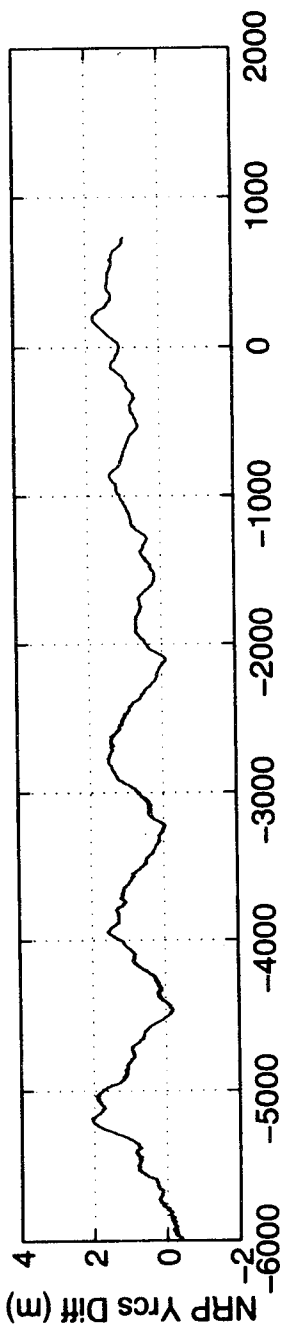
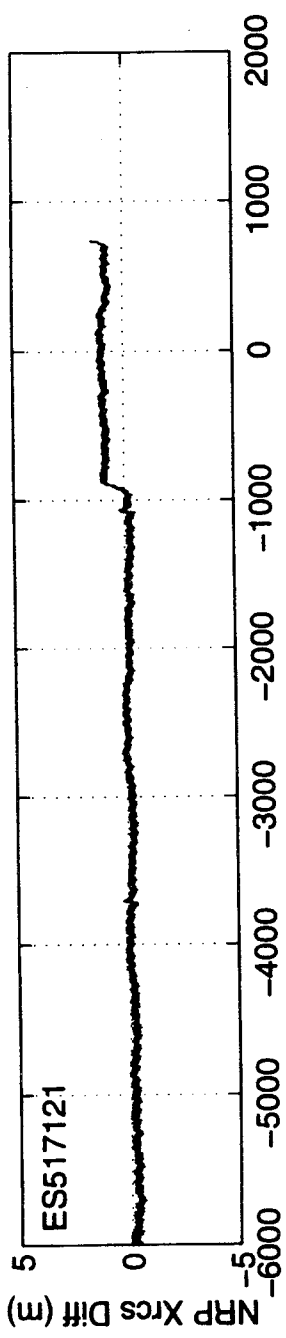


NRP TOTAL SYSTEM POSITION DIFF





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517122  
START TIME: 245489.111  
STOP TIME: 245640.111

MINIMUM HDOP: 0.9  
MAXIMUM HDOP: 0.9  
AVERAGE HDOP: 0.9

MINIMUM VDOP: 3.4  
MAXIMUM VDOP: 3.5  
AVERAGE VDOP: 3.4

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

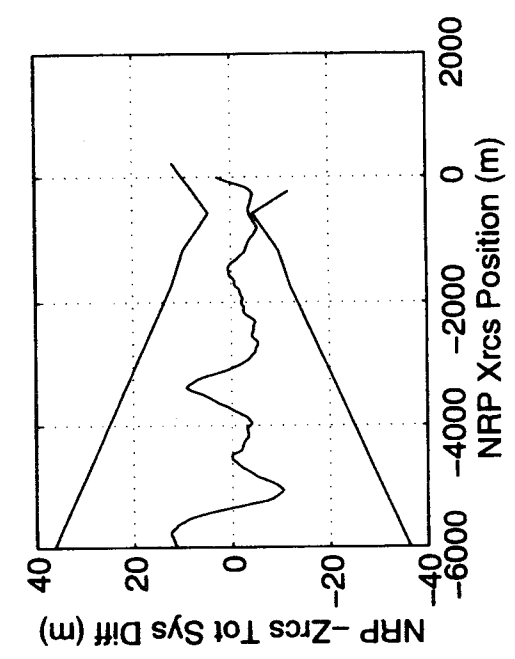
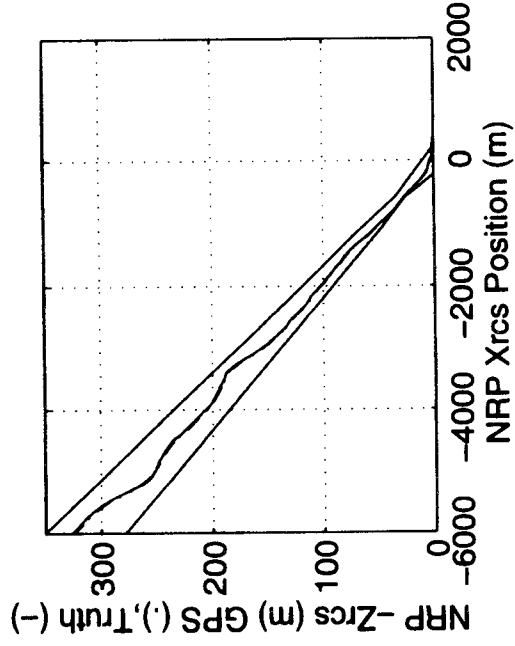
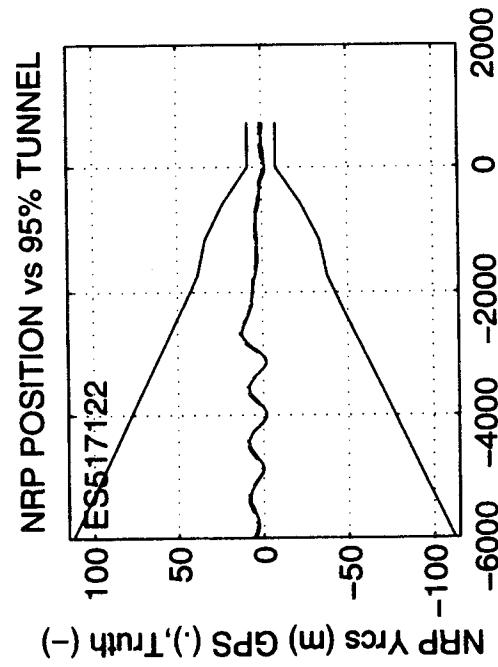
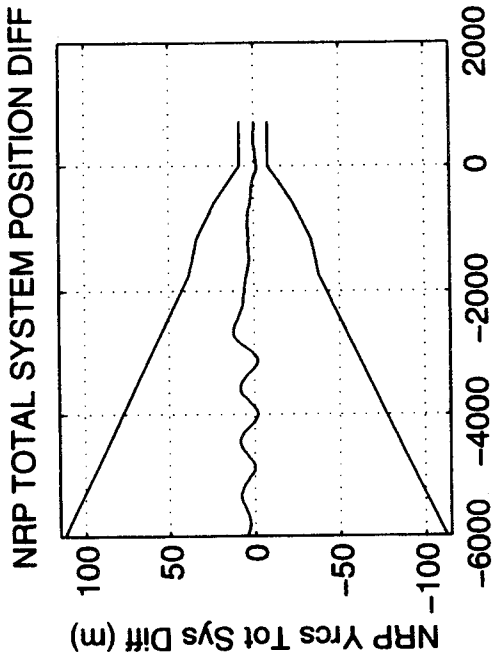
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.685  
NRP Yrcs MEAN DIFFERENCE (m): 0.950  
NRP Zrcs MEAN DIFFERENCE (m): 0.025

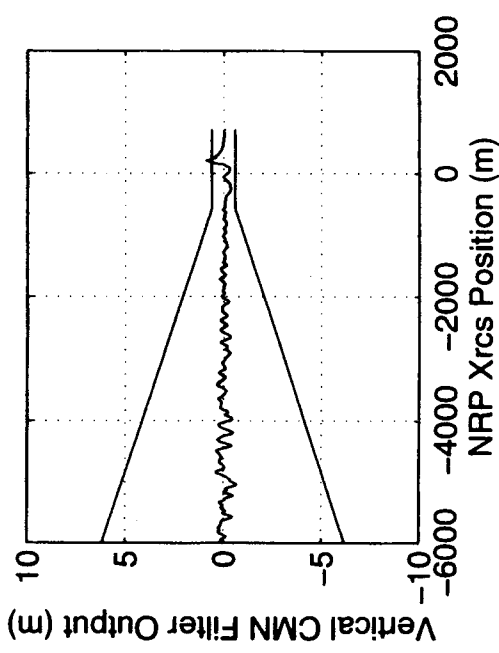
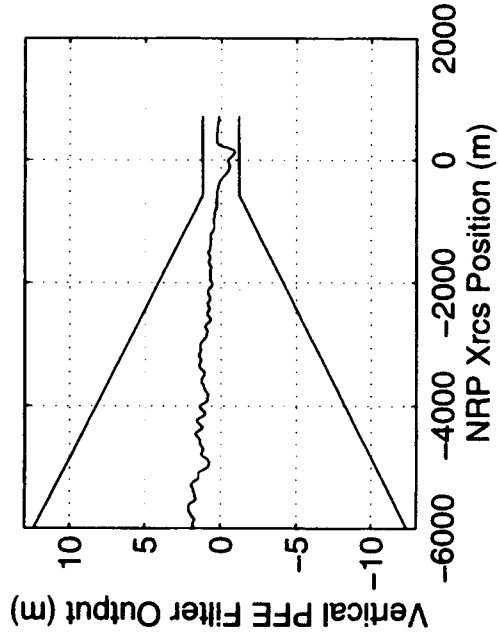
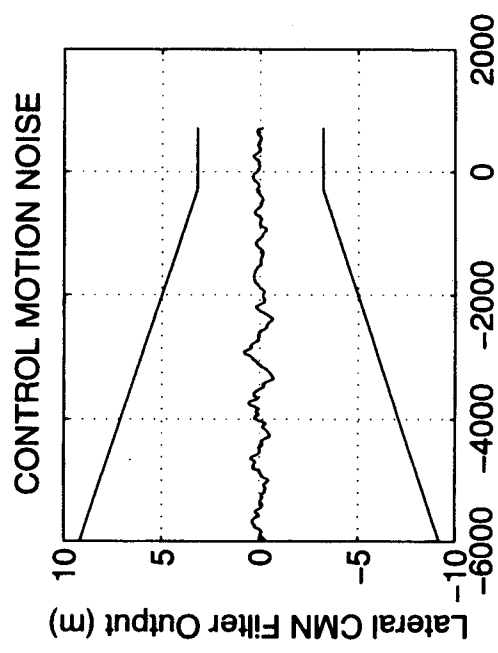
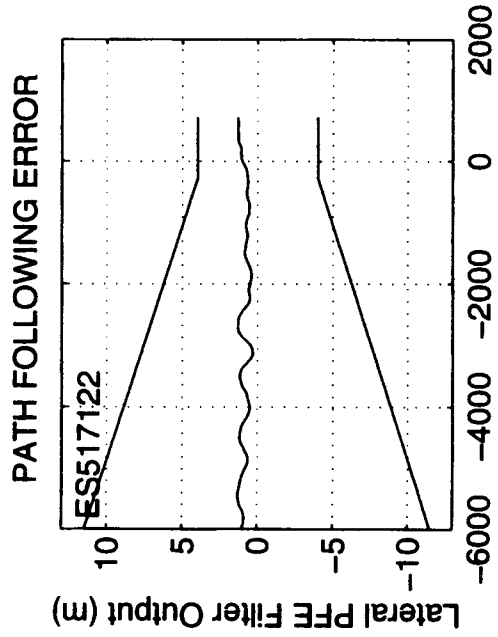
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.718  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.642  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.820

NRP Xrcs 2-RMS DIFFERENCE (m): 1.547  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.006  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.821

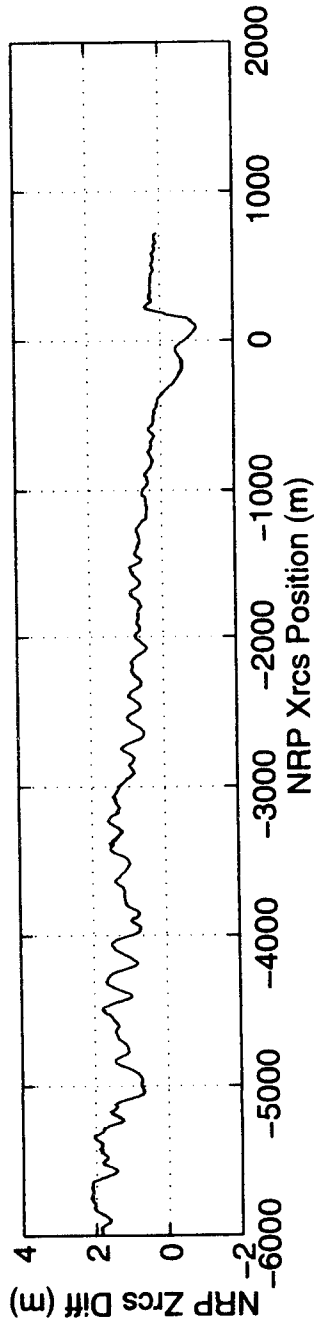
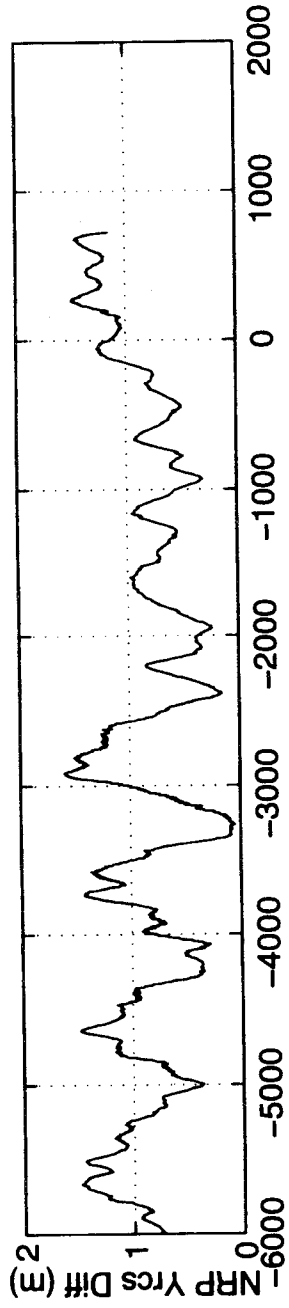
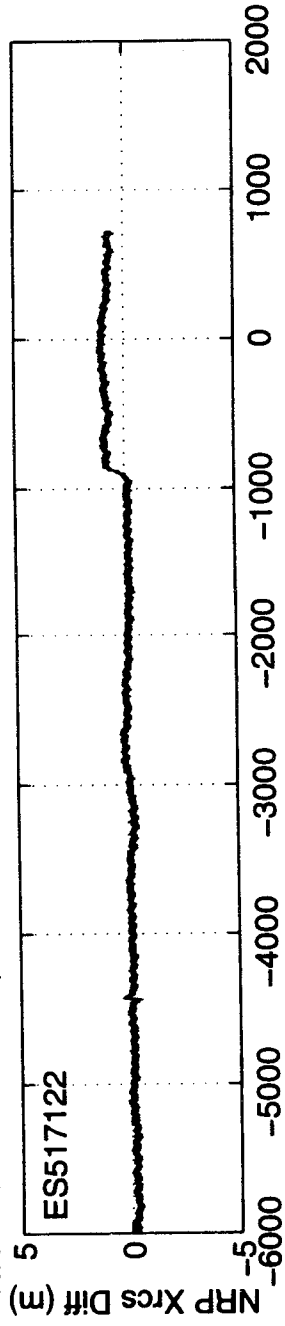
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 161.005  
LGRP Yrcs POSITION (m): -0.466





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES





APPROACH #: ES517123  
START TIME: 246018.517  
STOP TIME: 246180.264

MINIMUM HDOP: 0.8  
MAXIMUM HDOP: 0.8  
AVERAGE HDOP: 0.8

MINIMUM VDOP: 3.3  
MAXIMUM VDOP: 3.5  
AVERAGE VDOP: 3.4

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

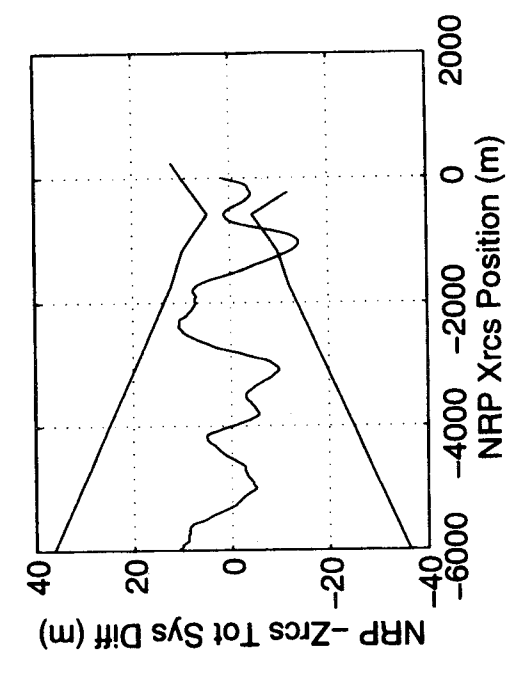
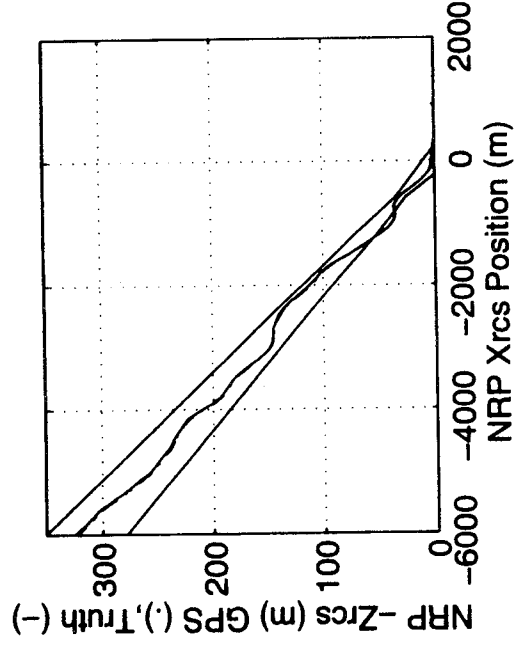
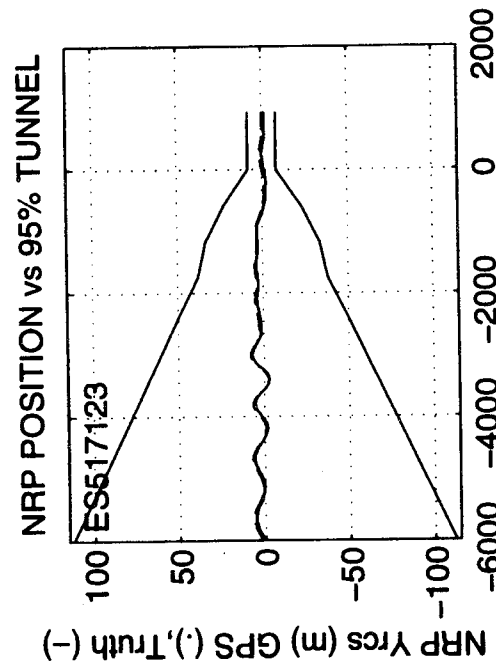
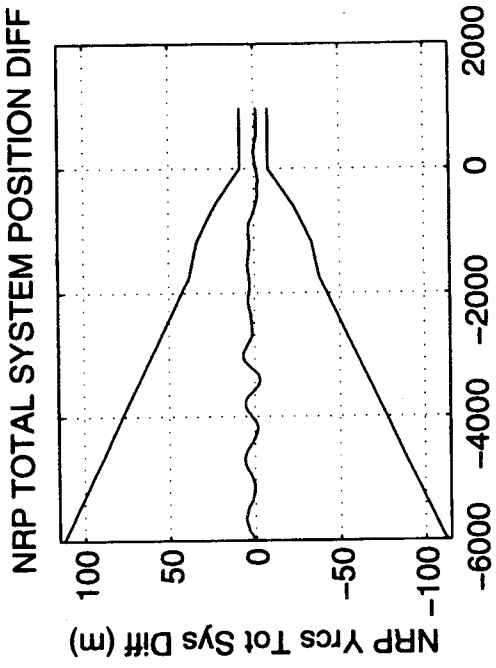
\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

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TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

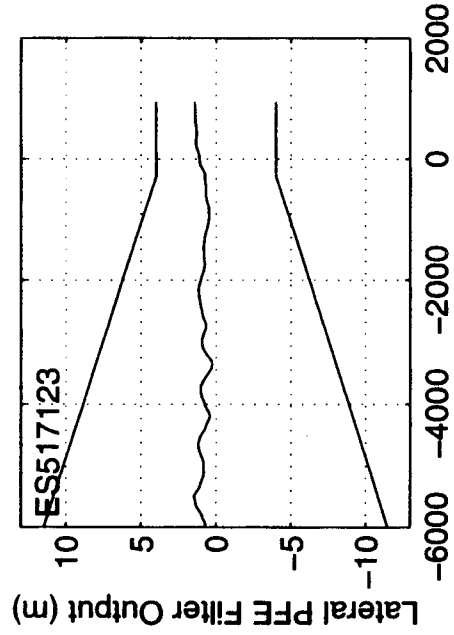
NRP Xrcs MEAN DIFFERENCE (m): 0.598  
NRP Yrcs MEAN DIFFERENCE (m): 1.039  
NRP Zrcs MEAN DIFFERENCE (m): -0.169  
  
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.816  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.709  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 1.068  
  
NRP Xrcs 2-RMS DIFFERENCE (m): 1.448  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.196  
NRP Zrcs 2-RMS DIFFERENCE (m): 1.120

-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

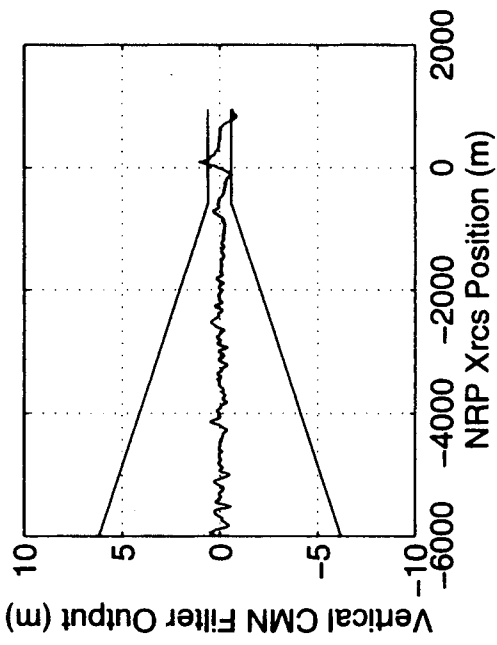
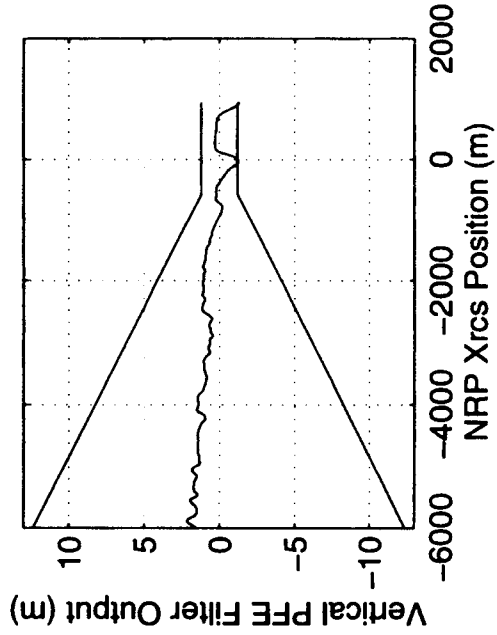
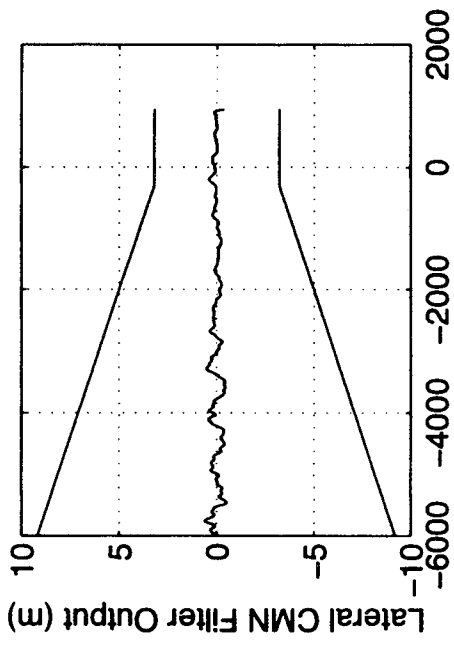
LGPR Xrcs POSITION (m): 68.411  
LGPR Yrcs POSITION (m): -0.306



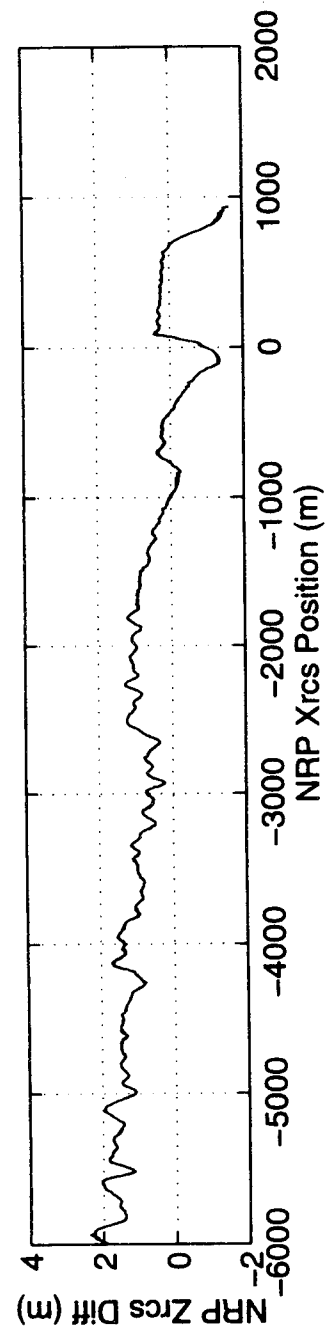
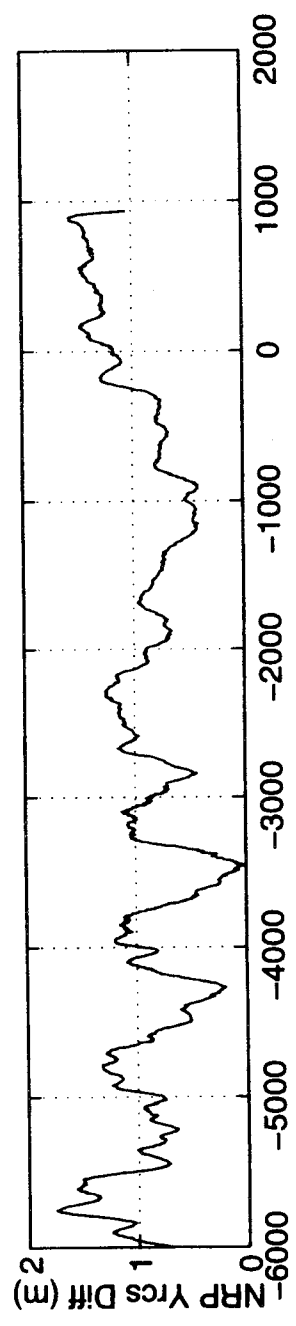
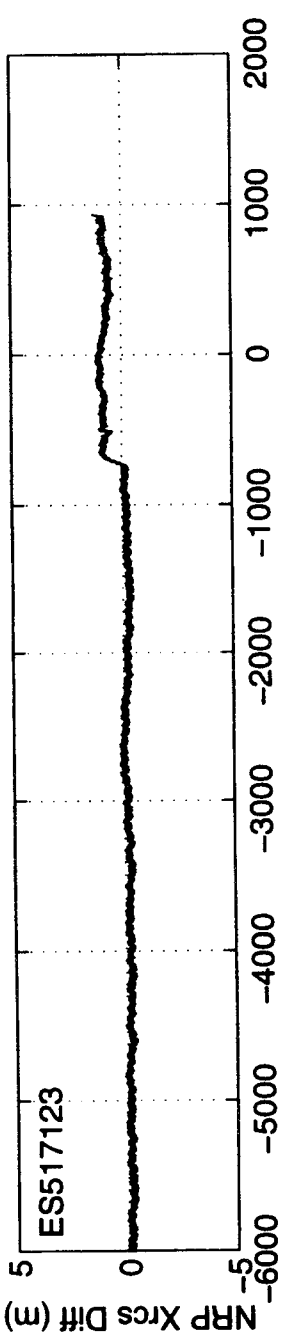
PATH FOLLOWING ERROR



CONTROL MOTION NOISE



NRP LONGITUDINAL, LATERAL AND VERTICAL POSITION DIFFERENCES



APPROACH #: ES517124  
START TIME: 246569.122  
STOP TIME: 246730.319

MINIMUM HDOP: 0.8  
MAXIMUM HDOP: 0.8  
AVERAGE HDOP: 0.8

MINIMUM VDOP: 3.2  
MAXIMUM VDOP: 3.3  
AVERAGE VDOP: 3.2

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

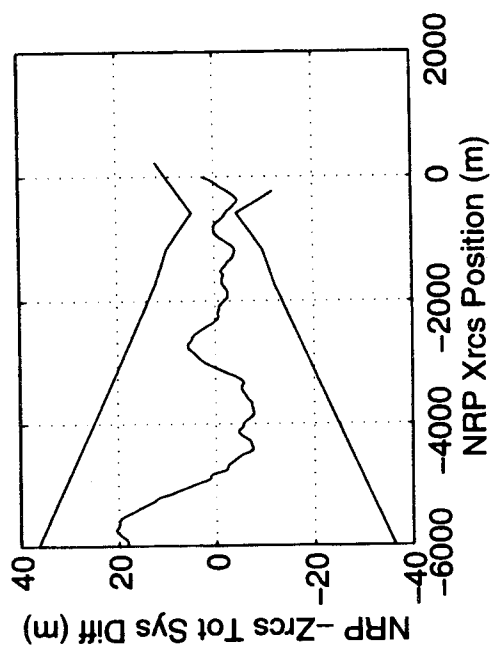
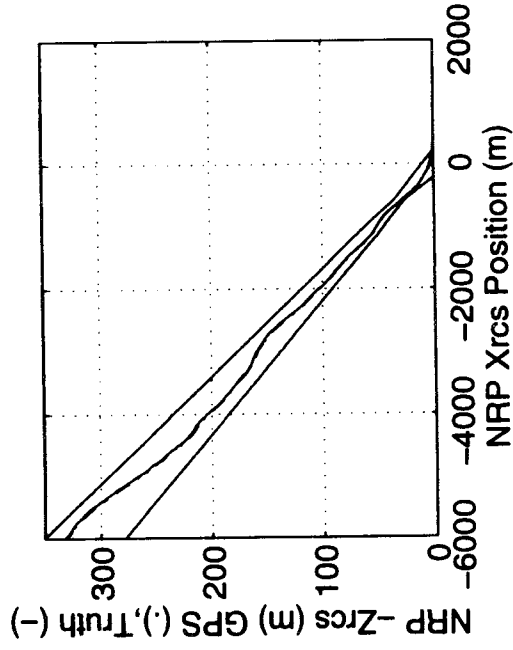
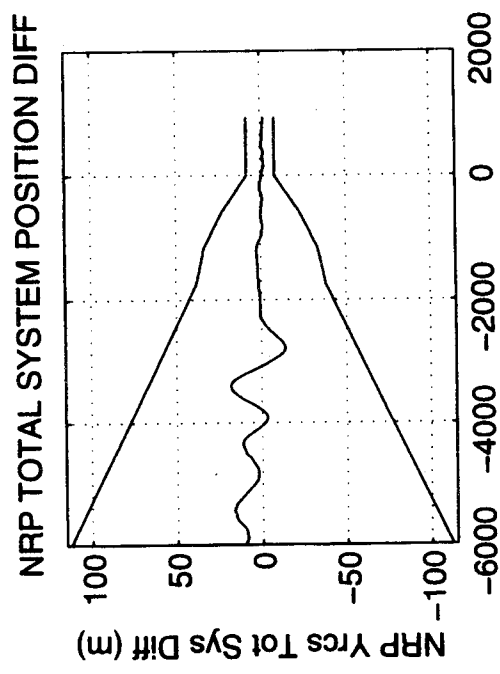
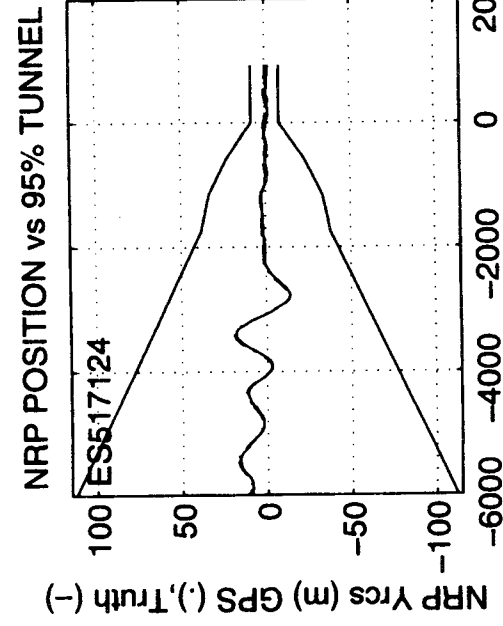
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.684  
NRP Yrcs MEAN DIFFERENCE (m): 1.148  
NRP Zrcs MEAN DIFFERENCE (m): -0.004

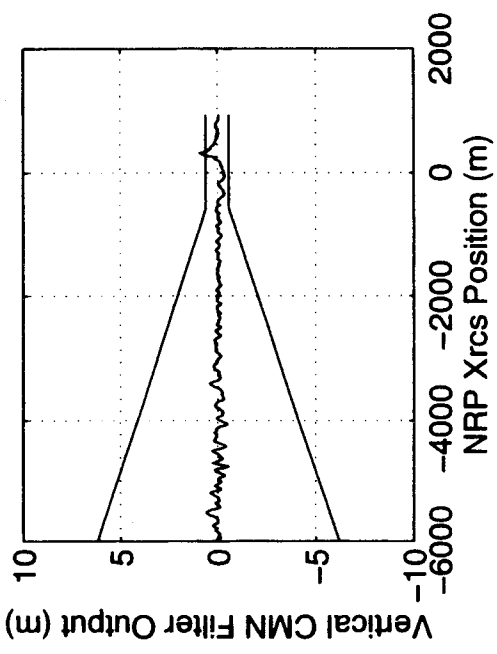
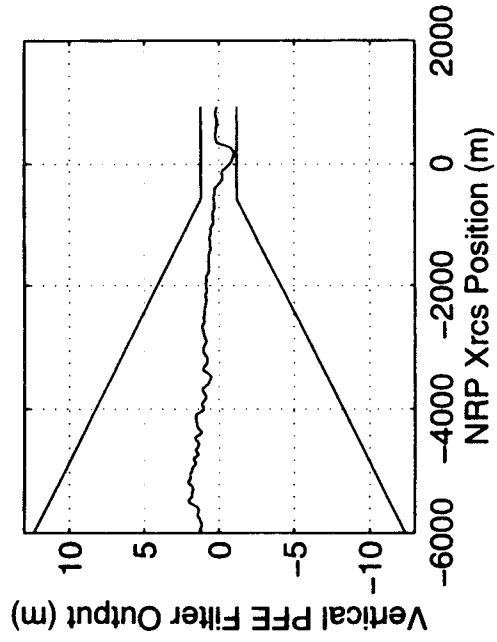
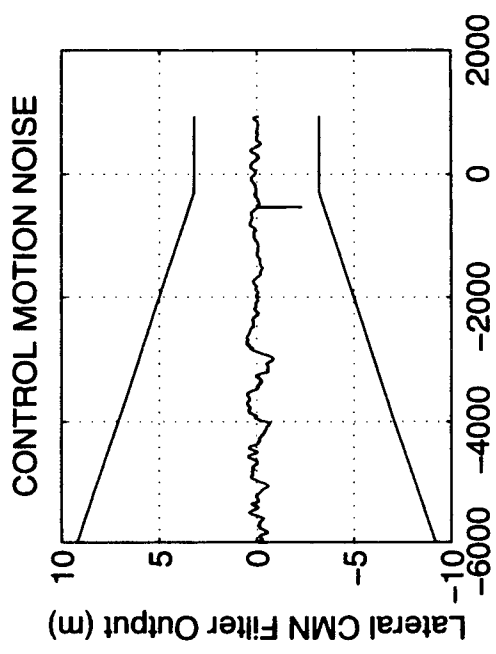
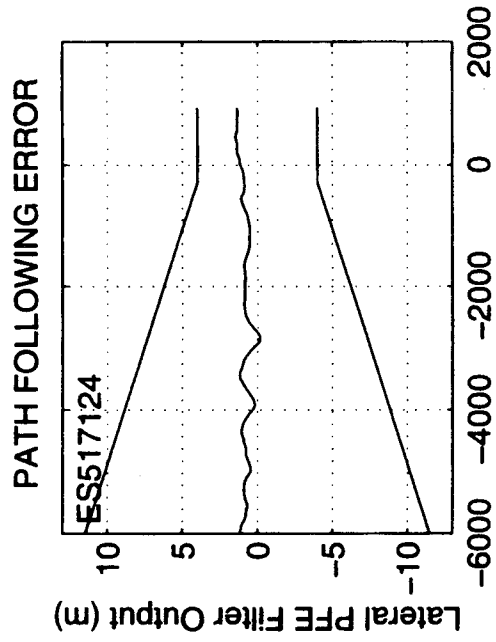
NRP Xrcs 2-SIGMA DIFFERENCE (m): 1.727  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.643  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.911

NRP Xrcs 2-RMS DIFFERENCE (m): 2.203  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.385  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.911

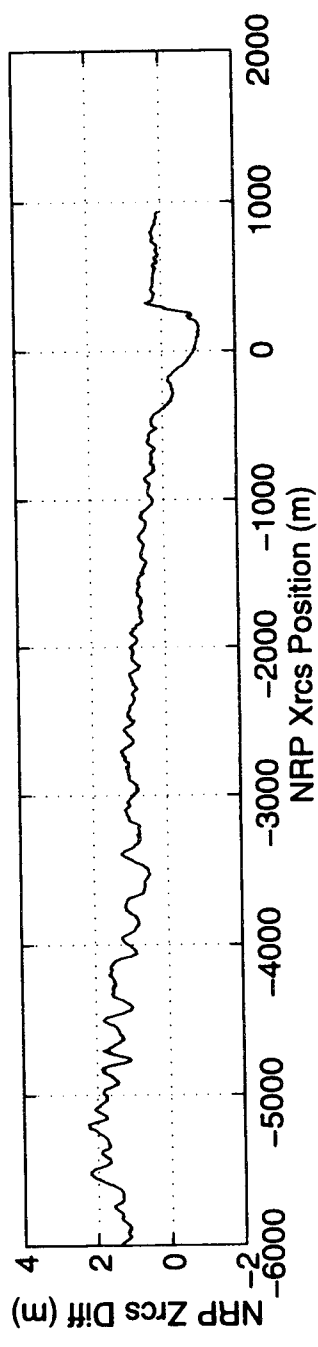
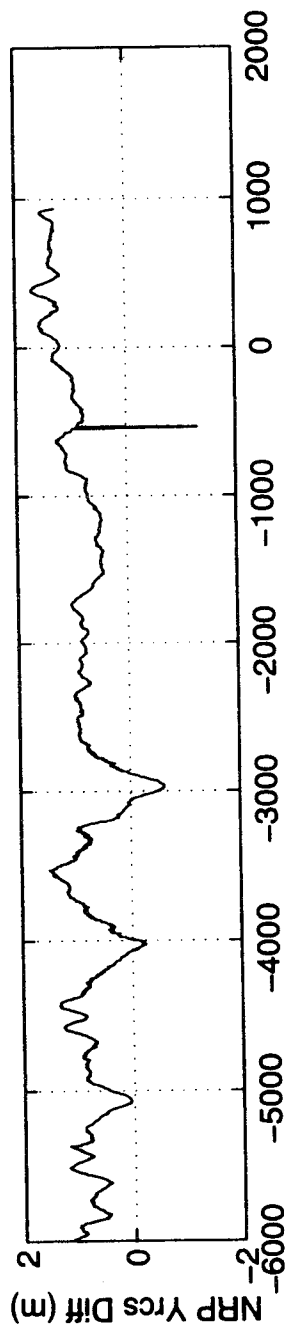
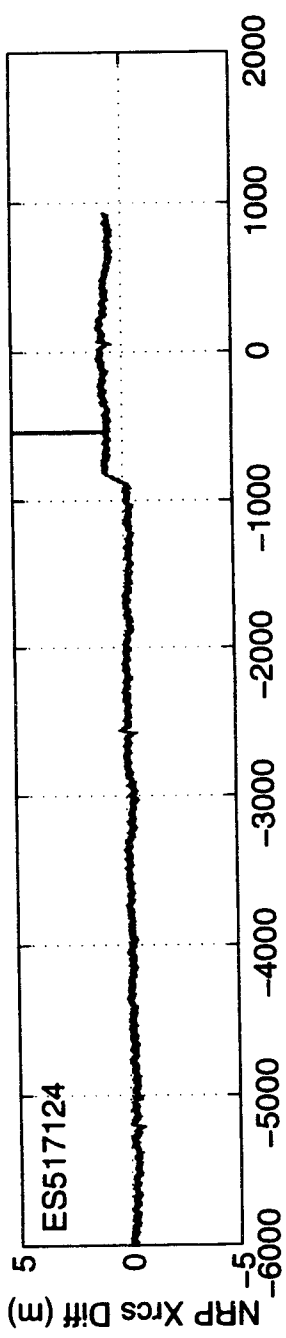
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 217.891  
LGRP Yrcs POSITION (m): -1.343





# NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES





APPROACH #: ES517125  
START TIME: 247177.122  
STOP TIME: 247330.517

MINIMUM HDOP: 0.8  
MAXIMUM HDOP: 0.8  
AVERAGE HDOP: 0.8

MINIMUM VDOP: 2.8  
MAXIMUM VDOP: 3.0  
AVERAGE VDOP: 2.9

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

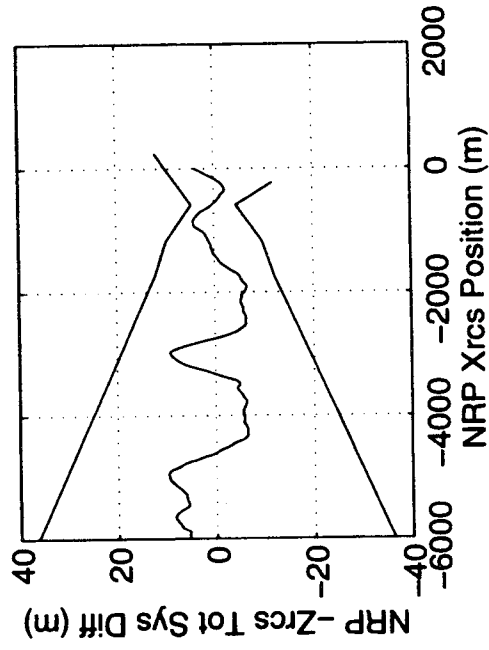
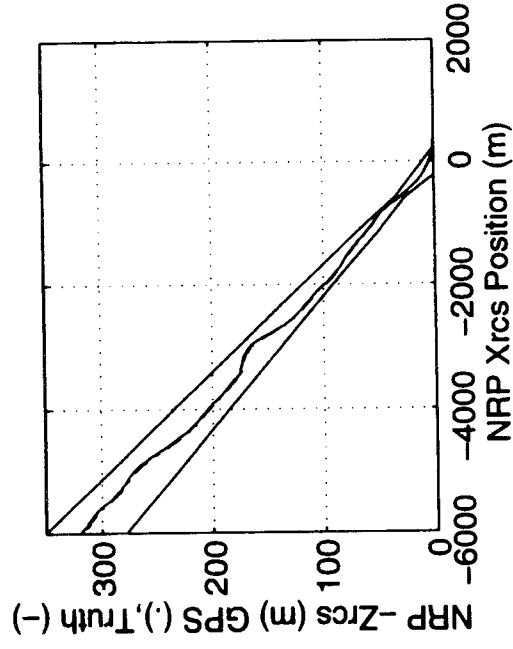
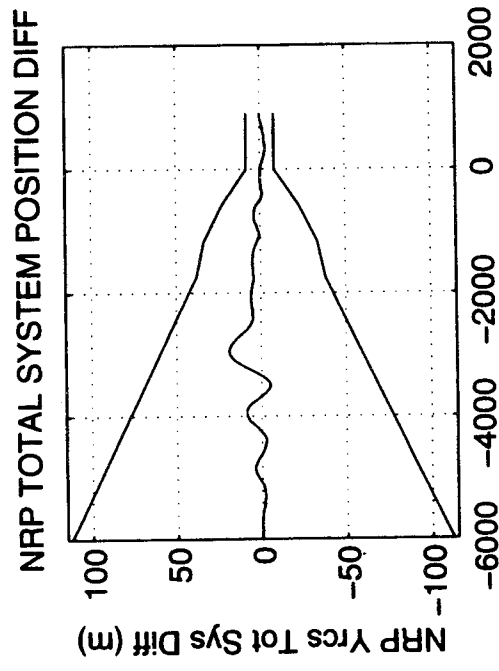
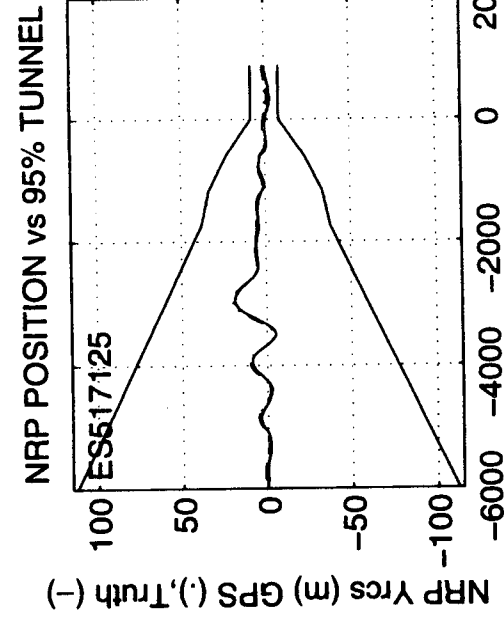
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.606  
NRP Yrcs MEAN DIFFERENCE (m): 1.129  
NRP Zrcs MEAN DIFFERENCE (m): 0.076

NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.500  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.664  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.901

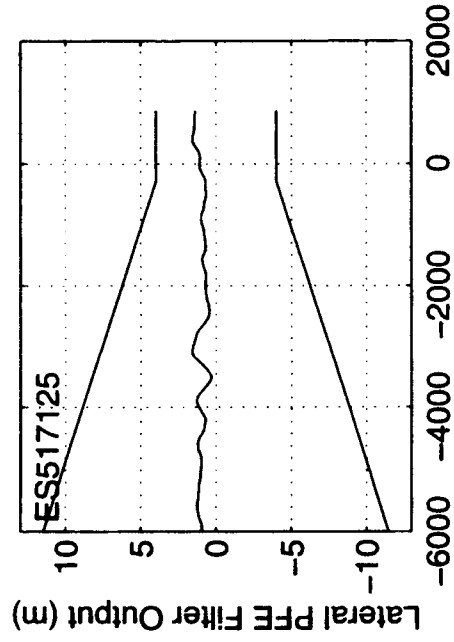
NRP Xrcs 2-RMS DIFFERENCE (m): 1.311  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.353  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.914

LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

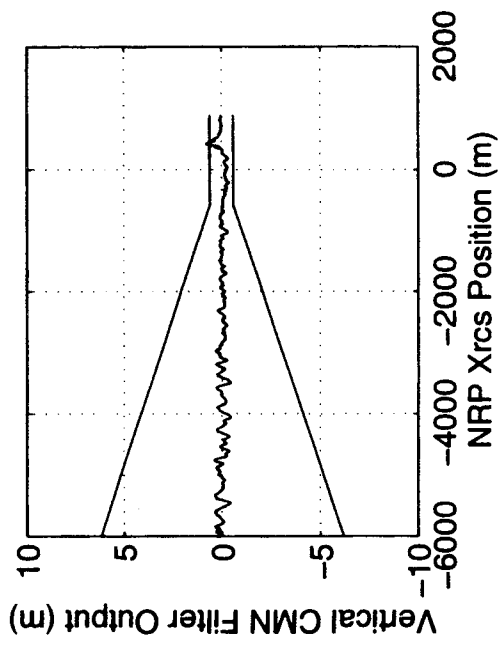
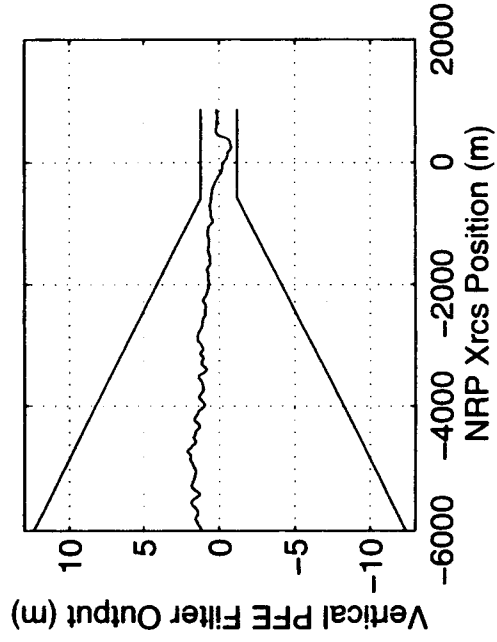
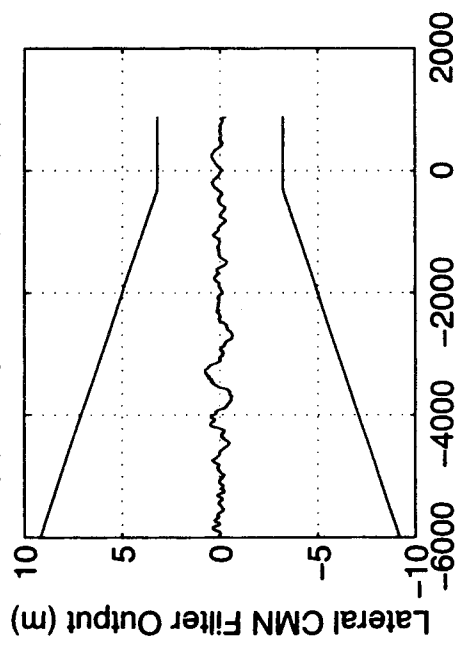
-----  
LGRP Xrcs POSITION (m): 337.325  
LGRP Yrcs POSITION (m): -2.694



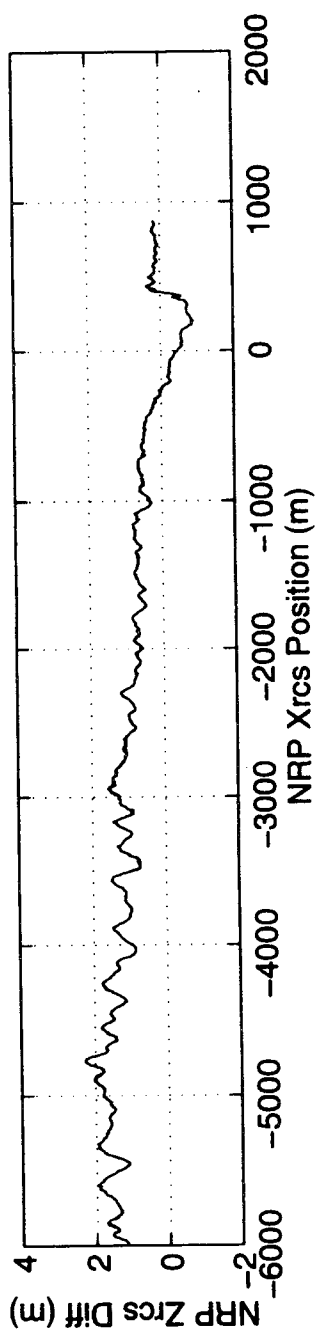
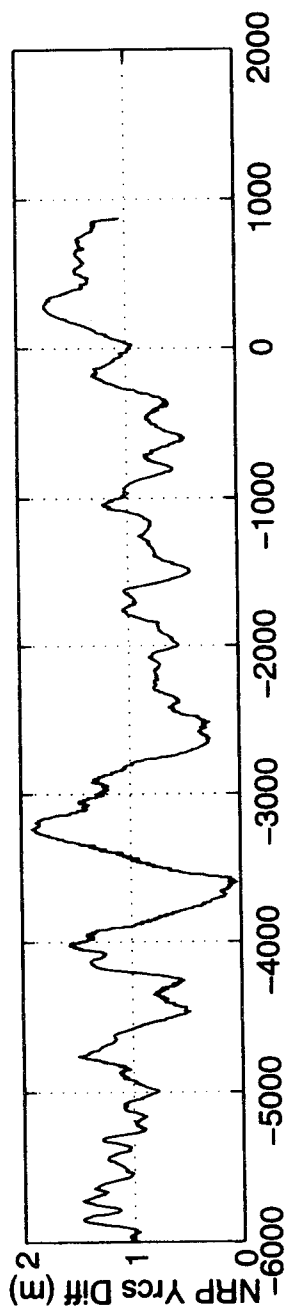
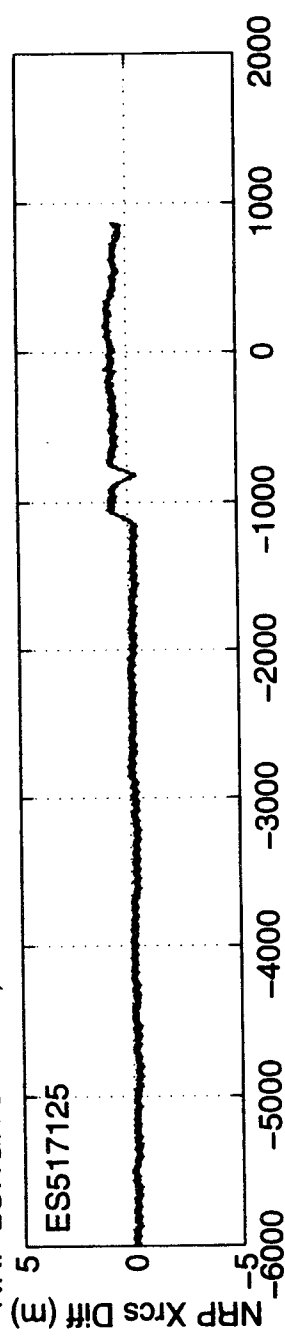
PATH FOLLOWING ERROR



CONTROL MOTION NOISE



NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517126  
START TIME: 247710.056  
STOP TIME: 247860.396

MINIMUM HDOP: 0.6  
MAXIMUM HDOP: 0.8  
AVERAGE HDOP: 0.6

MINIMUM VDOP: 1.6  
MAXIMUM VDOP: 2.6  
AVERAGE VDOP: 1.9

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

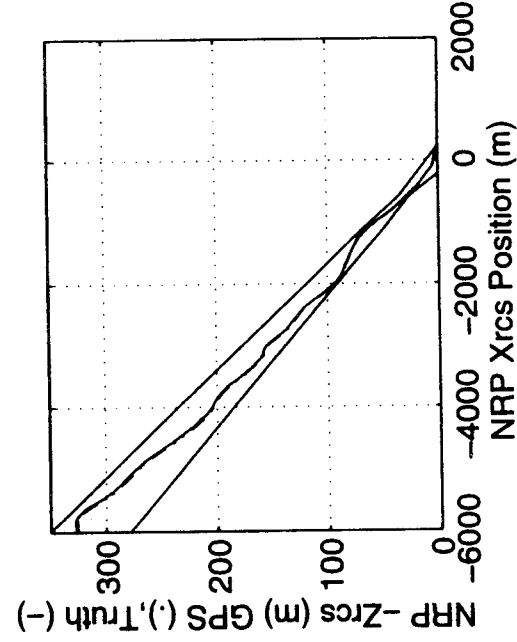
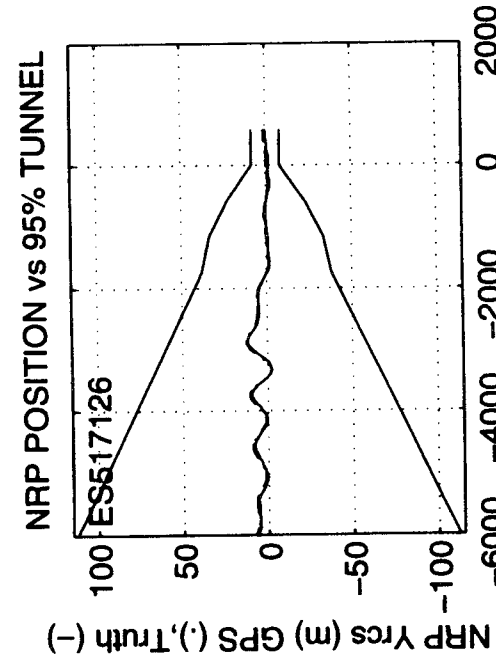
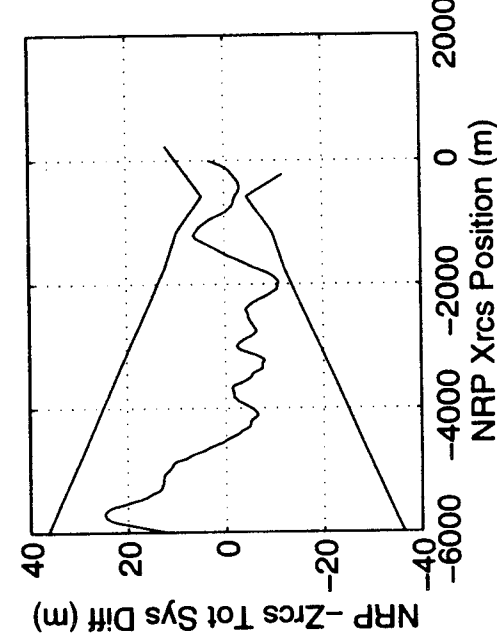
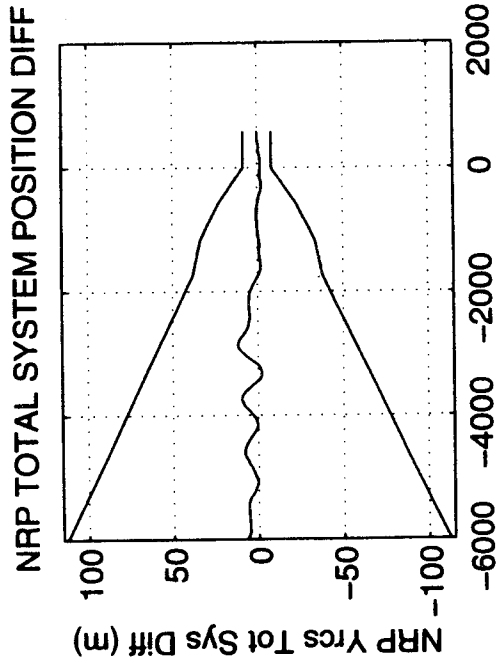
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.637  
NRP Yrcs MEAN DIFFERENCE (m): 0.902  
NRP Zrcs MEAN DIFFERENCE (m): 0.093

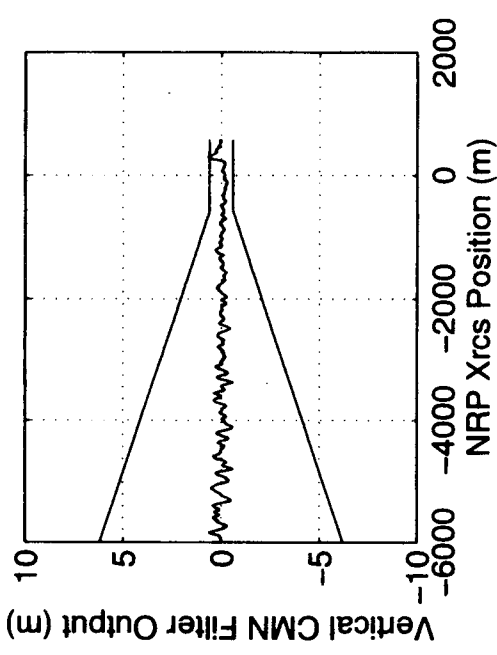
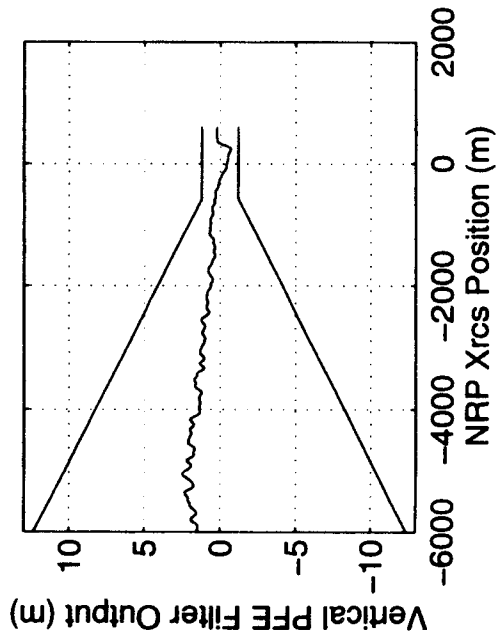
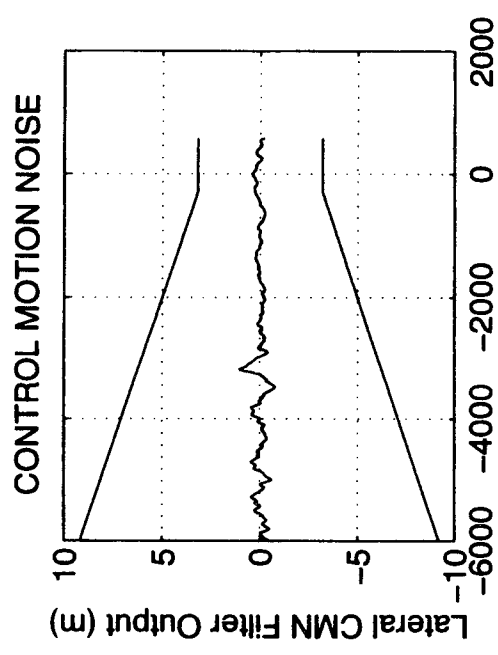
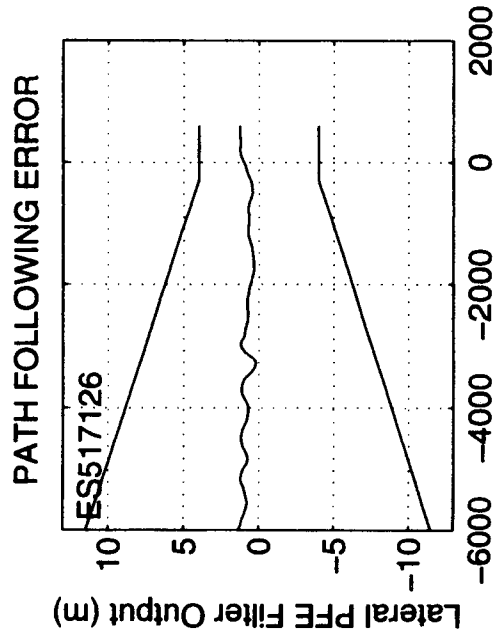
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.755  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.688  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.832

NRP Xrcs 2-RMS DIFFERENCE (m): 1.481  
NRP Yrcs 2-RMS DIFFERENCE (m): 1.931  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.852

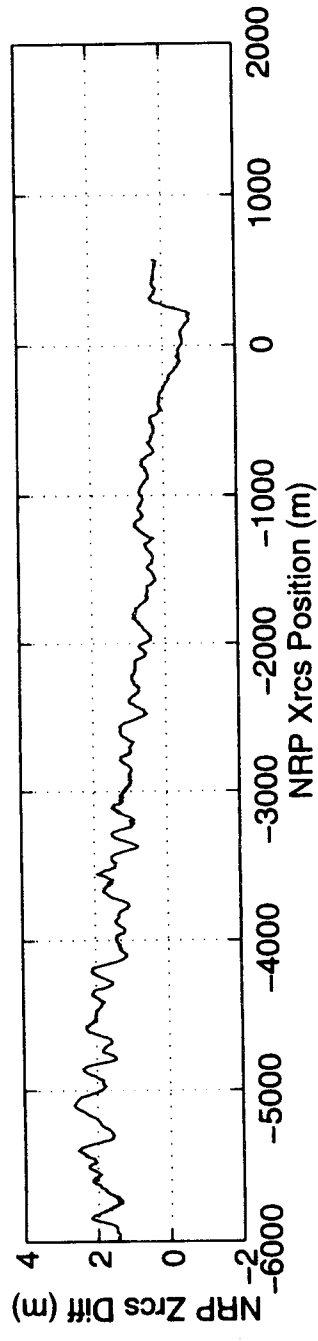
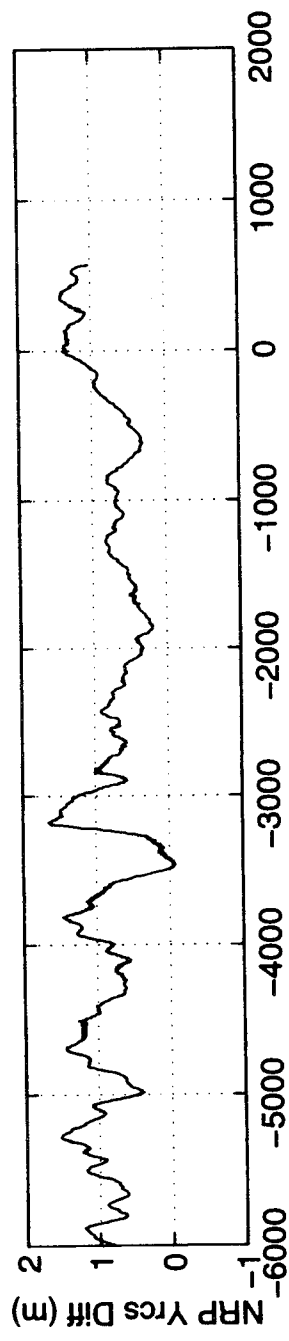
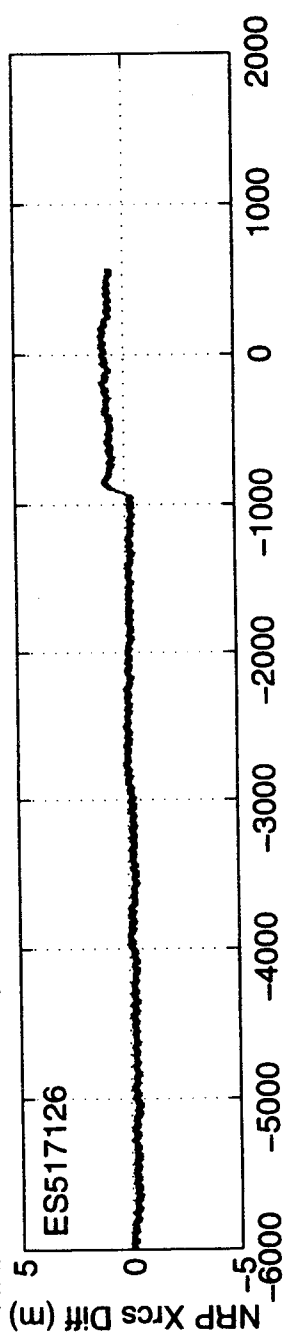
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 302.166  
LGRP Yrcs POSITION (m): -0.362





NRP LONGITUDINAL, LATERAL AND VERTICAL POSITION DIFFERENCES





APPROACH #: ES517127  
START TIME: 248275.660  
STOP TIME: 248435.198

MINIMUM HDOP: 0.6  
MAXIMUM HDOP: 0.6  
AVERAGE HDOP: 0.6

MINIMUM VDOP: 1.5  
MAXIMUM VDOP: 1.5  
AVERAGE VDOP: 1.5

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

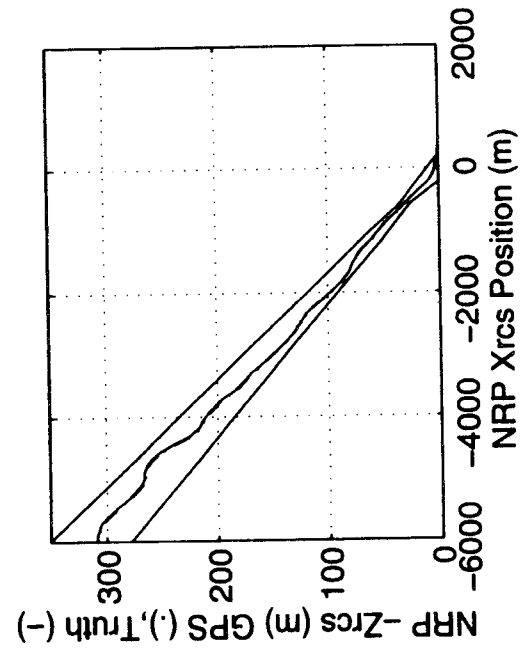
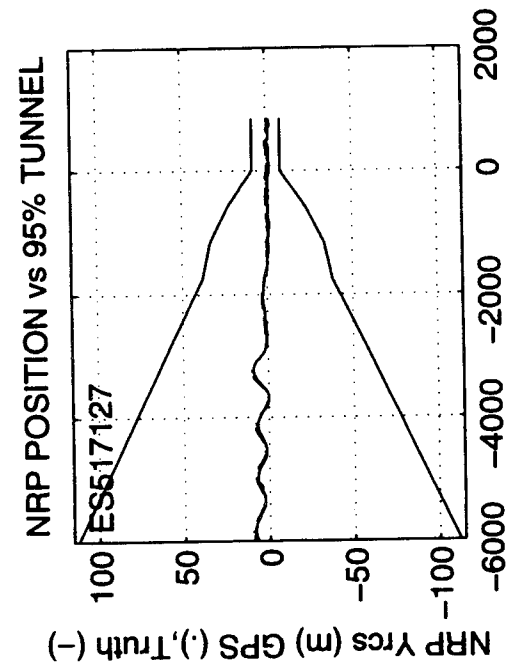
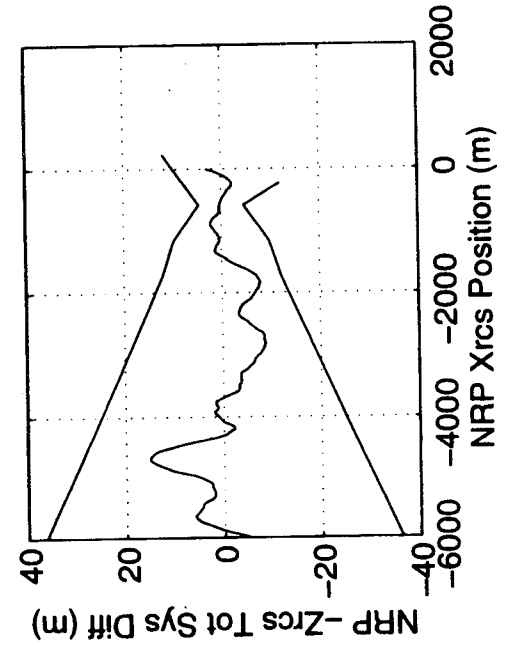
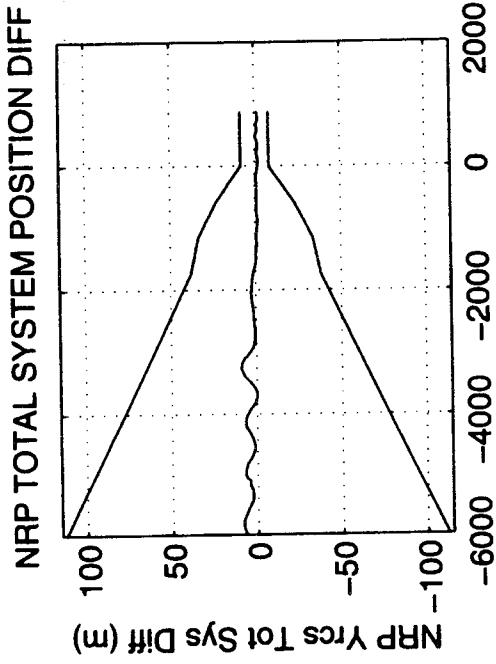
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.710  
NRP Yrcs MEAN DIFFERENCE (m): 1.183  
NRP Zrcs MEAN DIFFERENCE (m): 0.094

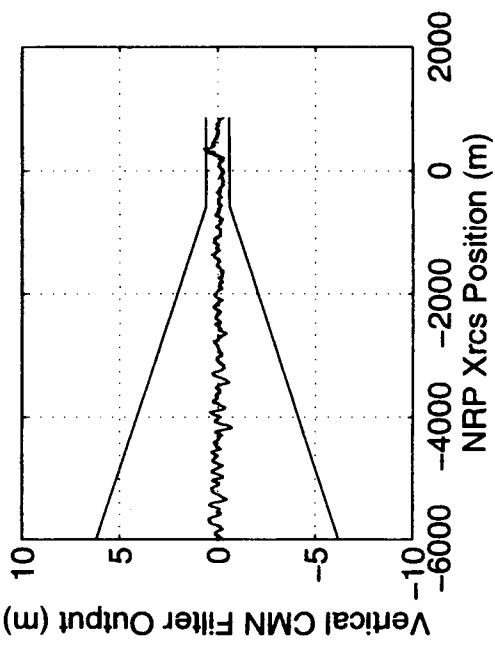
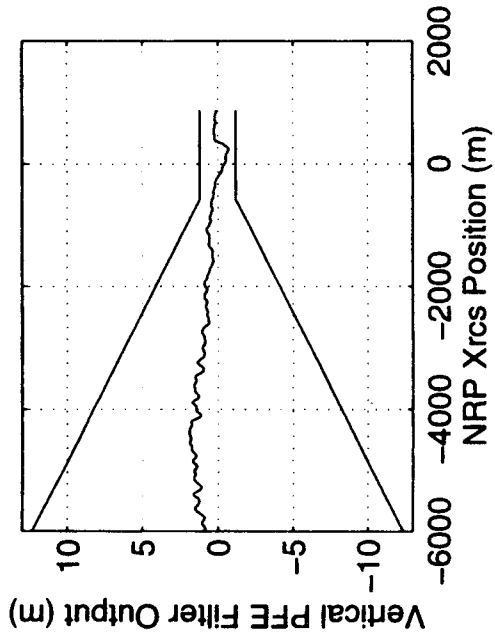
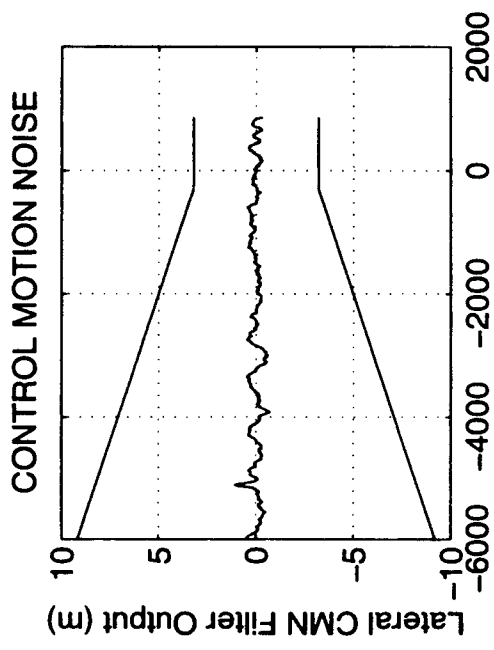
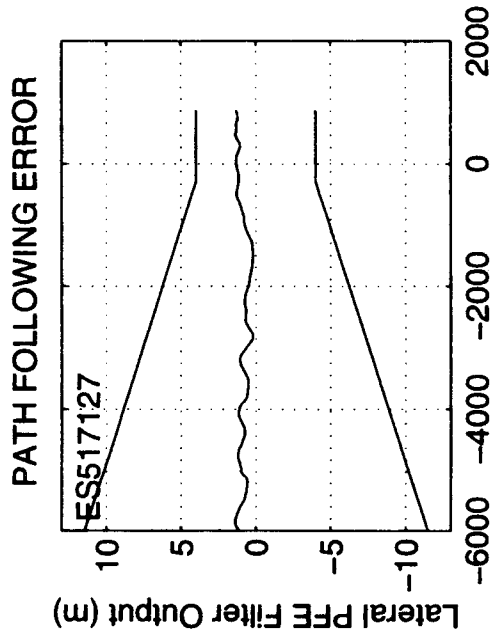
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.709  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.423  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.782

NRP Xrcs 2-RMS DIFFERENCE (m): 1.586  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.403  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.804

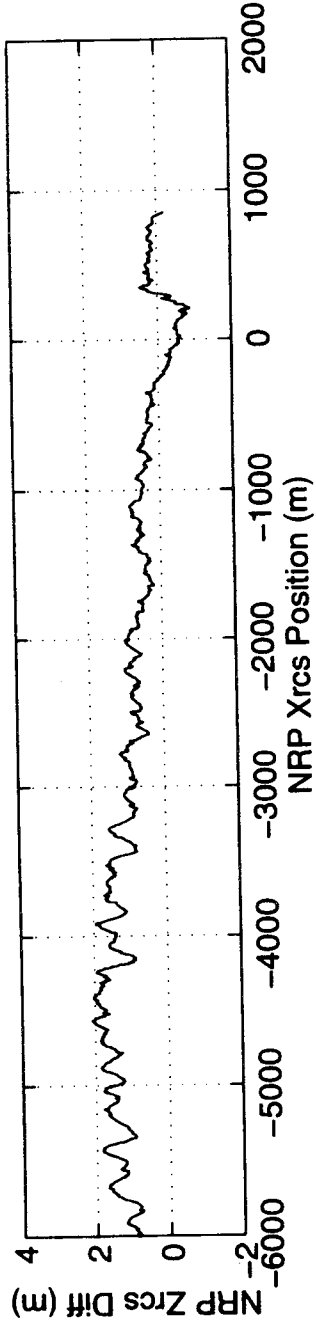
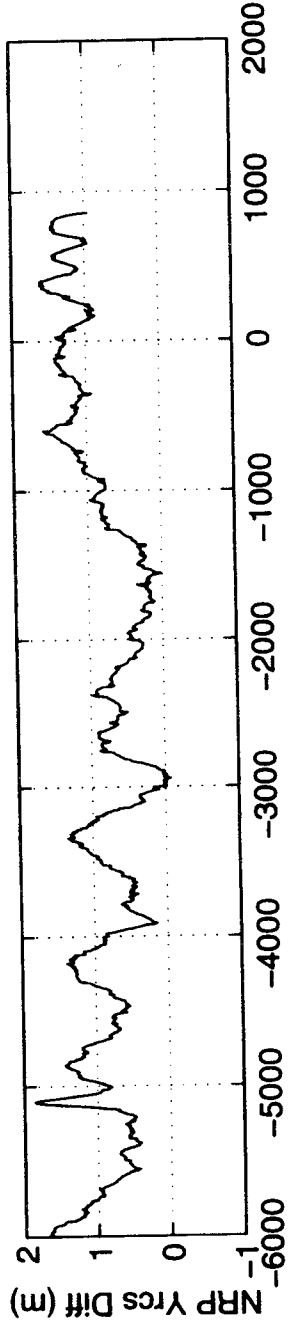
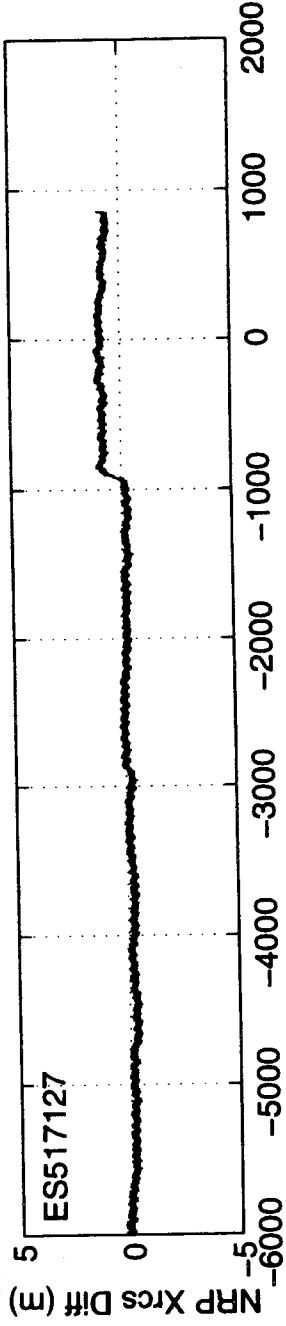
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 260.391  
LGRP Yrcs POSITION (m): -1.053





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517128  
START TIME: 248792.990  
STOP TIME: 248950.254

MINIMUM HDOP: 0.5  
MAXIMUM HDOP: 0.6  
AVERAGE HDOP: 0.6

MINIMUM VDOP: 1.1  
MAXIMUM VDOP: 1.4  
AVERAGE VDOP: 1.3

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 9  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

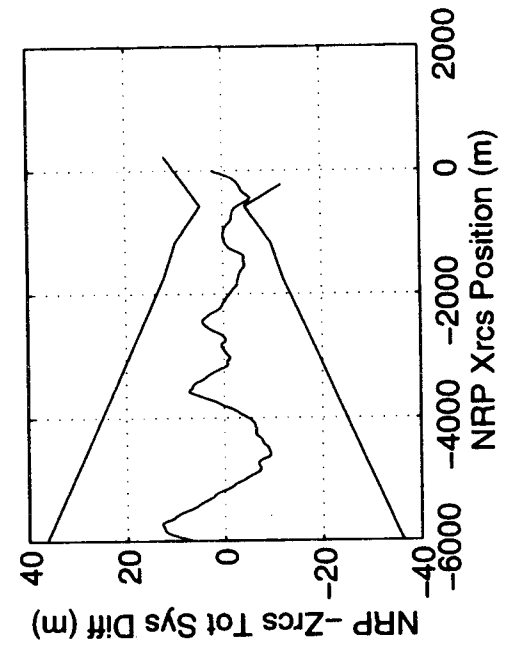
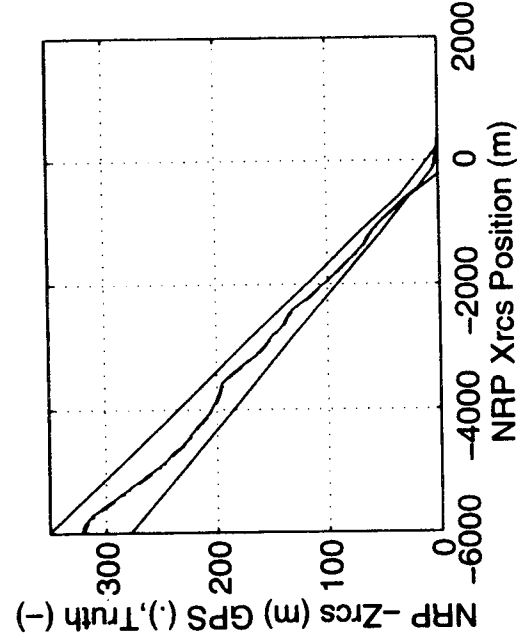
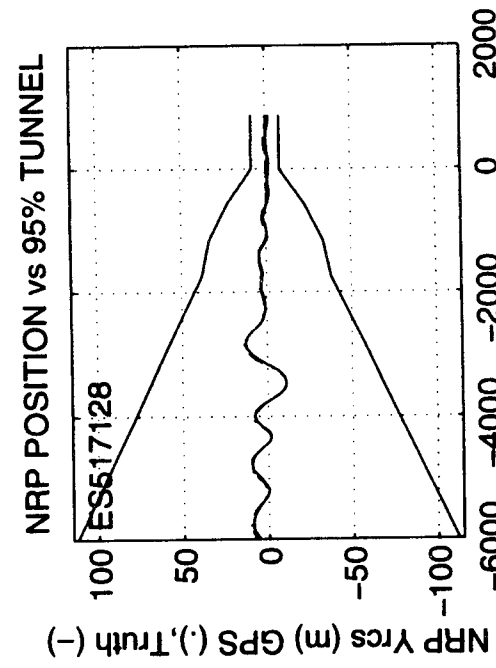
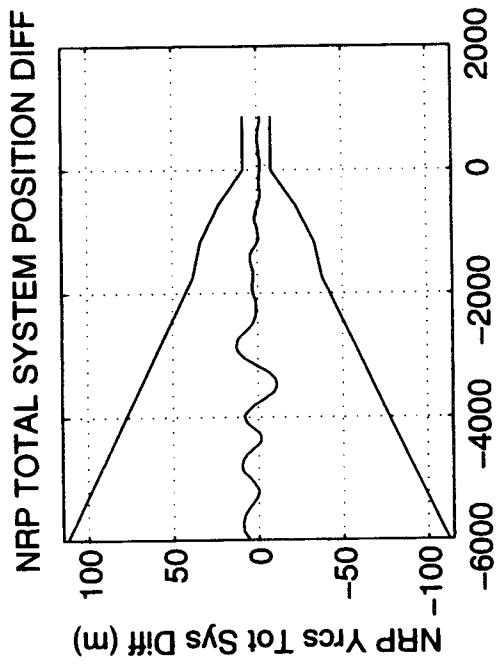
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.638  
NRP Yrcs MEAN DIFFERENCE (m): 1.084  
NRP Zrcs MEAN DIFFERENCE (m): 0.124

NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.869  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.546  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.938

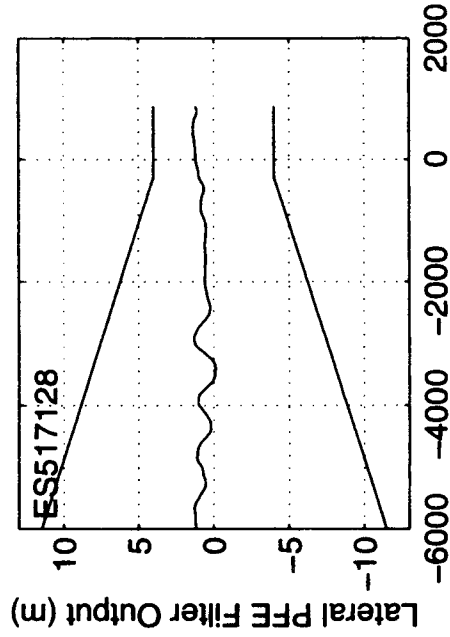
NRP Xrcs 2-RMS DIFFERENCE (m): 1.544  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.235  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.970

-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

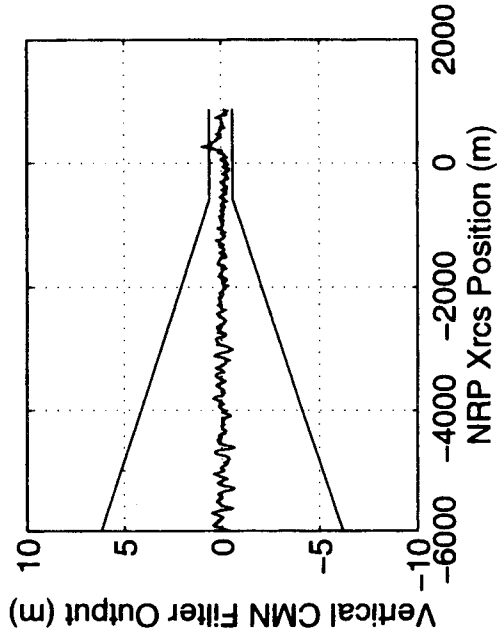
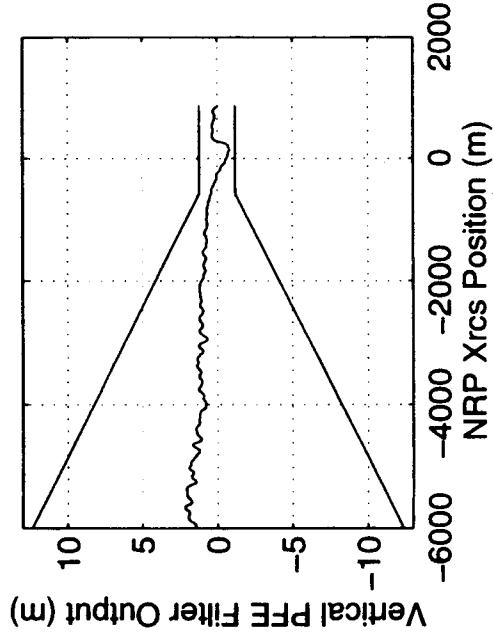
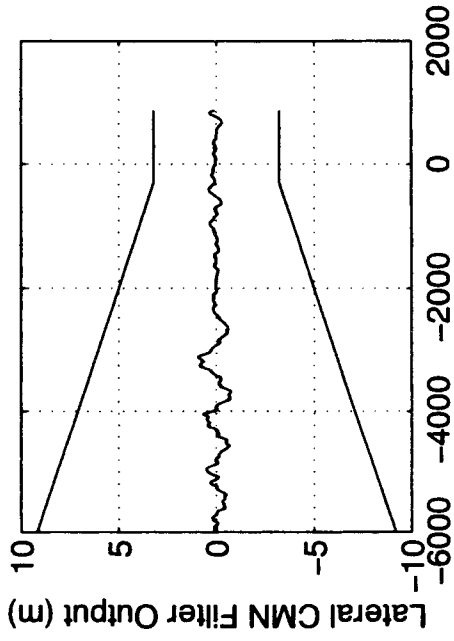
-----  
LGRP Xrcs POSITION (m): 161.936  
LGRP Yrcs POSITION (m): -1.296



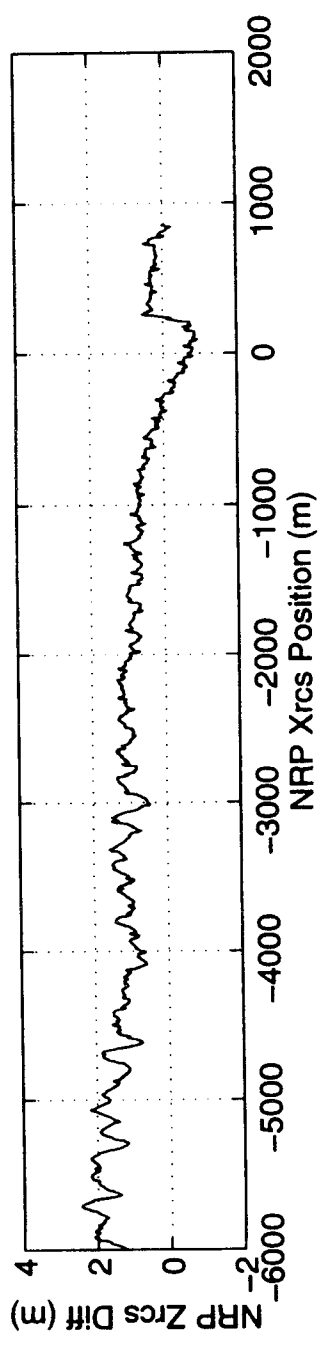
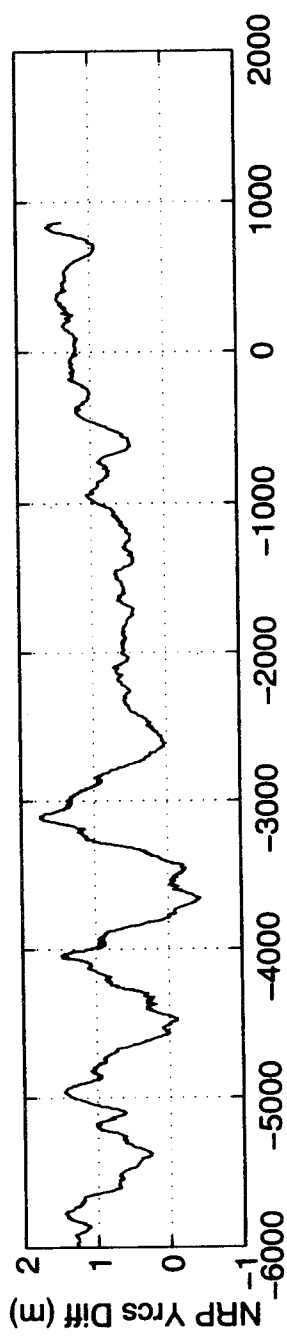
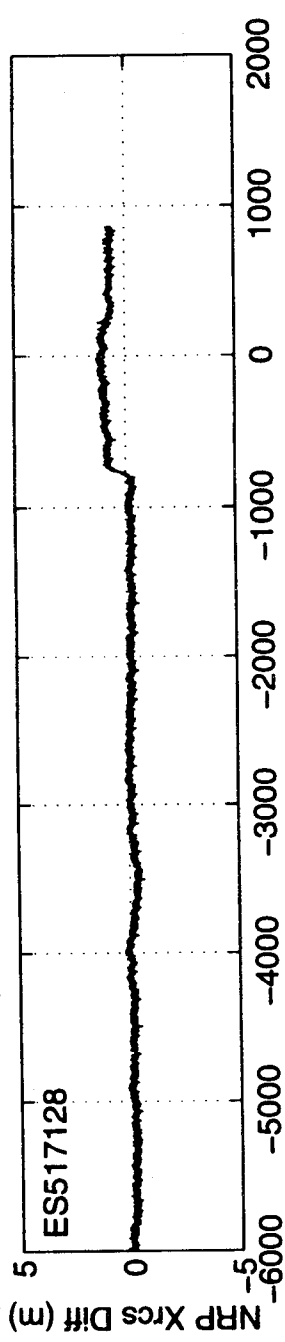
PATH FOLLOWING ERROR



CONTROL MOTION NOISE



NRP LONGITUDINAL, LATERAL AND VERTICAL POSITION DIFFERENCES





APPROACH #: ES517129  
START TIME: 249340.858  
STOP TIME: 249504.726

MINIMUM HDOP: 0.7  
MAXIMUM HDOP: 0.7  
AVERAGE HDOP: 0.7

MINIMUM VDOP: 1.6  
MAXIMUM VDOP: 1.7  
AVERAGE VDOP: 1.7

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

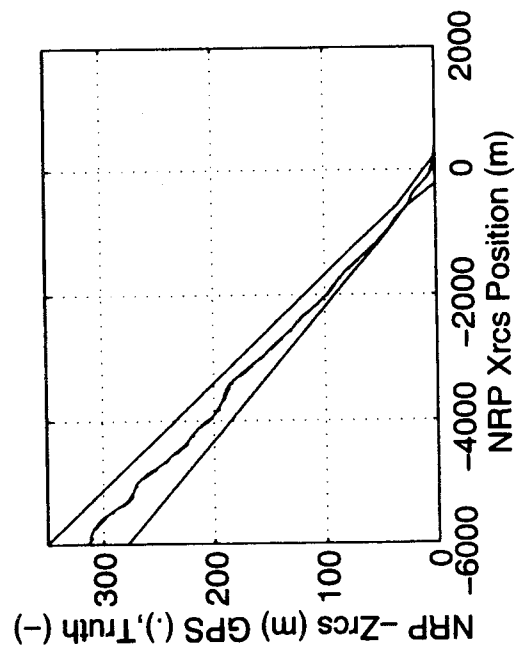
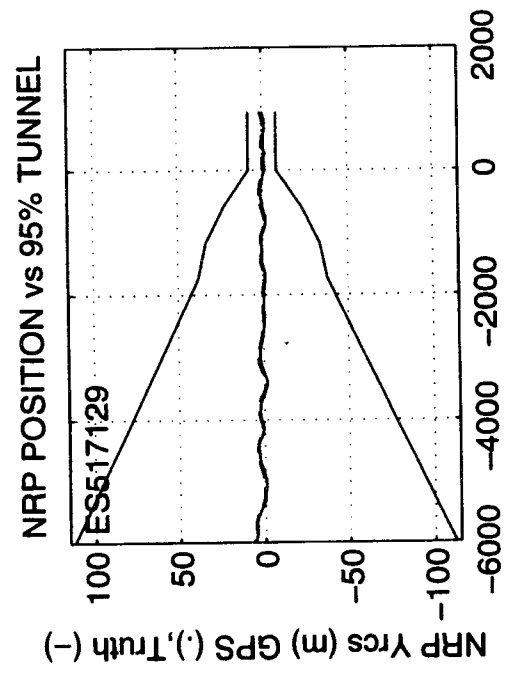
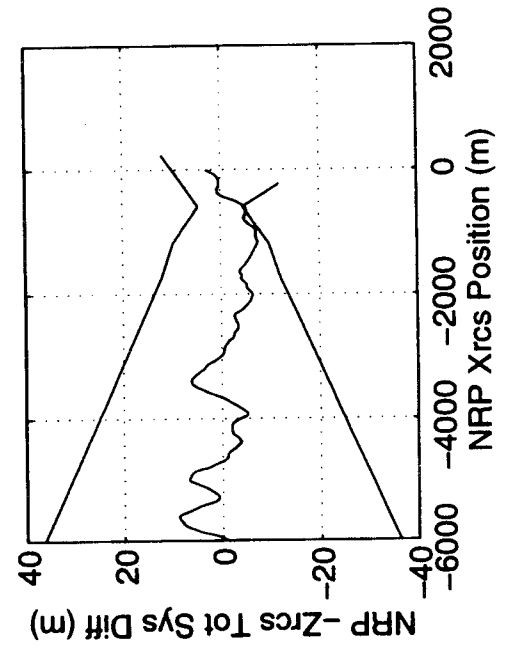
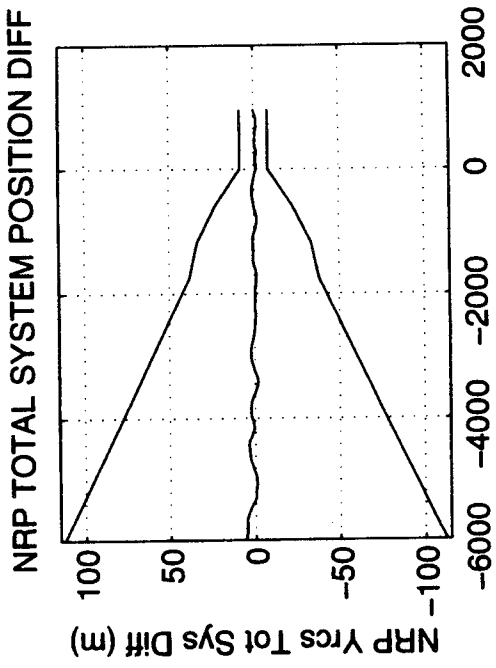
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.582  
NRP Yrcs MEAN DIFFERENCE (m): 1.116  
NRP Zrcs MEAN DIFFERENCE (m): -0.049

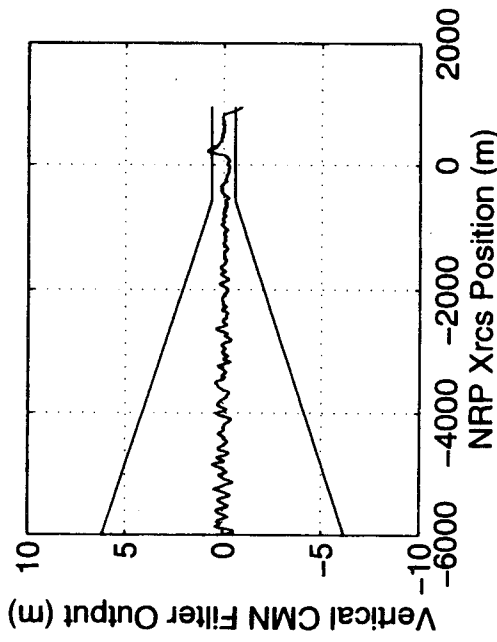
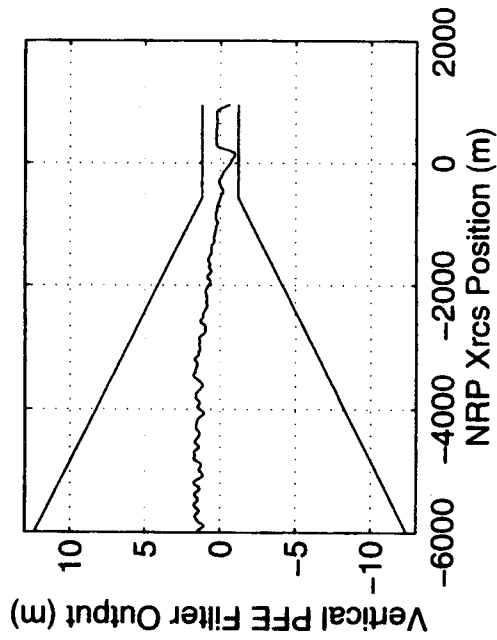
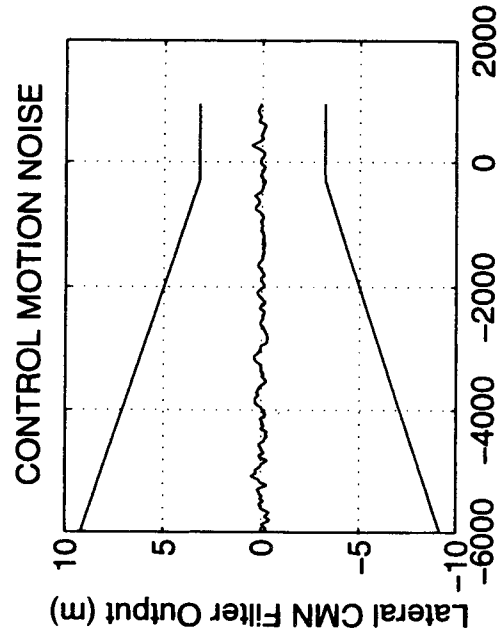
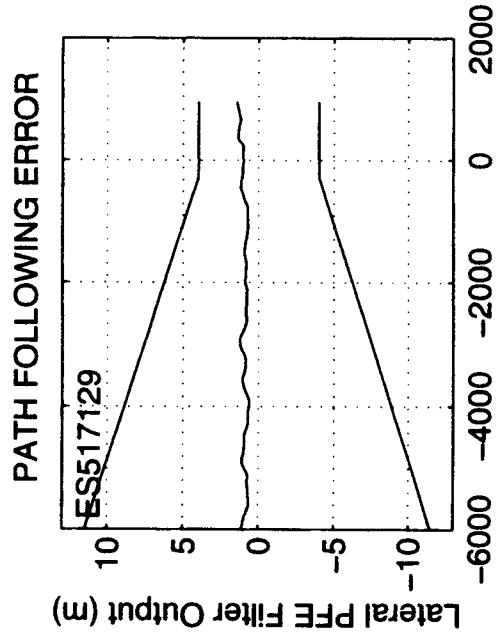
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.773  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.494  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.792

NRP Xrcs 2-RMS DIFFERENCE (m): 1.398  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.286  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.798

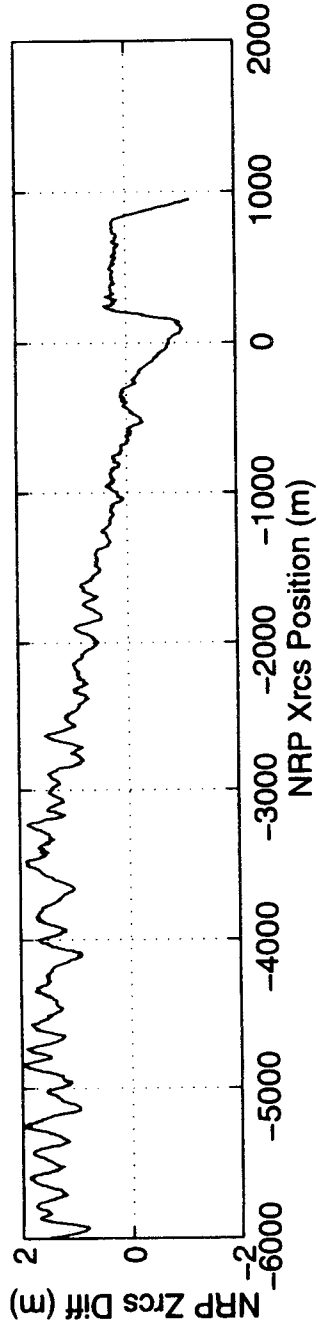
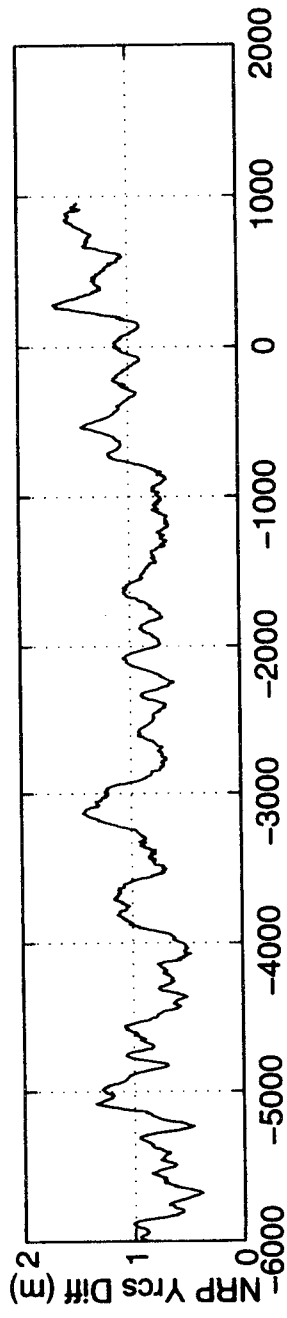
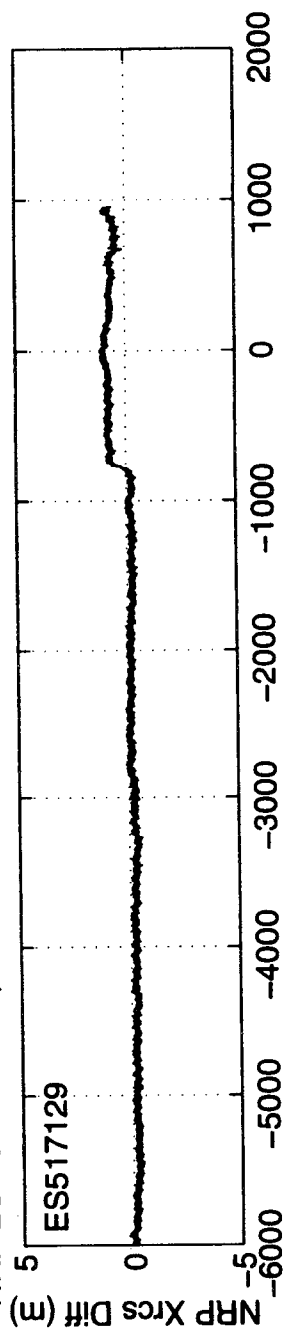
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 162.773  
LGRP Yrcs POSITION (m): -0.457





NRP LONGITUDINAL, LATERAL AND VERTICAL POSITION DIFFERENCES



APPROACH #: ES517130  
START TIME: 249861.781  
STOP TIME: 250015.264

MINIMUM HDOP: 0.7  
MAXIMUM HDOP: 0.7  
AVERAGE HDOP: 0.7

MINIMUM VDOP: 1.7  
MAXIMUM VDOP: 1.7  
AVERAGE VDOP: 1.7

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

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TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
-----

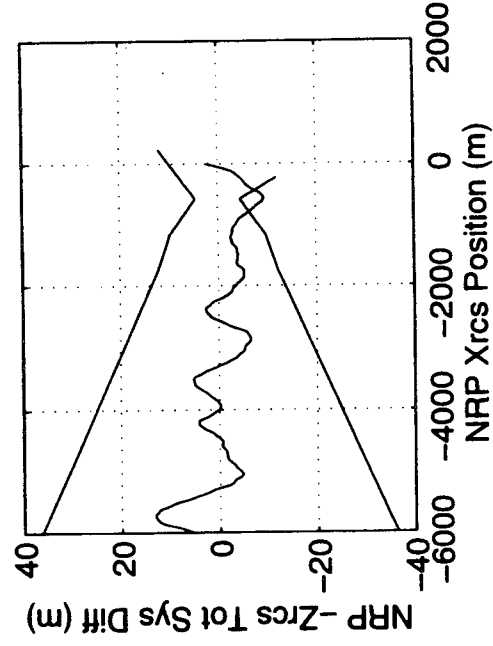
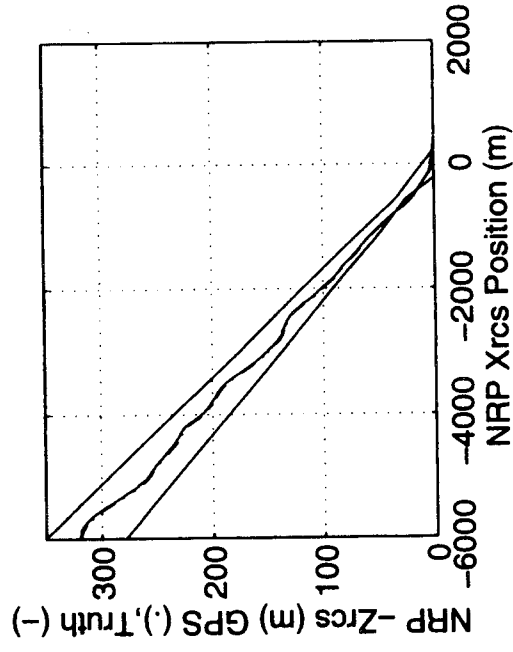
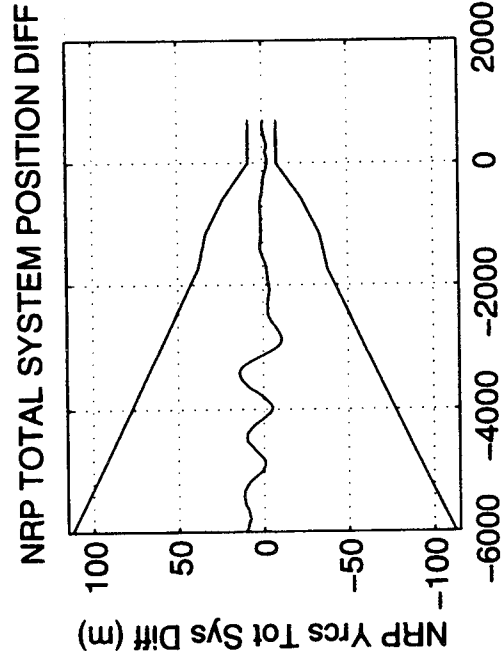
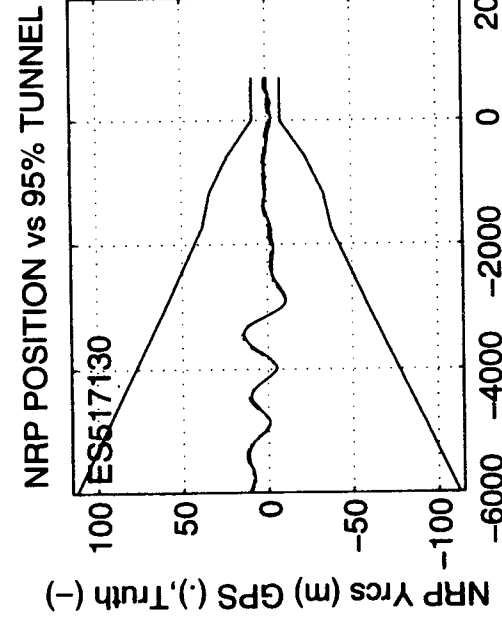
NRP Xrcs MEAN DIFFERENCE (m): 0.694  
NRP Yrcs MEAN DIFFERENCE (m): 1.120  
NRP Zrcs MEAN DIFFERENCE (m): 0.040

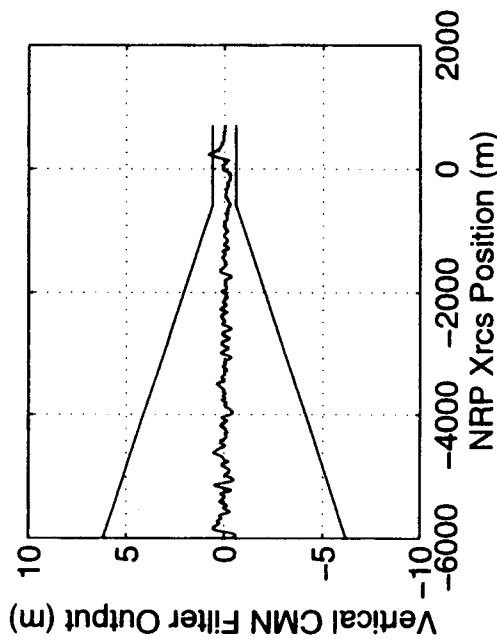
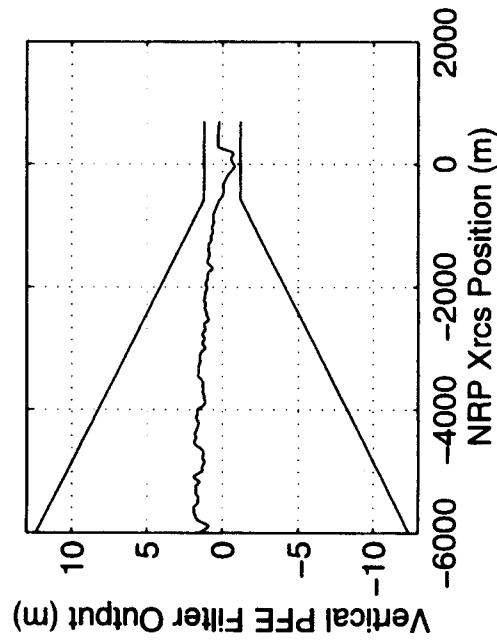
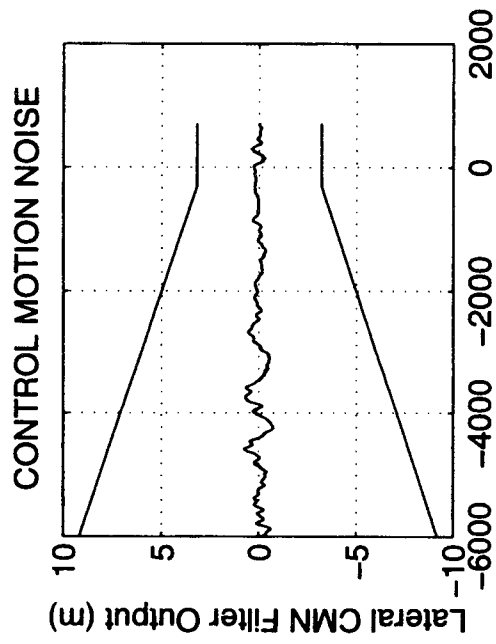
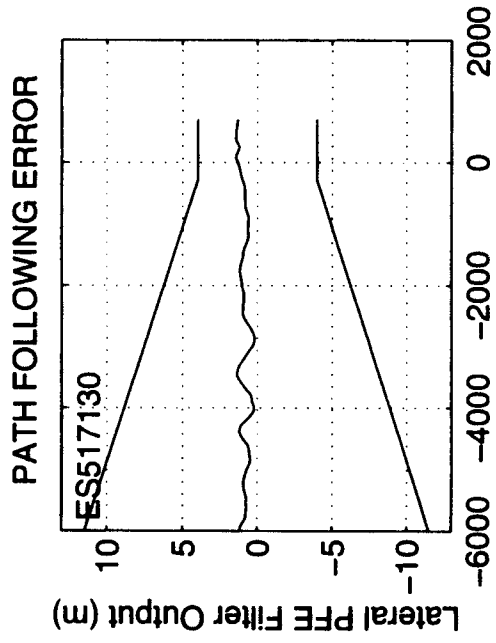
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.754  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.625  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.893

NRP Xrcs 2-RMS DIFFERENCE (m): 1.579  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.326  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.897

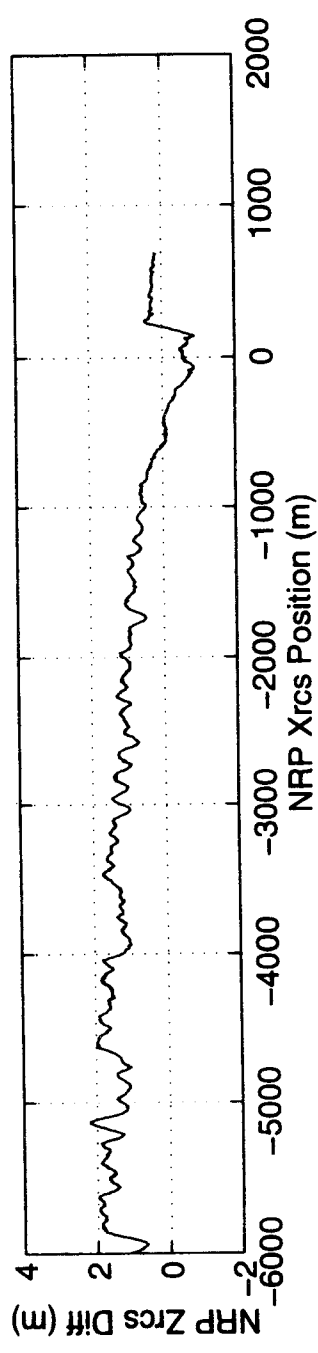
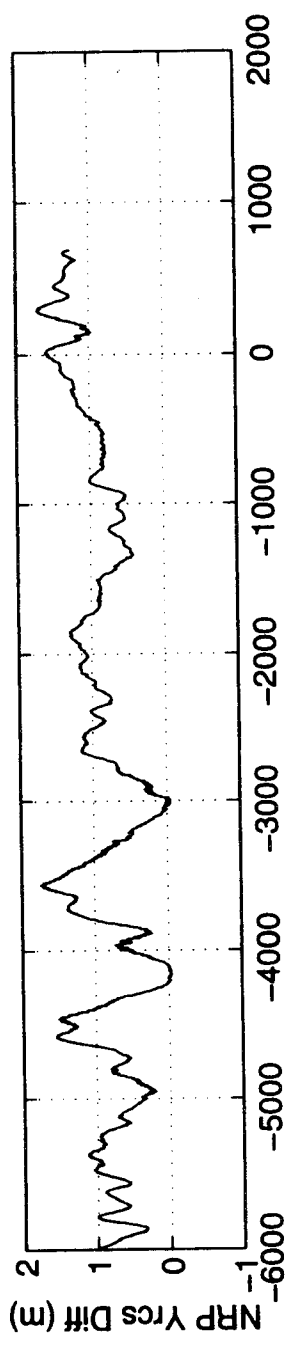
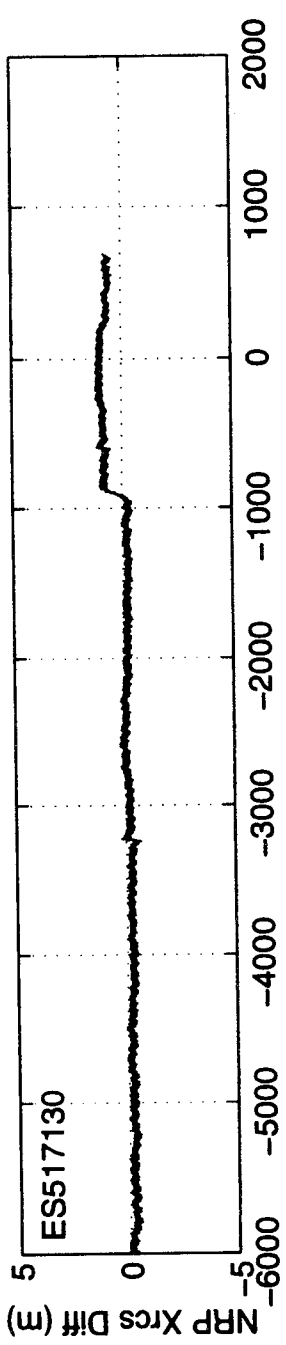
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----

LGRP Xrcs POSITION (m): 103.225  
LGRP Yrcs POSITION (m): -2.144





# NRP LONGITUDINAL, LATERAL AND VERTICAL POSITION DIFFERENCES





APPROACH #: ES517131  
START TIME: 250375.924  
STOP TIME: 250540.990

MINIMUM HDOP: 0.8  
MAXIMUM HDOP: 0.9  
AVERAGE HDOP: 0.8

MINIMUM VDOP: 1.7  
MAXIMUM VDOP: 3.1  
AVERAGE VDOP: 2.3

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

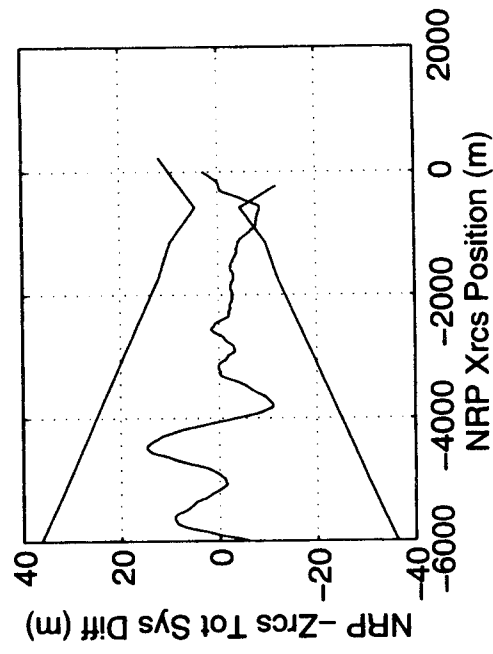
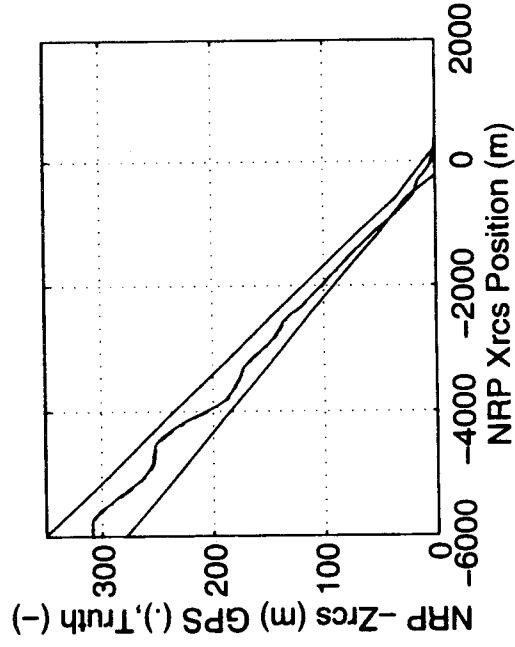
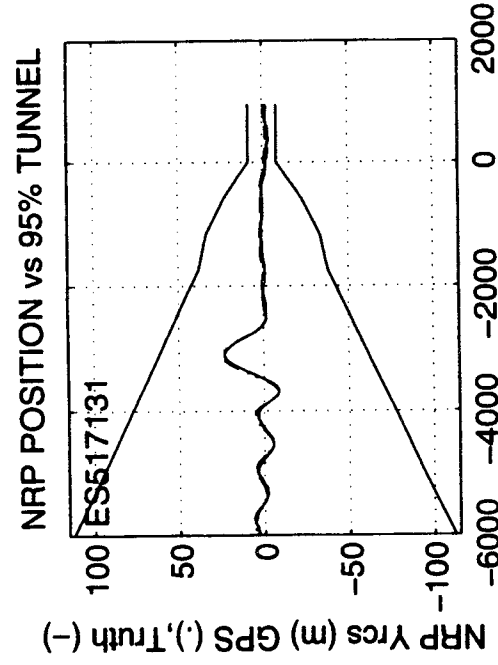
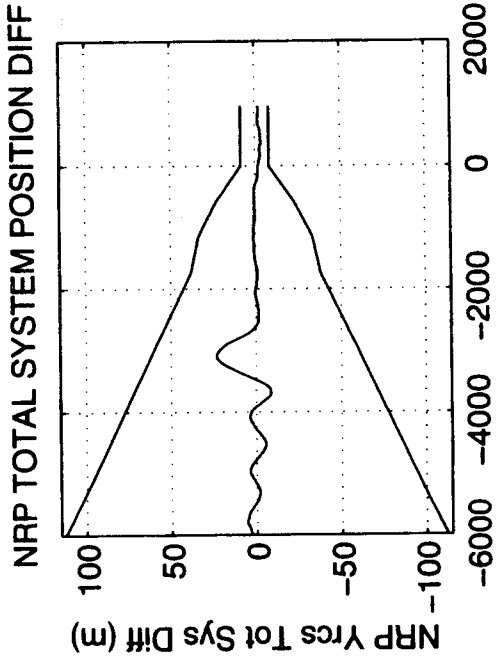
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.769  
NRP Yrcs MEAN DIFFERENCE (m): 1.124  
NRP Zrcs MEAN DIFFERENCE (m): -0.060

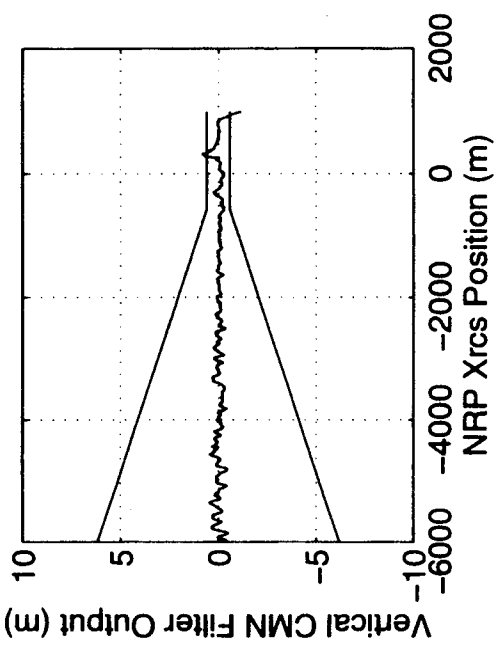
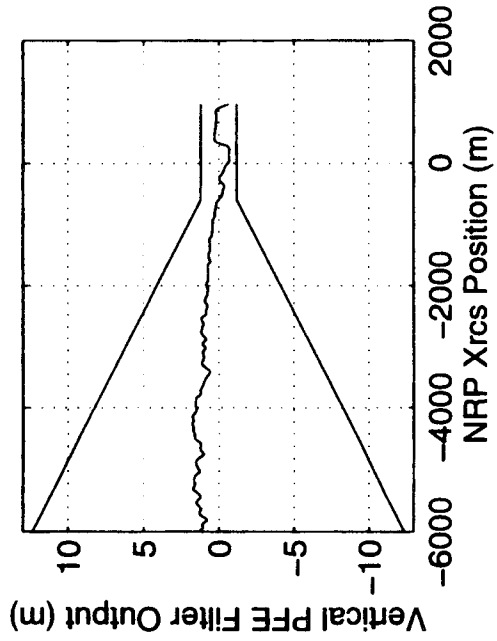
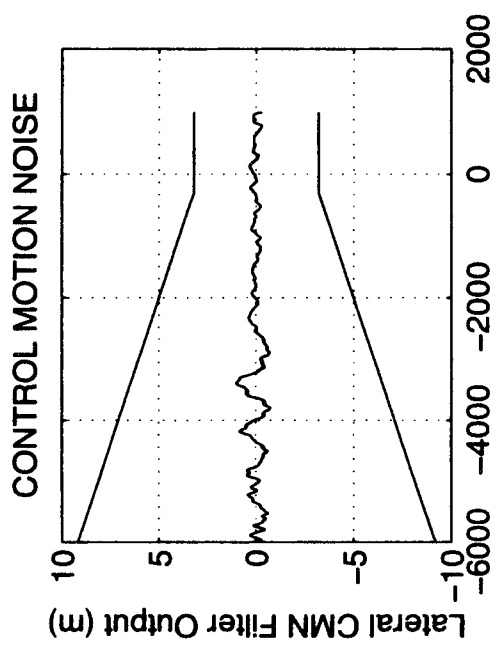
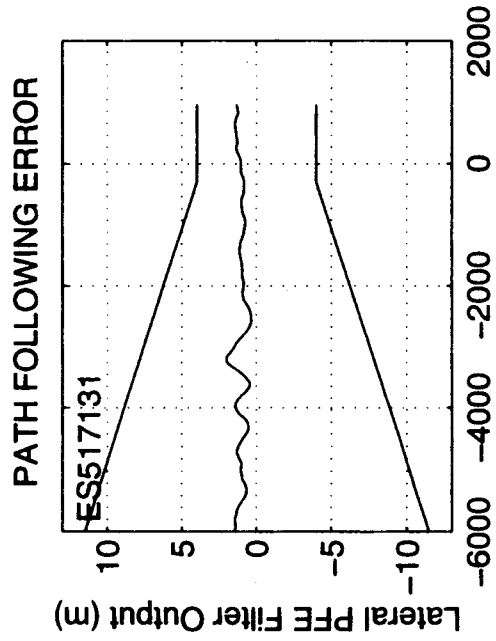
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.713  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.519  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.793

NRP Xrcs 2-RMS DIFFERENCE (m): 1.695  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.308  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.802

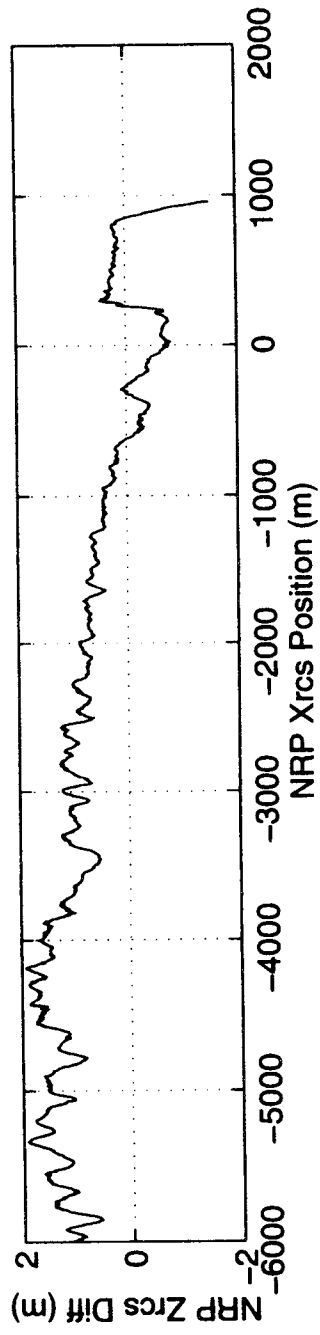
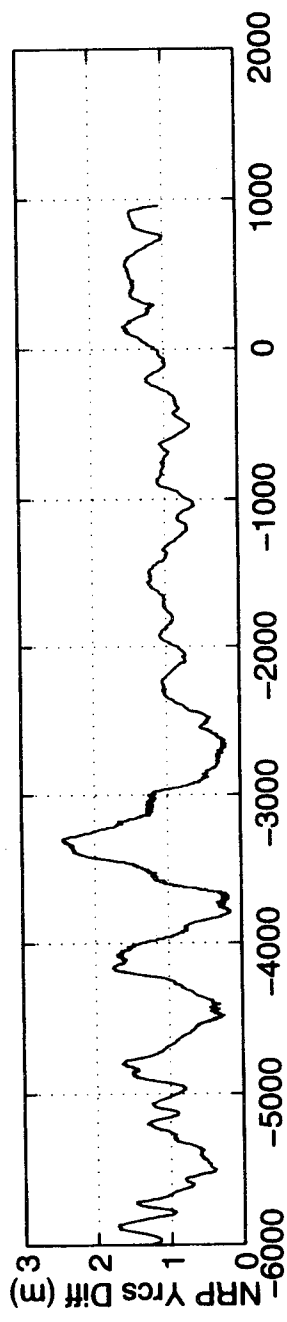
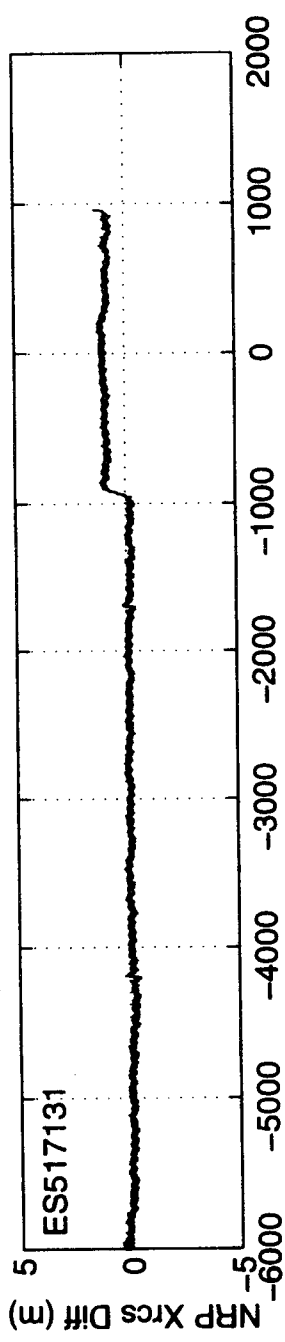
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

-----  
LGRP Xrcs POSITION (m): 199.681  
LGRP Yrcs POSITION (m): -2.640





NRP LONGITUDINAL, LATERAL AND VERTICAL POSITION DIFFERENCES



APPROACH #: ES517132  
START TIME: 250947.594  
STOP TIME: 251105.385

MINIMUM HDOP: 0.9  
MAXIMUM HDOP: 0.9  
AVERAGE HDOP: 0.9

MINIMUM VDOP: 3.0  
MAXIMUM VDOP: 3.1  
AVERAGE VDOP: 3.1

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
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\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

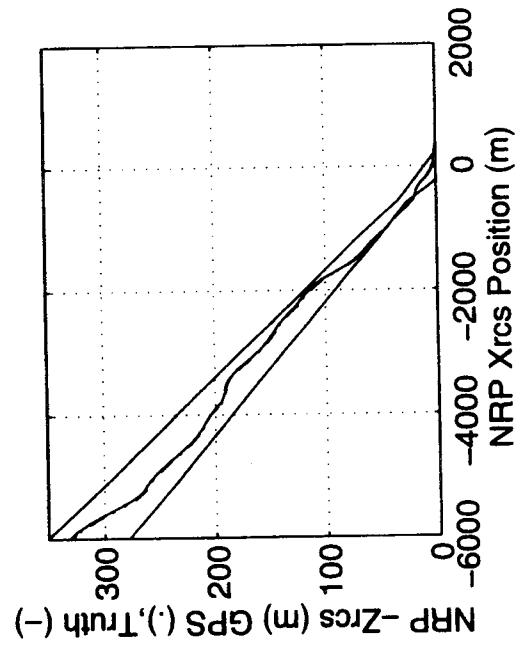
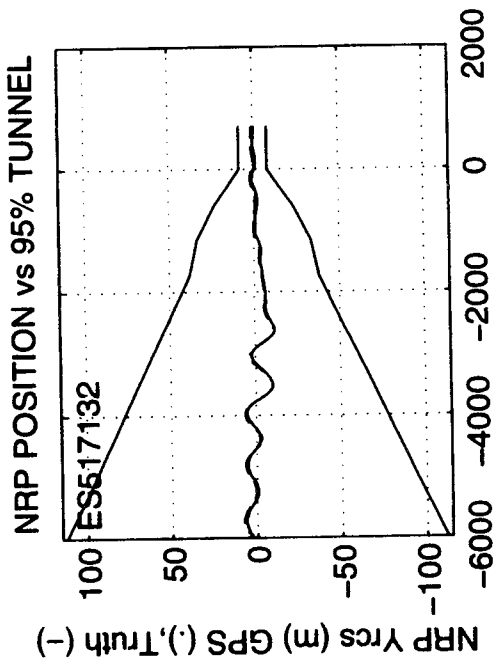
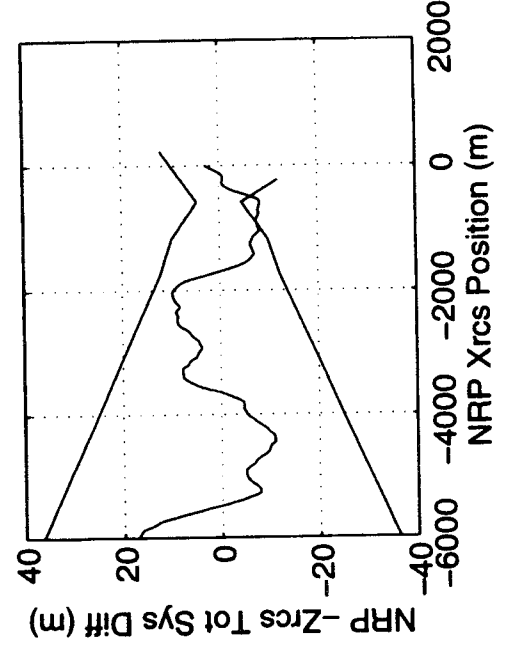
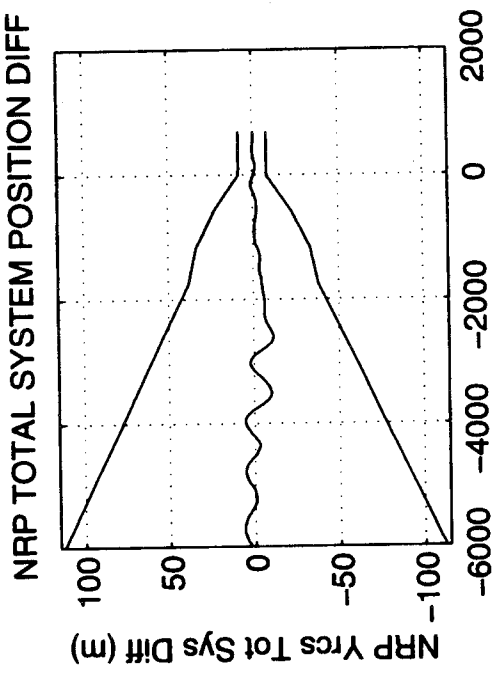
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.643  
NRP Yrcs MEAN DIFFERENCE (m): 1.118  
NRP Zrcs MEAN DIFFERENCE (m): 0.076

NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.808  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.457  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.874

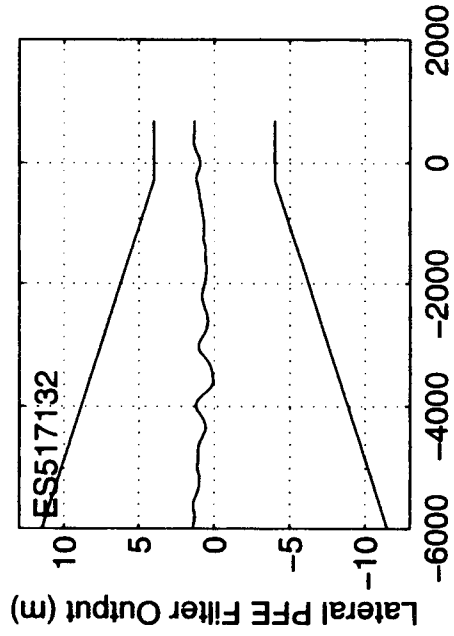
NRP Xrcs 2-RMS DIFFERENCE (m): 1.519  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.283  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.887

-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

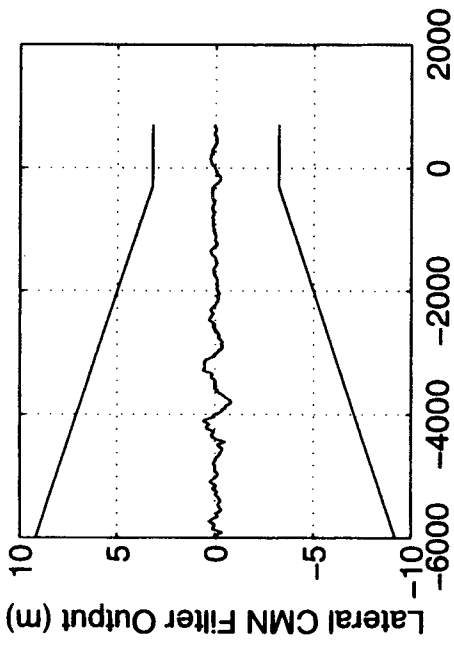
LGRP Xrcs POSITION (m): 264.429  
LGRP Yrcs POSITION (m): -0.363



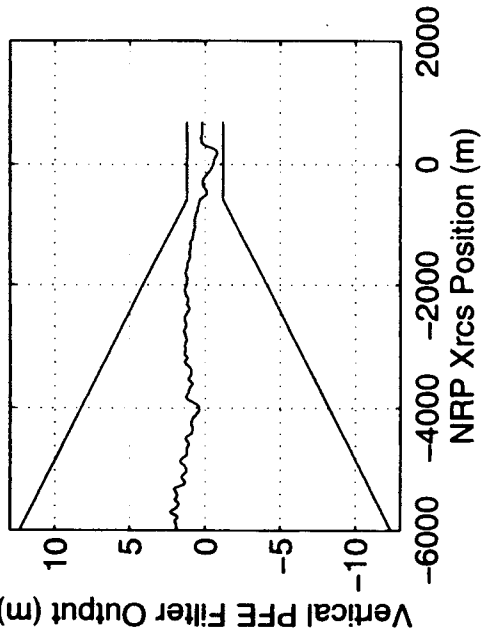
PATH FOLLOWING ERROR



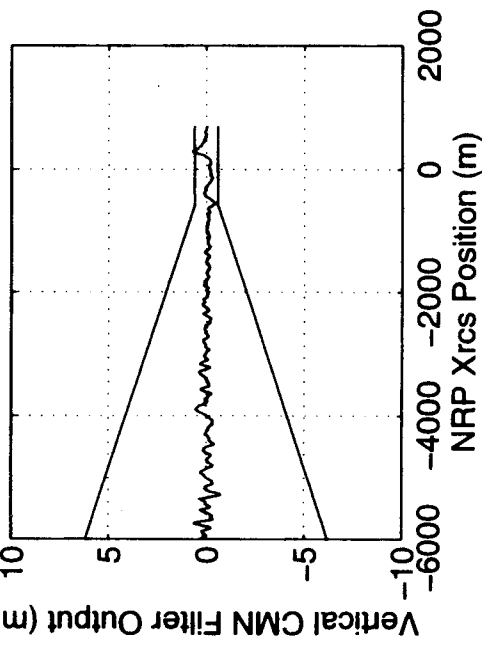
CONTROL MOTION NOISE



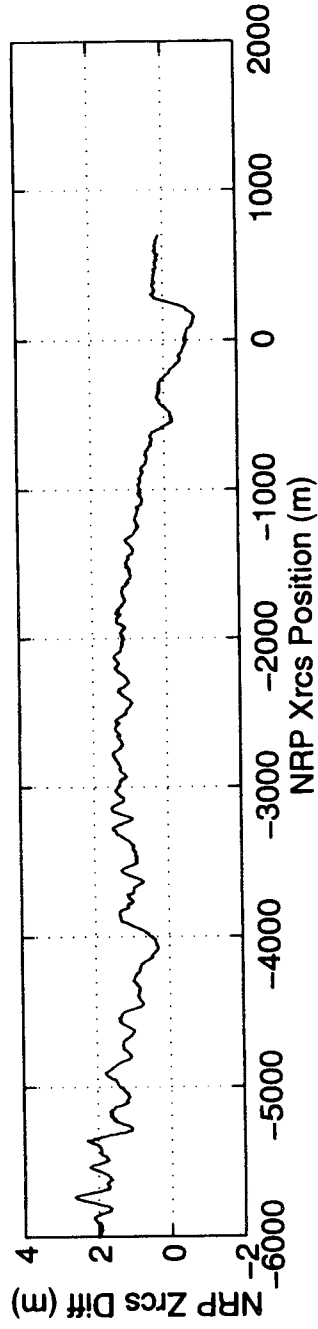
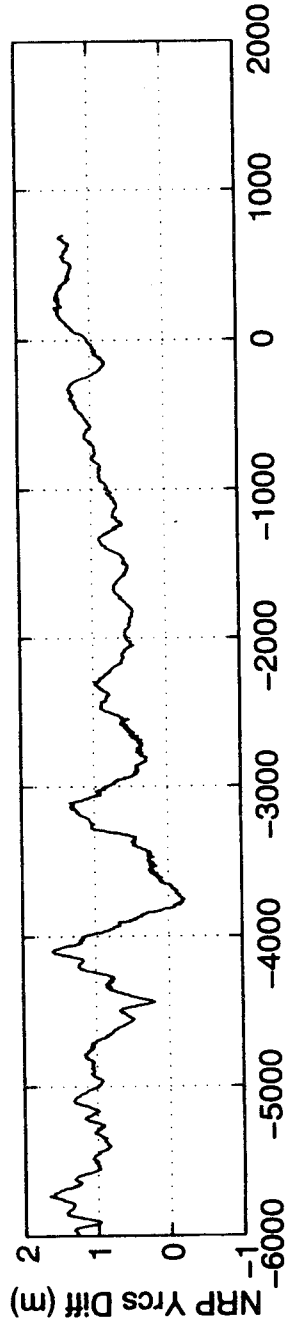
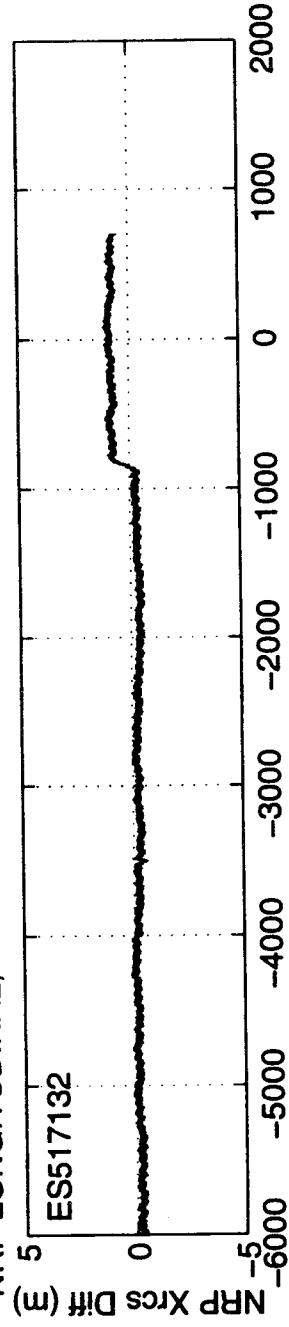
Vertical PFE Filter Output (m)



Vertical CMN Filter Output (m)



NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES





APPROACH #: ES517133  
START TIME: 251726.121  
STOP TIME: 252030.990

MINIMUM HDOP: 0.9  
MAXIMUM HDOP: 0.9  
AVERAGE HDOP: 0.9

MINIMUM VDOP: 2.7  
MAXIMUM VDOP: 2.9  
AVERAGE VDOP: 2.8

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID STATIC TRIAL \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL STATIC TRIAL \*  
\*\*\*\*\*

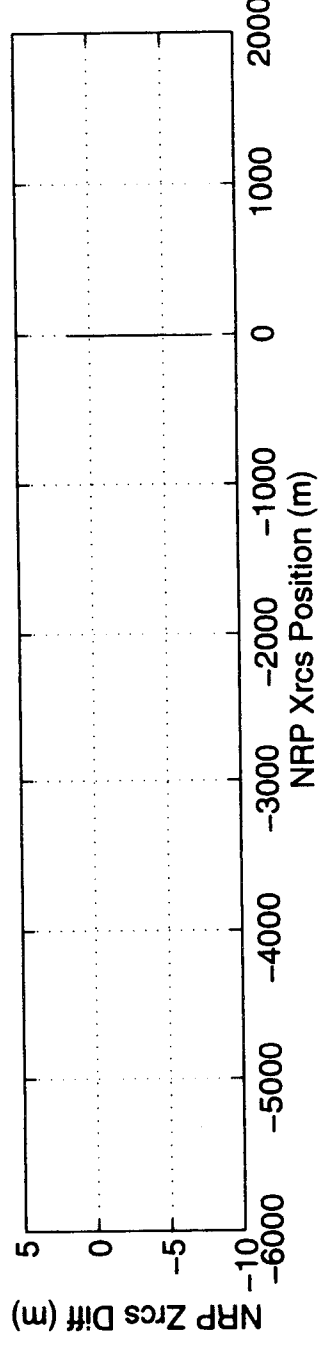
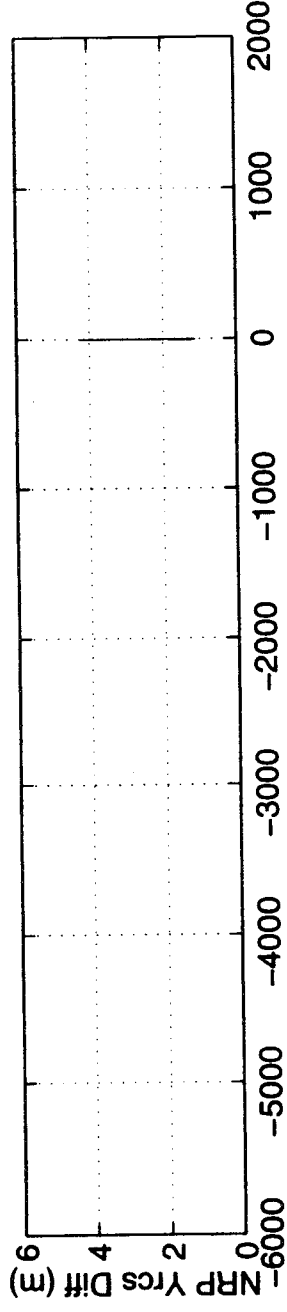
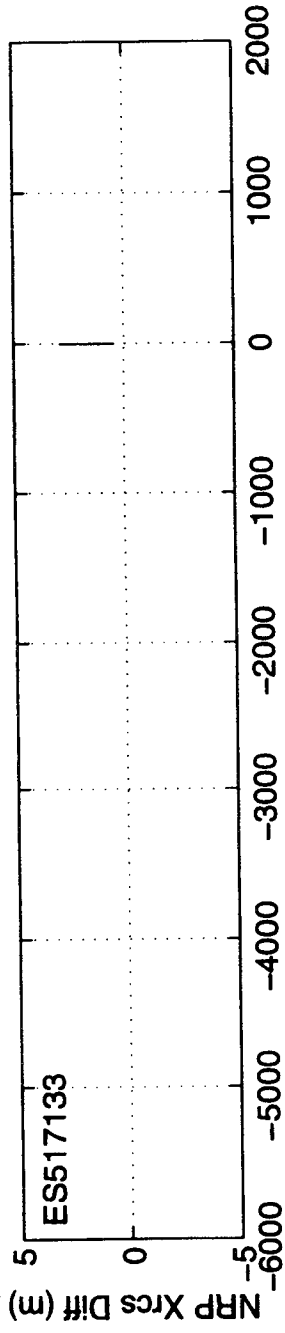
TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

-----  
NRP Xrcs MEAN DIFFERENCE (m): 1.127  
NRP Yrcs MEAN DIFFERENCE (m): 1.908  
NRP Zrcs MEAN DIFFERENCE (m): -1.507

NRP Xrcs 2-SIGMA DIFFERENCE (m): 1.403  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 1.856  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 5.330

NRP Xrcs 2-RMS DIFFERENCE (m): 2.654  
NRP Yrcs 2-RMS DIFFERENCE (m): 4.244  
NRP Zrcs 2-RMS DIFFERENCE (m): 6.123

NRP LONGITUDINAL, LATERAL AND VERTICAL POSITION DIFFERENCES



APPROACH #: ES517202  
START TIME: 328318.264  
STOP TIME: 328473.264

MINIMUM HDOP: 0.8  
MAXIMUM HDOP: 1.0  
AVERAGE HDOP: 0.9

MINIMUM VDOP: 1.5  
MAXIMUM VDOP: 2.7  
AVERAGE VDOP: 1.9

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

-----  
TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
-----

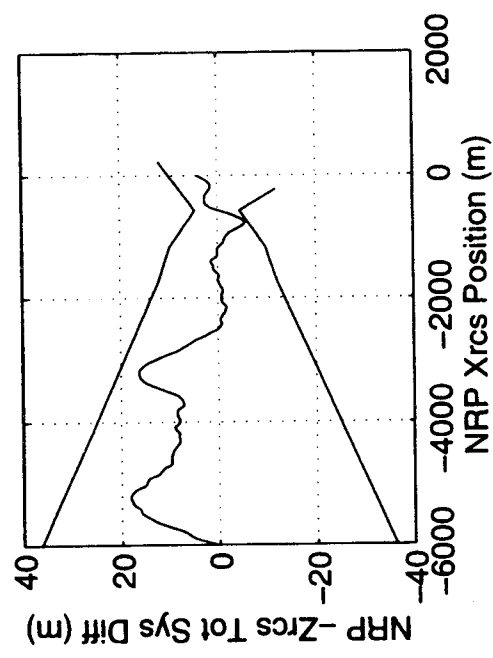
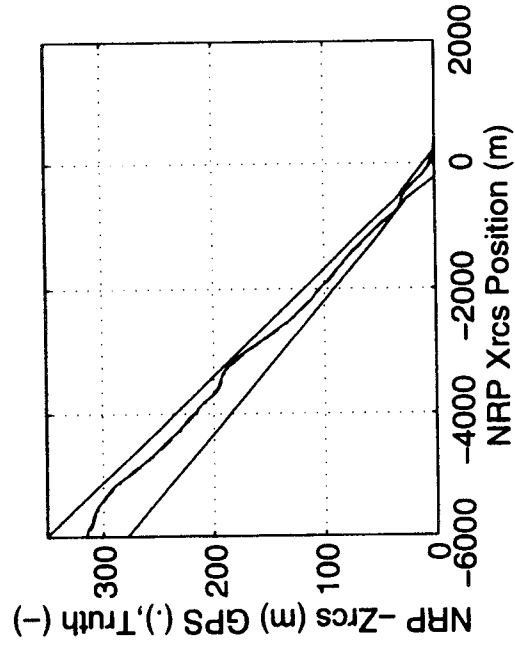
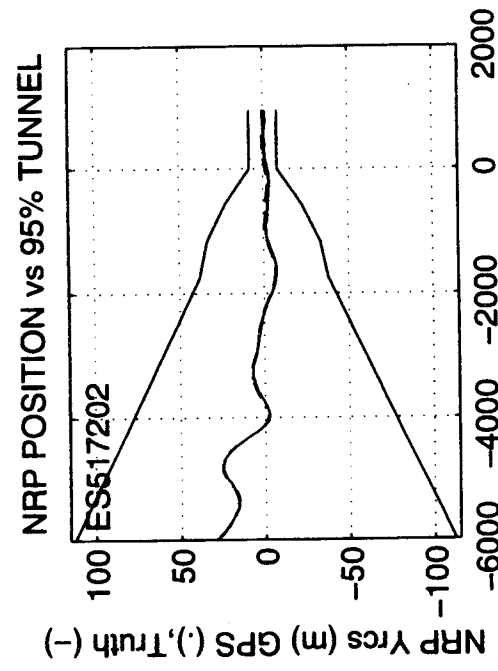
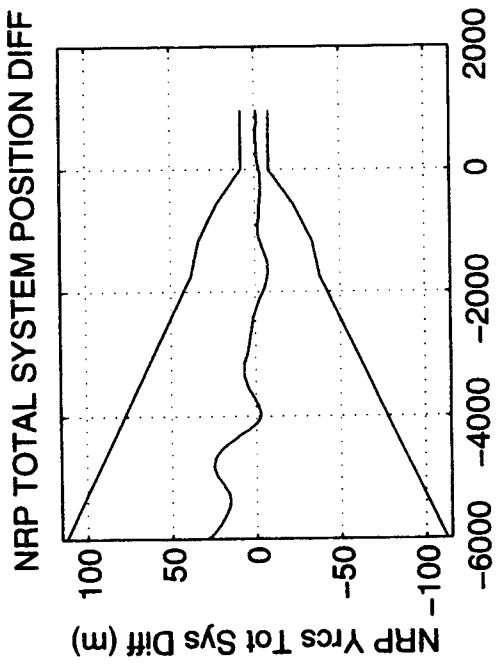
NRP Xrcs MEAN DIFFERENCE (m): 0.715  
NRP Yrcs MEAN DIFFERENCE (m): 1.162  
NRP Zrcs MEAN DIFFERENCE (m): 0.006

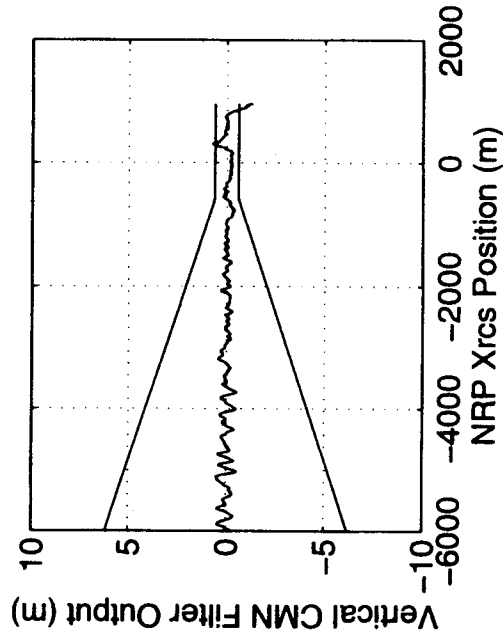
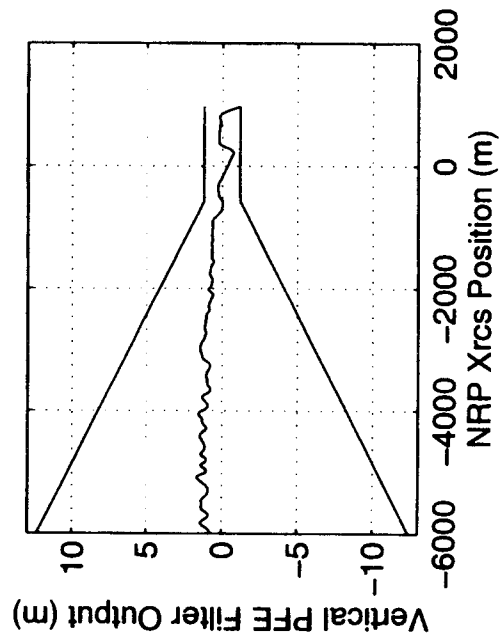
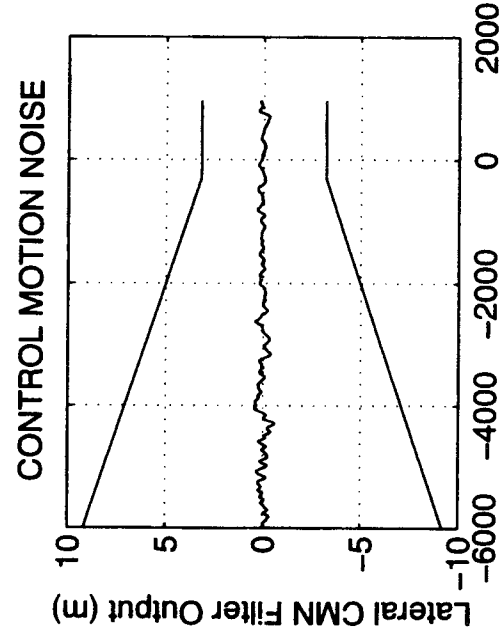
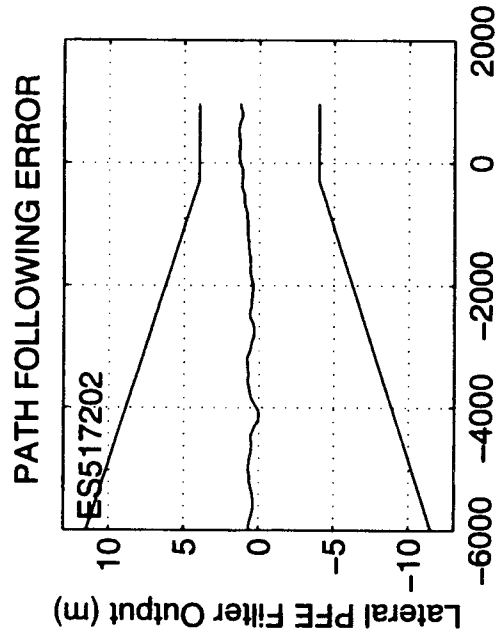
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.851  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.431  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.914

NRP Xrcs 2-RMS DIFFERENCE (m): 1.664  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.364  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.915

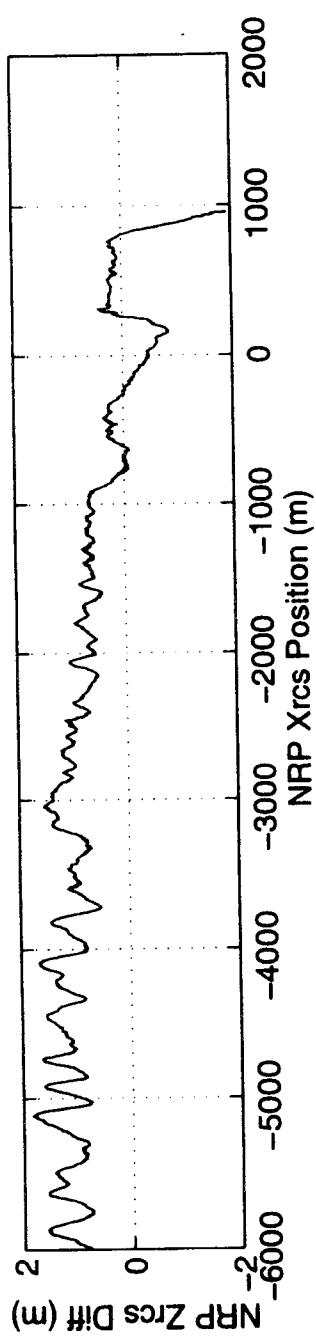
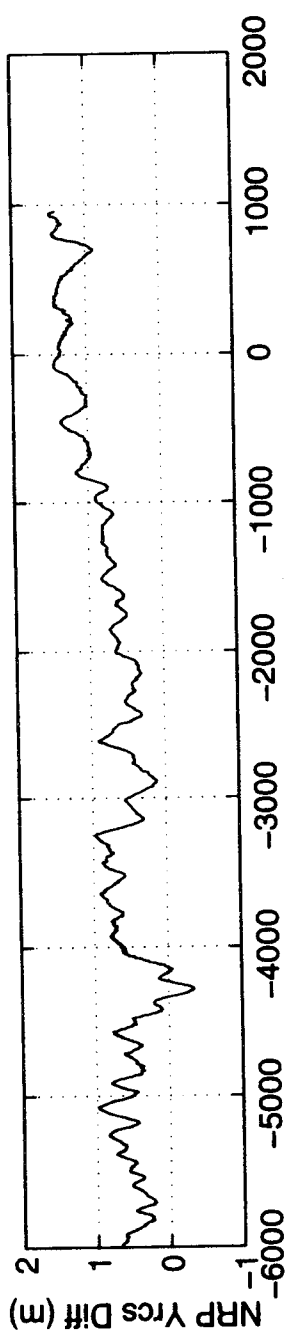
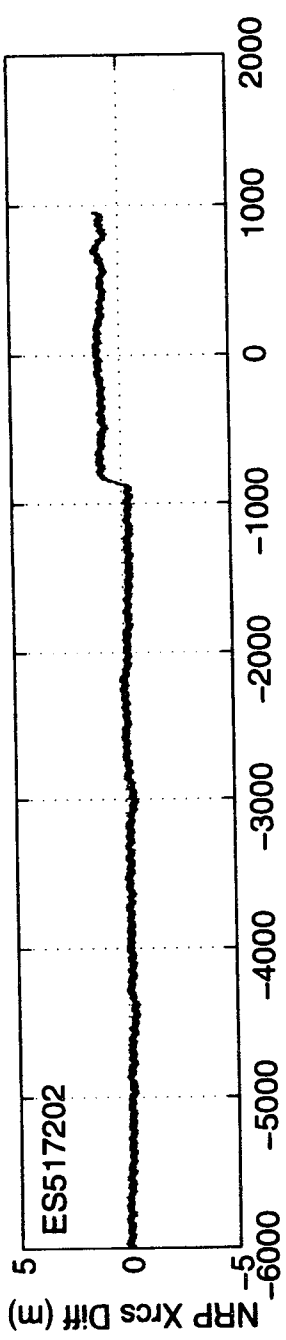
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----

LGRP Xrcs POSITION (m): 209.604  
LGRP Yrcs POSITION (m): -0.789





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517203  
START TIME: 329357.594  
STOP TIME: 329512.858

MINIMUM HDOP: 0.5  
MAXIMUM HDOP: 0.5  
AVERAGE HDOP: 0.5

MINIMUM VDOP: 1.2  
MAXIMUM VDOP: 1.2  
AVERAGE VDOP: 1.2

MINIMUM NUMBER OF SVs: 9  
MAXIMUM NUMBER OF SVs: 9  
AVERAGE NUMBER OF SVs: 9

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

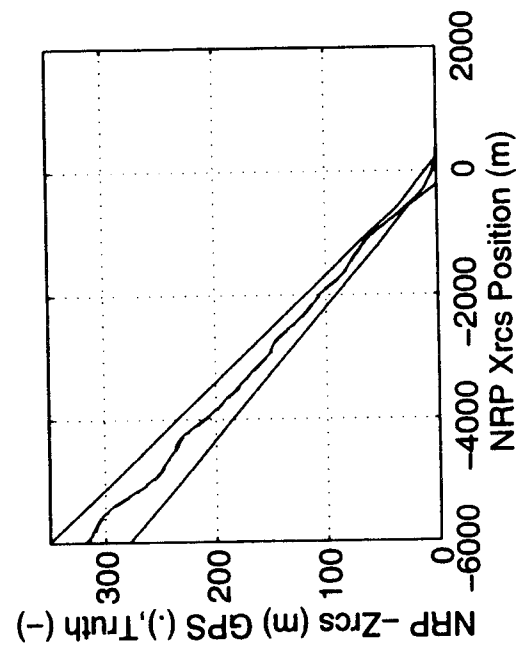
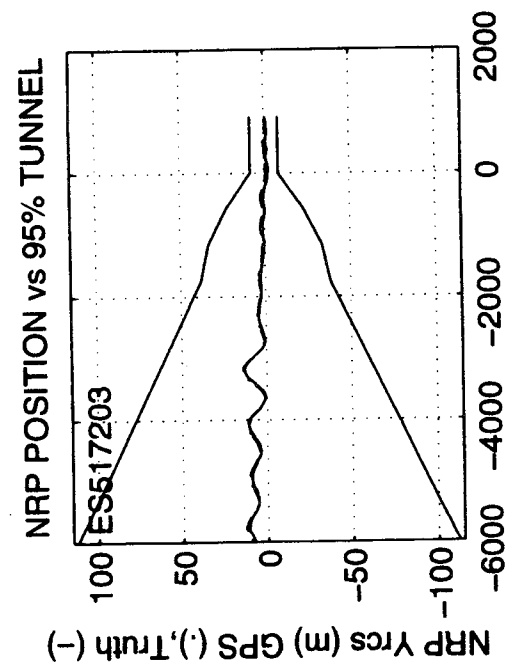
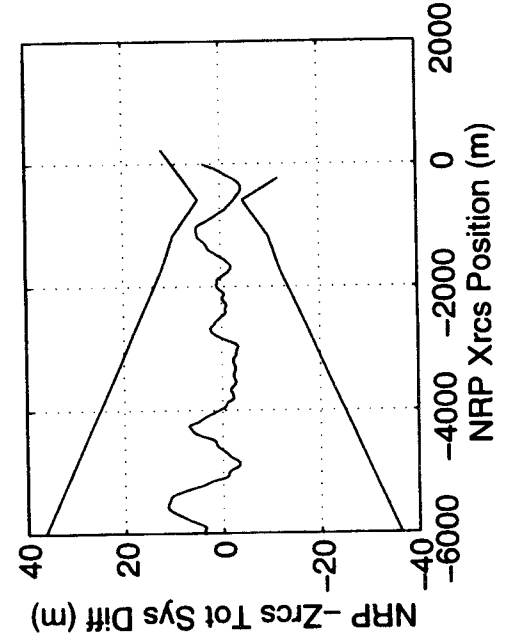
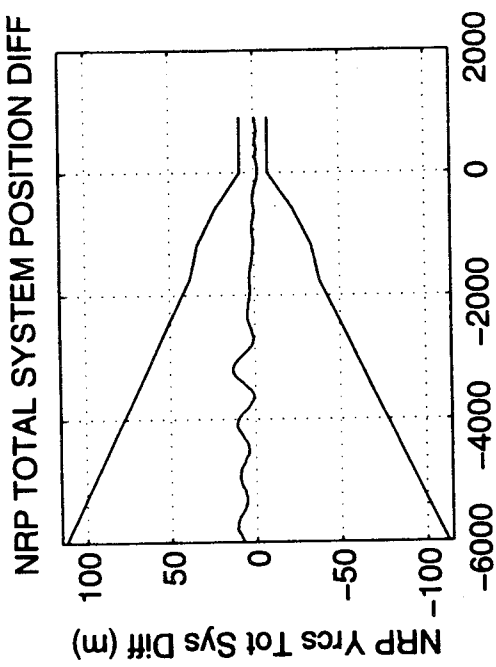
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.674  
NRP Yrcs MEAN DIFFERENCE (m): 1.176  
NRP Zrcs MEAN DIFFERENCE (m): 0.165

NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.873  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.558  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.805

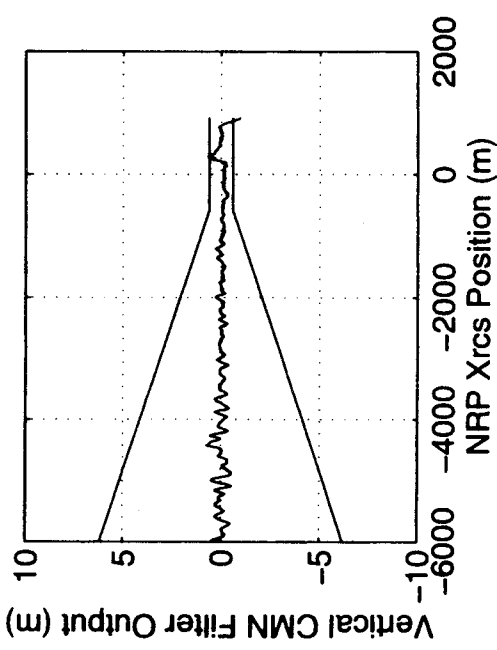
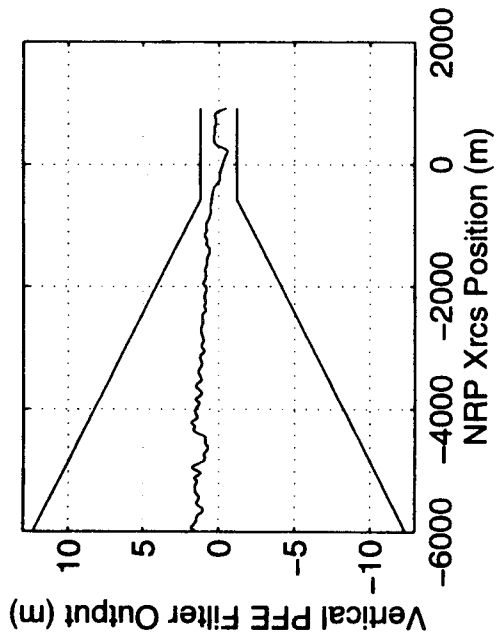
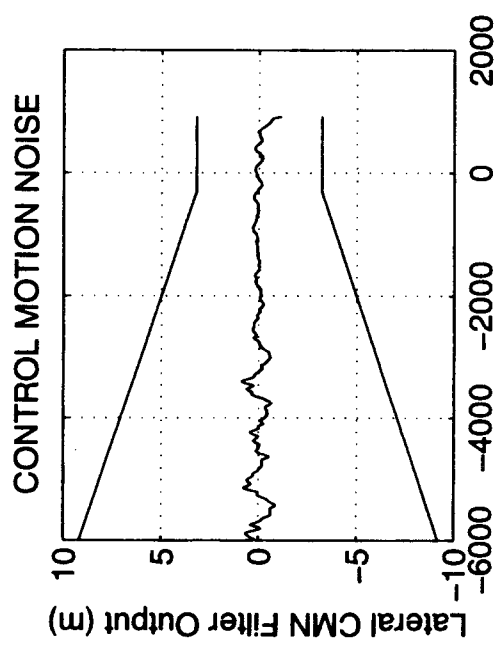
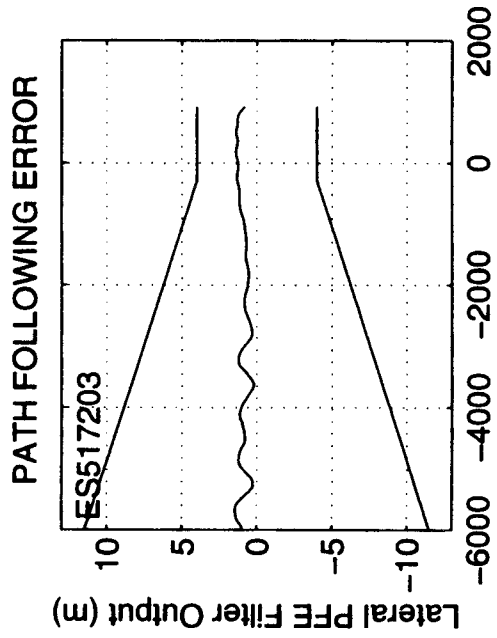
NRP Xrcs 2-RMS DIFFERENCE (m): 1.605  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.417  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.871

-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

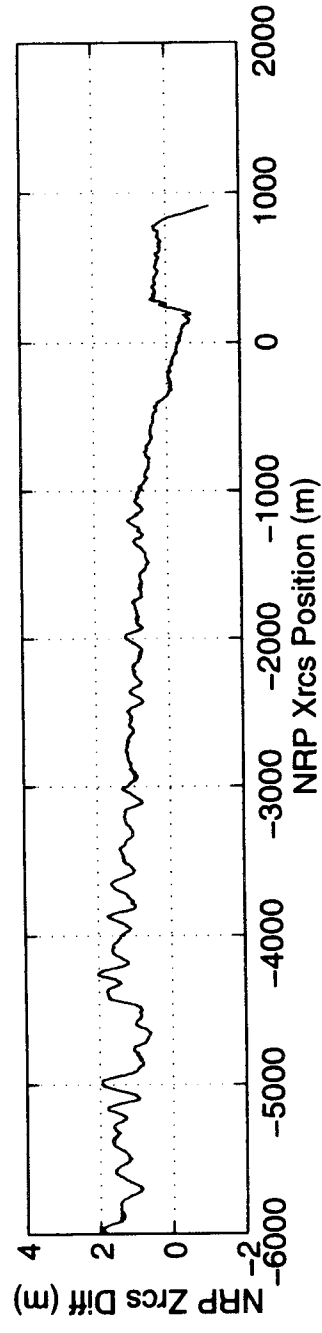
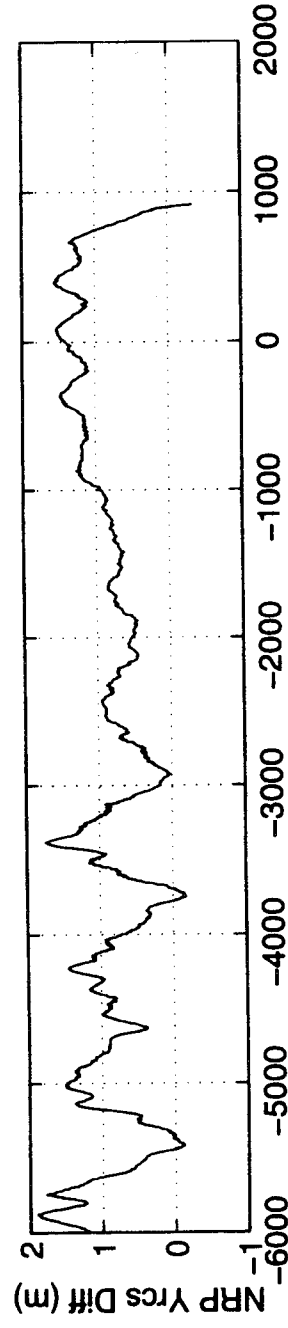
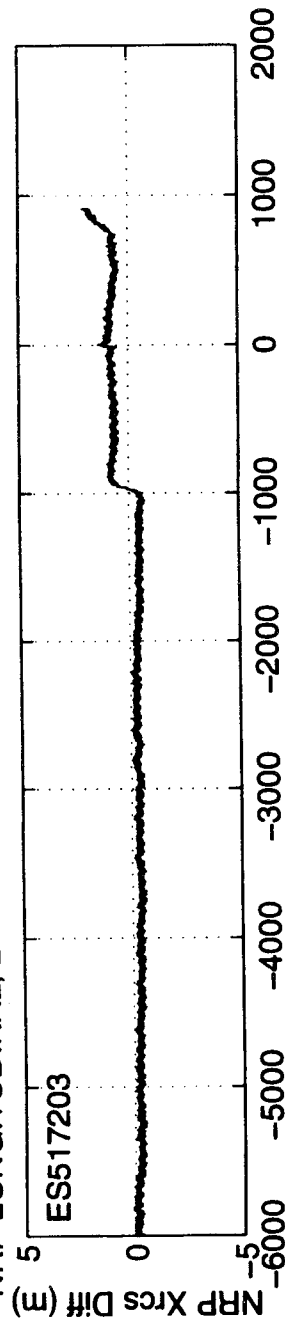
LGRP Xrcs POSITION (m): 226.388  
LGRP Yrcs POSITION (m): -0.789







NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517205  
START TIME: 330402.792  
STOP TIME: 330558.045

MINIMUM HDOP: 0.8  
MAXIMUM HDOP: 0.9  
AVERAGE HDOP: 0.9

MINIMUM VDOP: 2.7  
MAXIMUM VDOP: 2.9  
AVERAGE VDOP: 2.8

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
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\*\*\*\*\*  
\* VALID APPROACH \*  
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\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

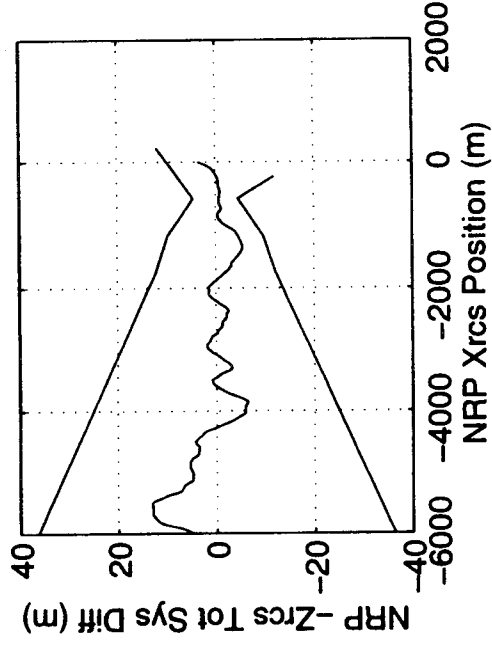
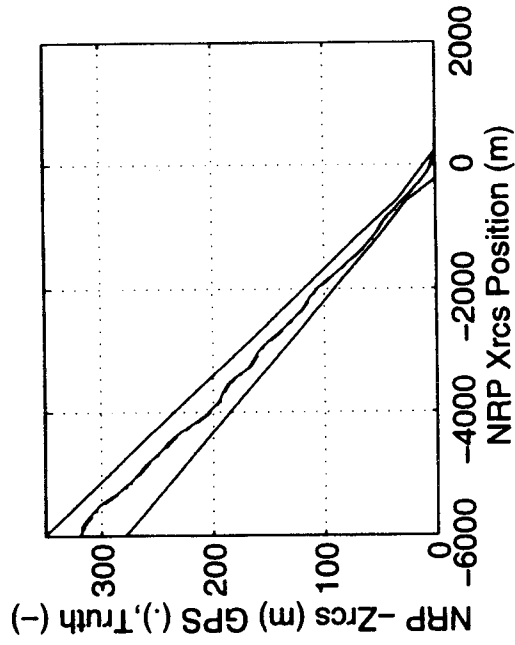
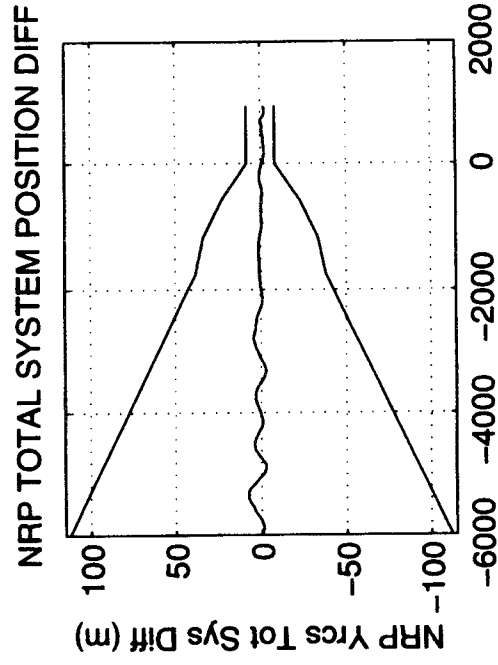
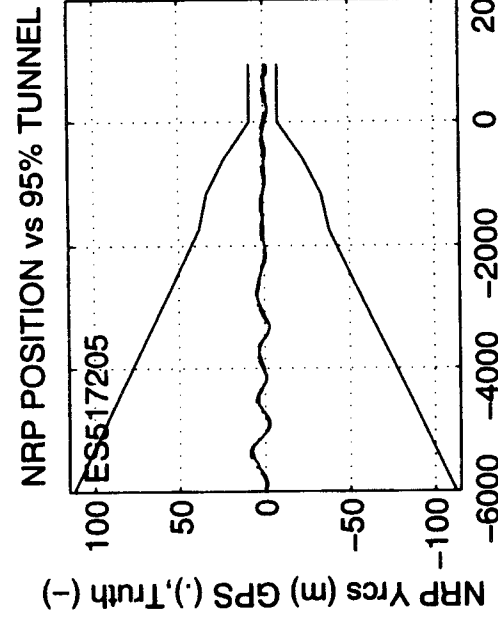
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.656  
NRP Yrcs MEAN DIFFERENCE (m): 1.180  
NRP Zrcs MEAN DIFFERENCE (m): 0.100

NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.867  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.614  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.820

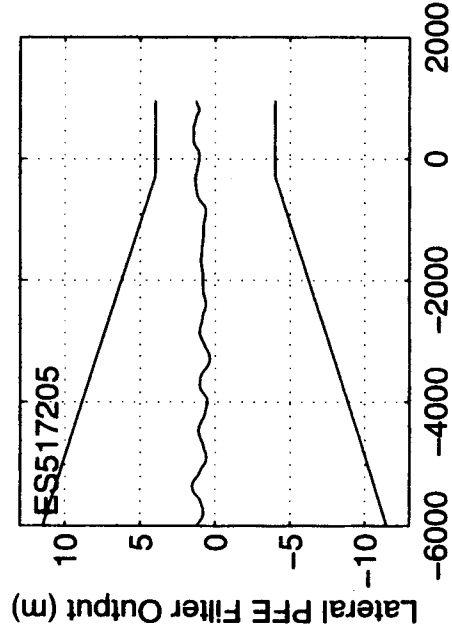
NRP Xrcs 2-RMS DIFFERENCE (m): 1.573  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.438  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.844

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LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

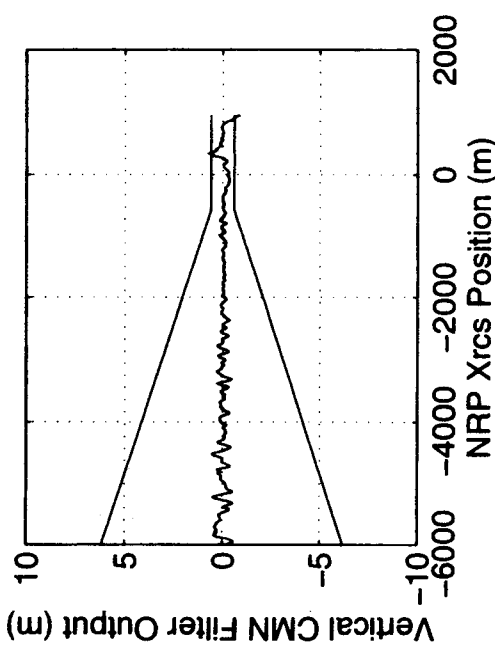
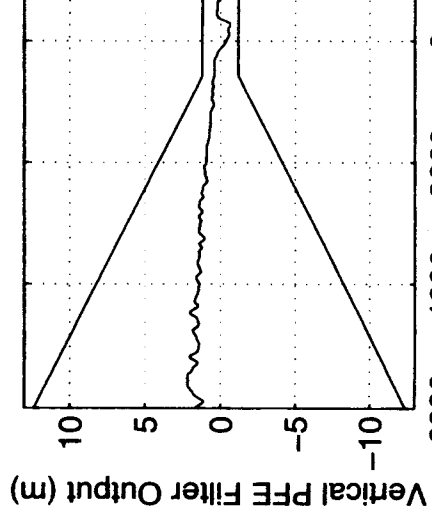
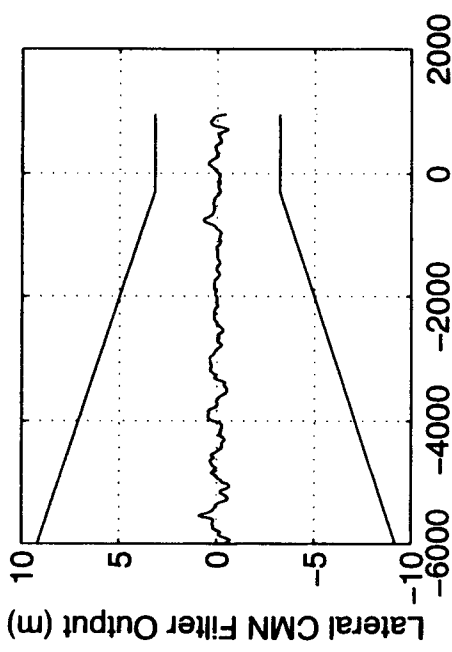
LGRP Xrcs POSITION (m): 290.706  
LGRP Yrcs POSITION (m): -1.296



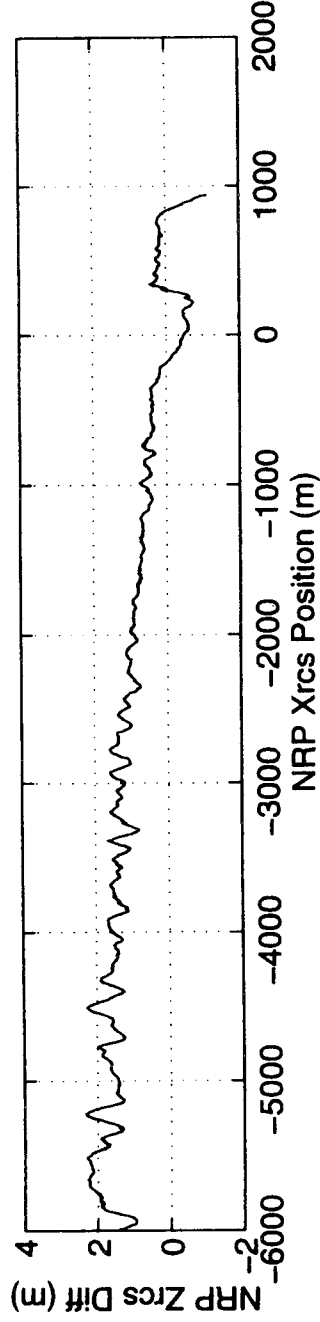
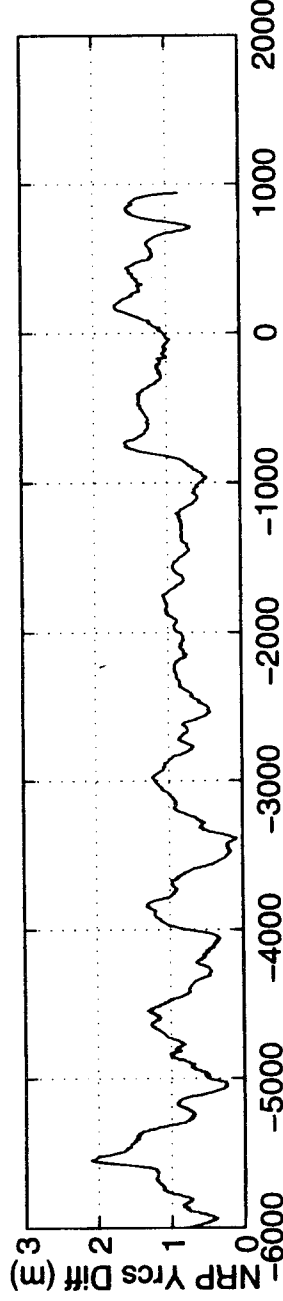
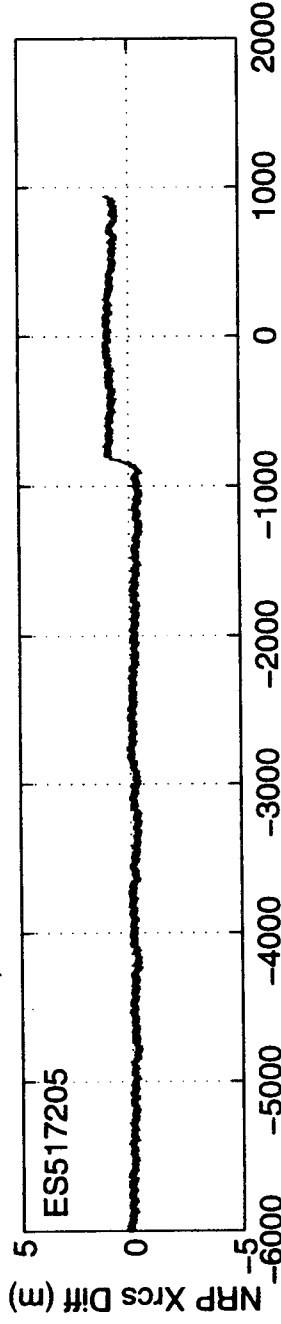
PATH FOLLOWING ERROR



CONTROL MOTION NOISE



NRP LONGITUDINAL, LATERAL AND VERTICAL POSITION DIFFERENCES



APPROACH #: ES517206  
START TIME: 330934.715  
STOP TIME: 331084.913

MINIMUM HDOP: 0.8  
MAXIMUM HDOP: 0.8  
AVERAGE HDOP: 0.8

MINIMUM VDOP: 3.0  
MAXIMUM VDOP: 3.1  
AVERAGE VDOP: 3.1

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
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\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

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TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
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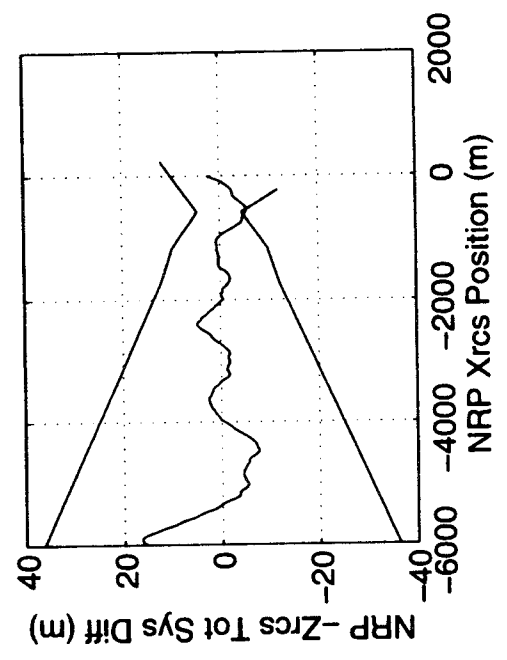
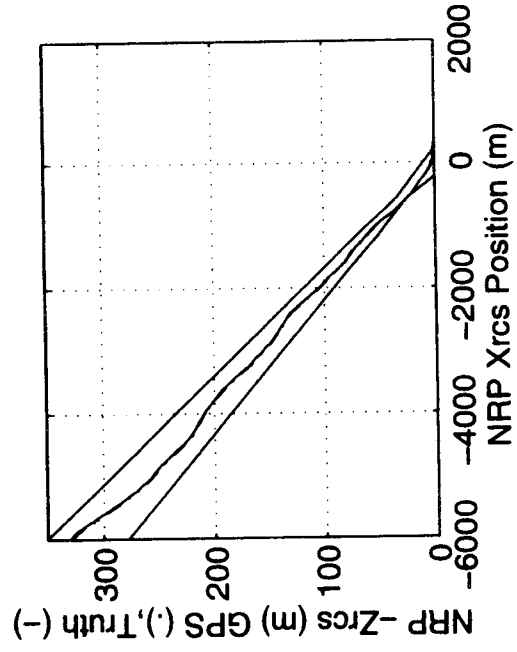
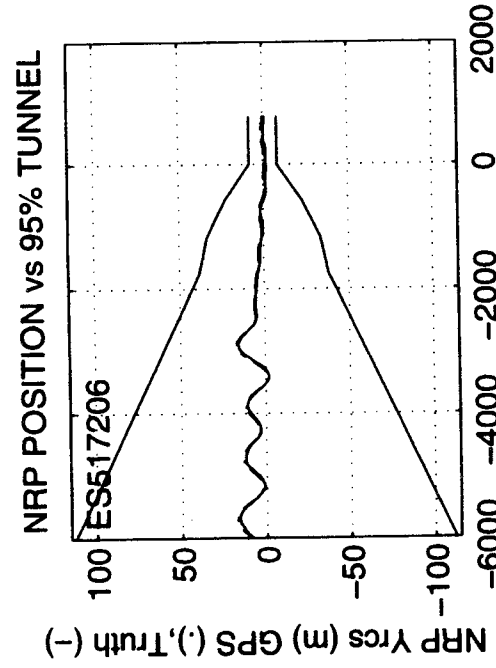
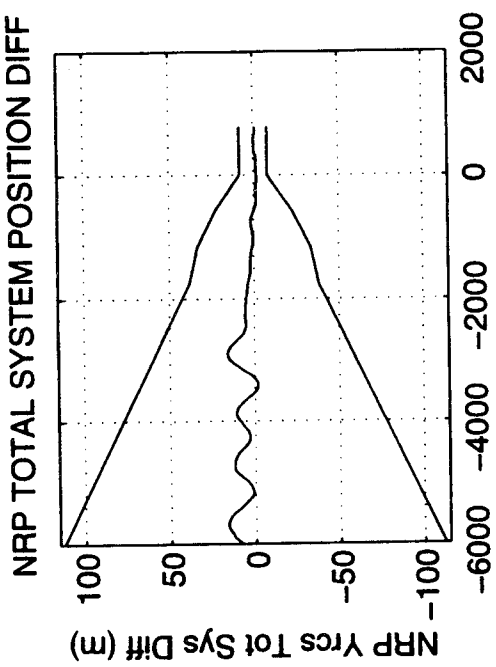
NRP Xrcs MEAN DIFFERENCE (m): 0.763  
NRP Yrcs MEAN DIFFERENCE (m): 1.153  
NRP Zrcs MEAN DIFFERENCE (m): 0.078

NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.659  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.454  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.864

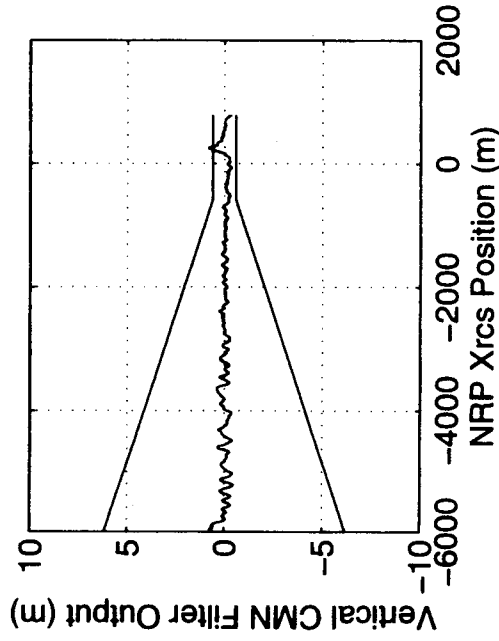
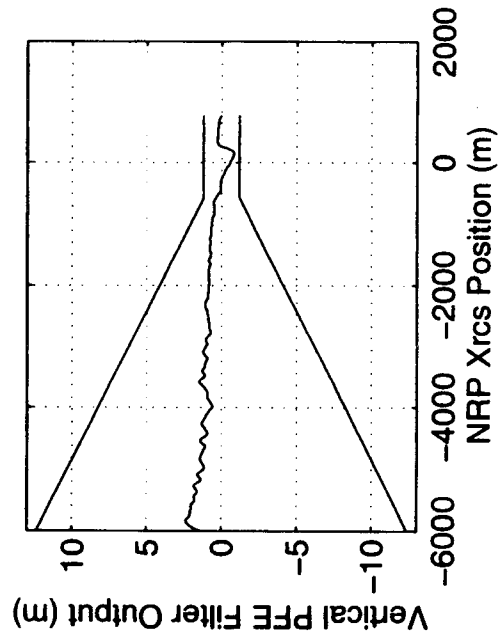
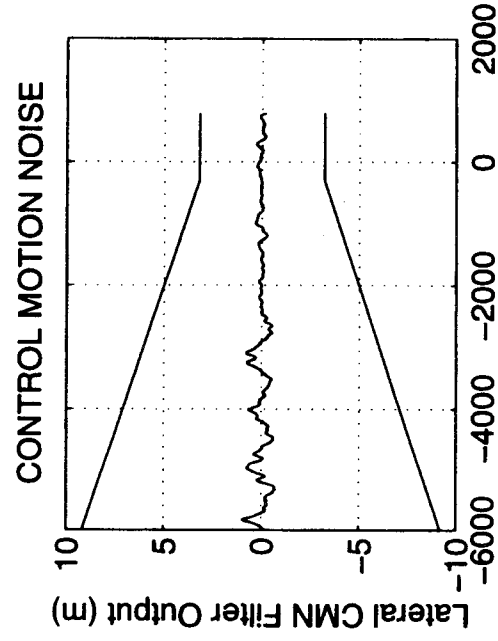
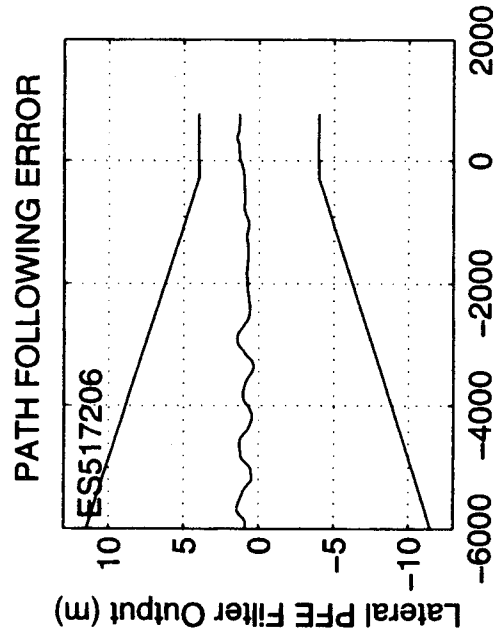
NRP Xrcs 2-RMS DIFFERENCE (m): 1.662  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.350  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.878

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LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
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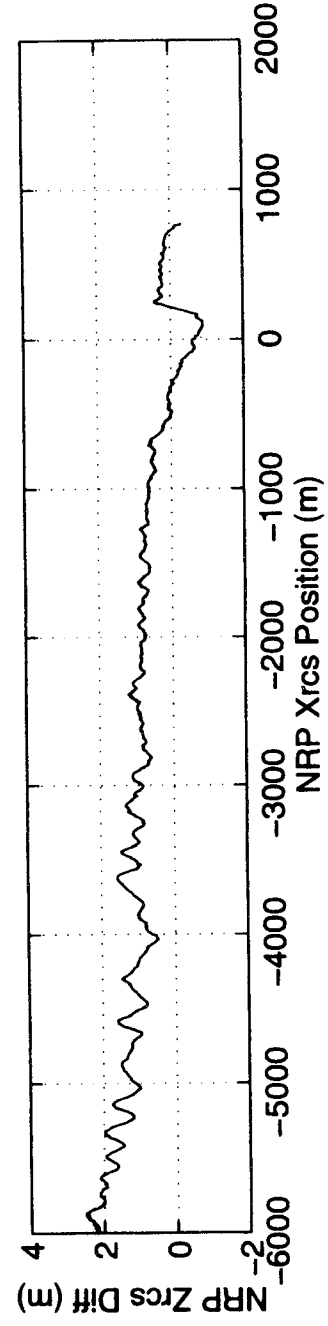
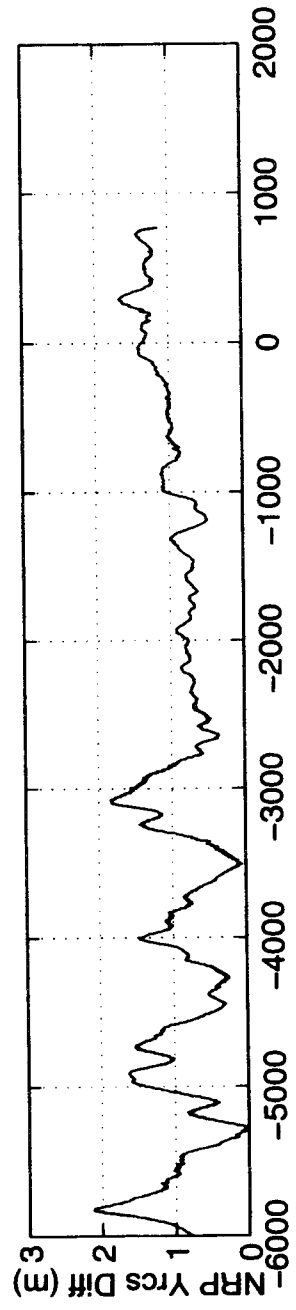
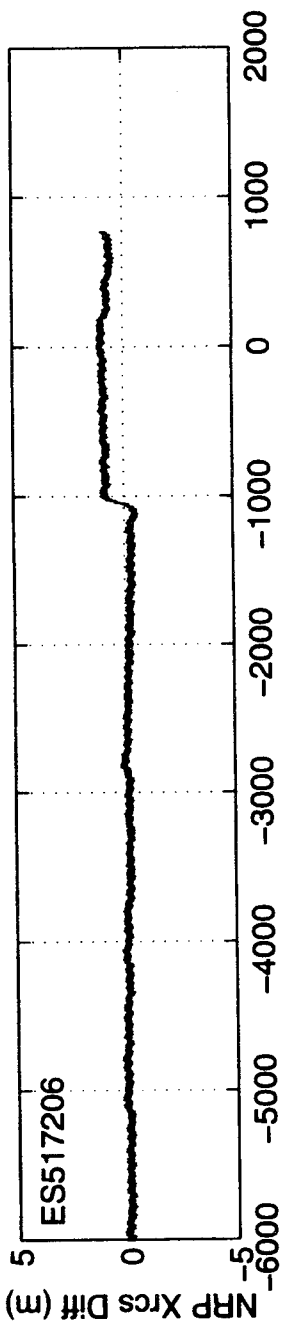
LGRP Xrcs POSITION (m): 218.830  
LGRP Yrcs POSITION (m): -1.175







NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517208  
START TIME: 331972.594  
STOP TIME: 332124.990

MINIMUM HDOP: 0.8  
MAXIMUM HDOP: 0.8  
AVERAGE HDOP: 0.8

MINIMUM VDOP: 3.0  
MAXIMUM VDOP: 3.1  
AVERAGE VDOP: 3.1

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

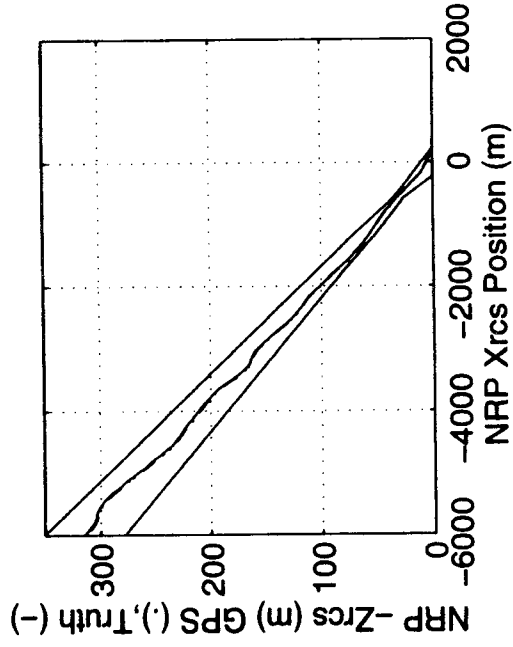
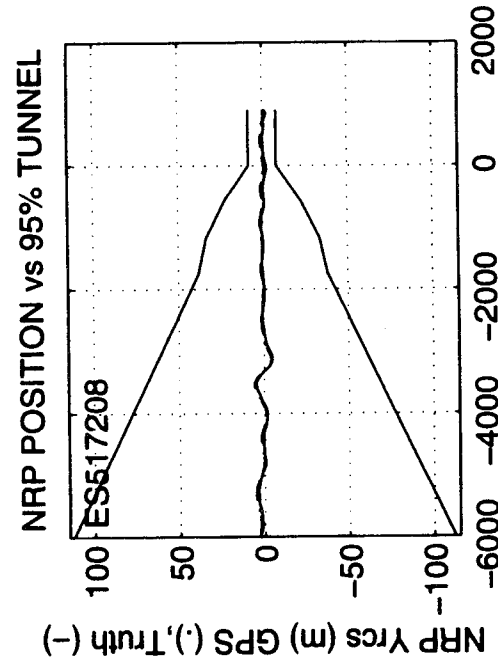
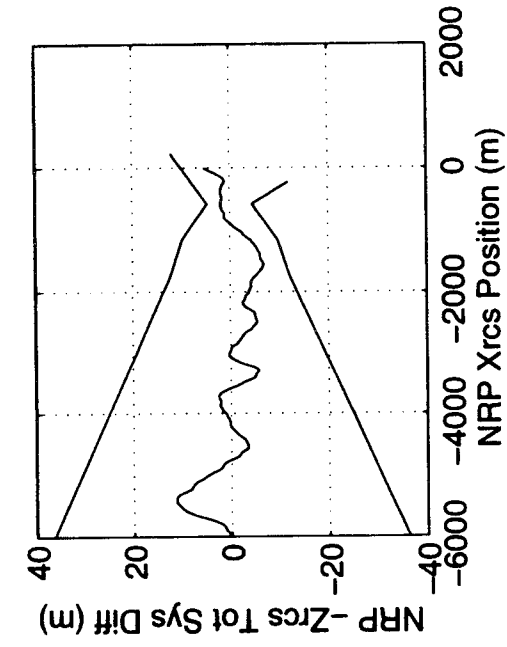
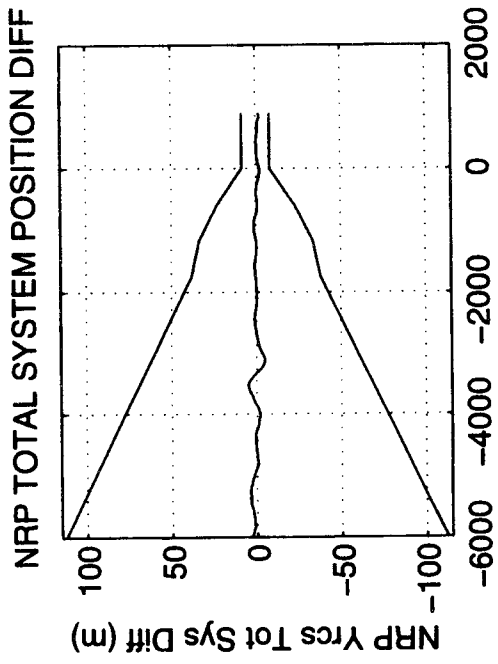
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.696  
NRP Yrcs MEAN DIFFERENCE (m): 1.131  
NRP Zrcs MEAN DIFFERENCE (m): 0.033

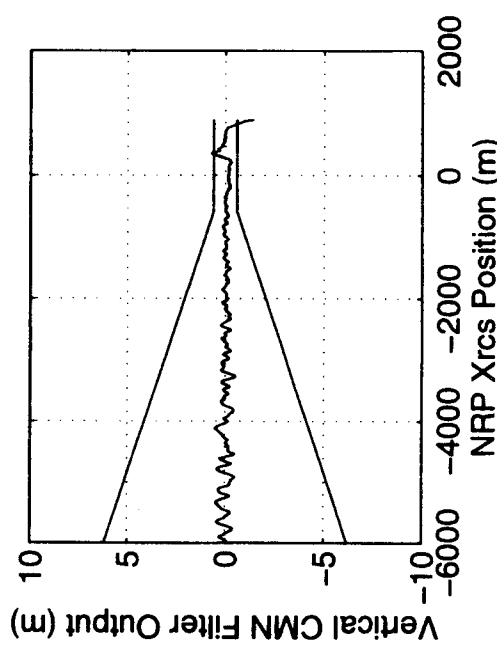
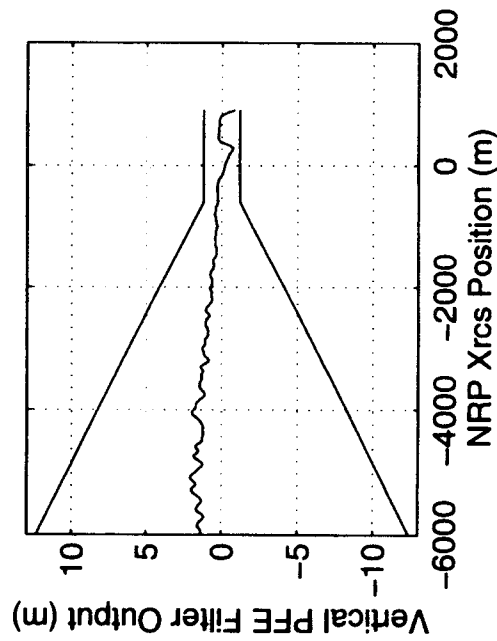
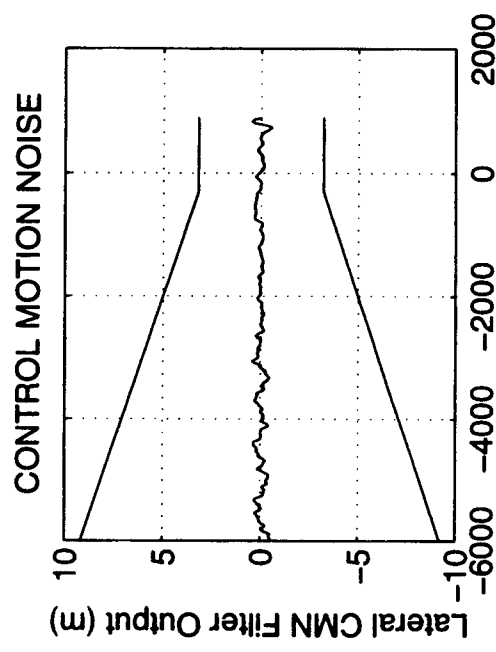
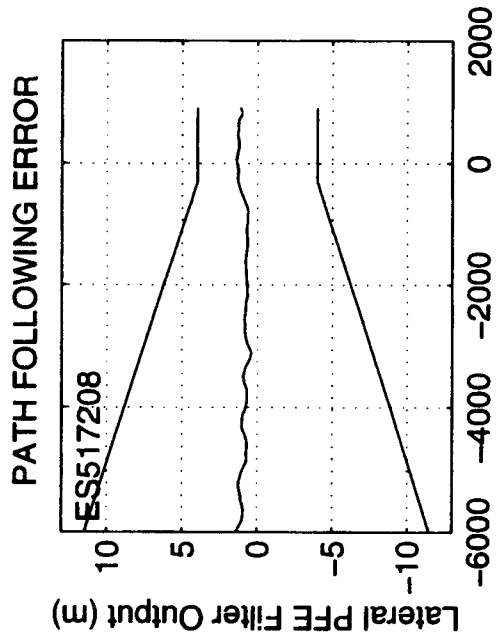
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.923  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.582  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.800

NRP Xrcs 2-RMS DIFFERENCE (m): 1.670  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.336  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.803

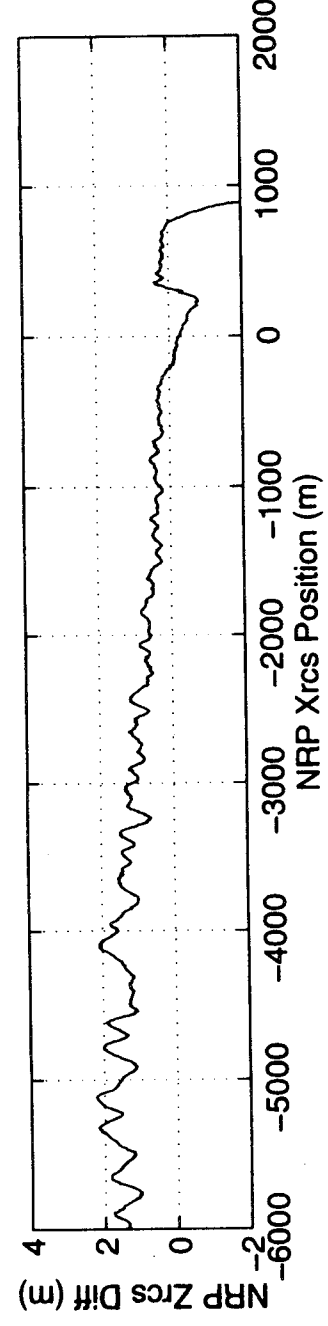
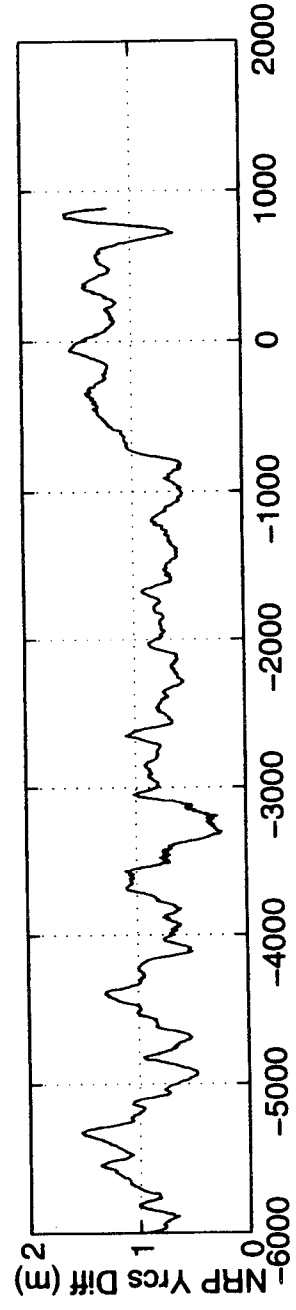
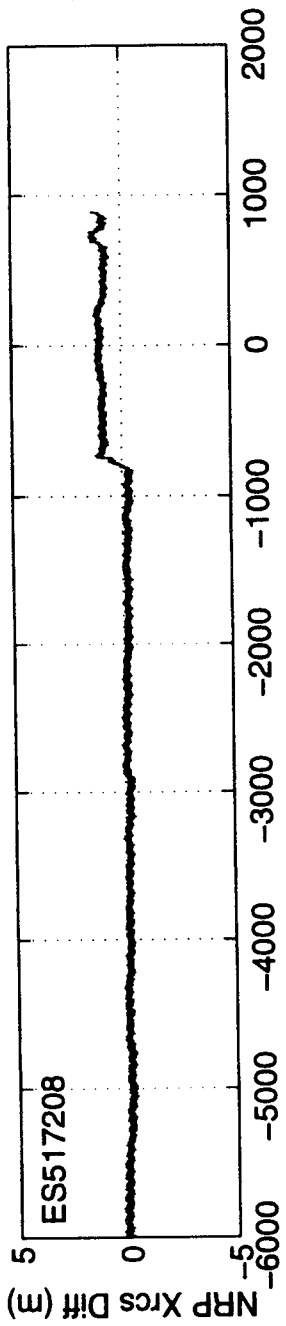
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

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LGRP Xrcs POSITION (m): 276.733  
LGRP Yrcs POSITION (m): -0.112





NRP LONGITUDINAL, LATERAL AND VERTICAL POSITION DIFFERENCES



APPROACH #: ES517209  
START TIME: 332497.396  
STOP TIME: 332649.198

MINIMUM HDOP: 0.7  
MAXIMUM HDOP: 0.7  
AVERAGE HDOP: 0.7

MINIMUM VDOP: 2.7  
MAXIMUM VDOP: 2.8  
AVERAGE VDOP: 2.8

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
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\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

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TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
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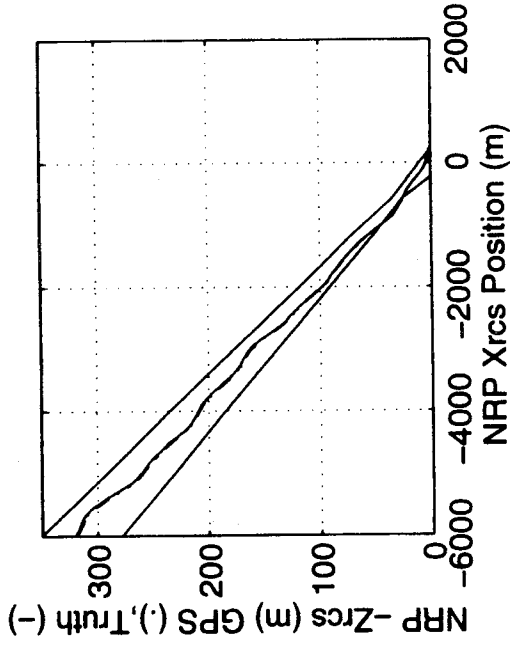
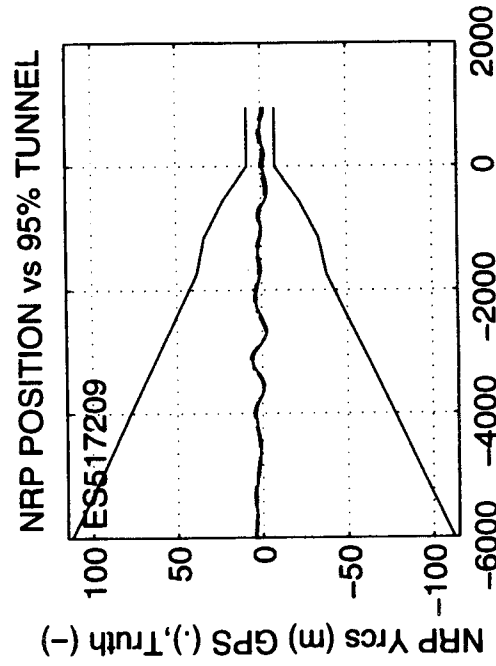
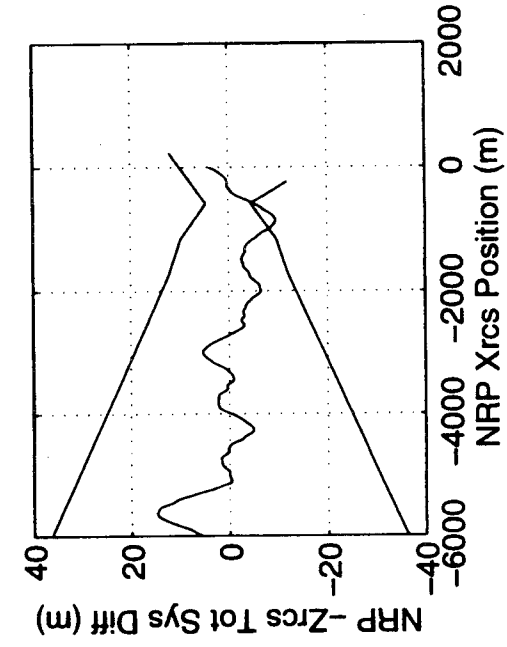
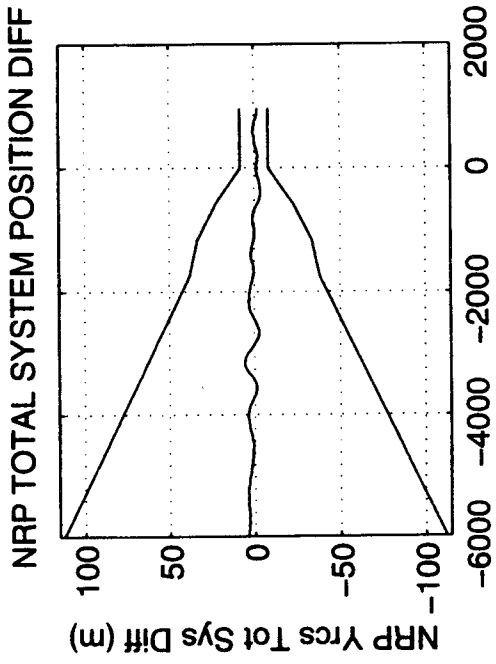
NRP Xrcs MEAN DIFFERENCE (m): 0.711  
NRP Yrcs MEAN DIFFERENCE (m): 1.253  
NRP Zrcs MEAN DIFFERENCE (m): 0.036

NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.878  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.529  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.865

NRP Xrcs 2-RMS DIFFERENCE (m): 1.671  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.561  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.868

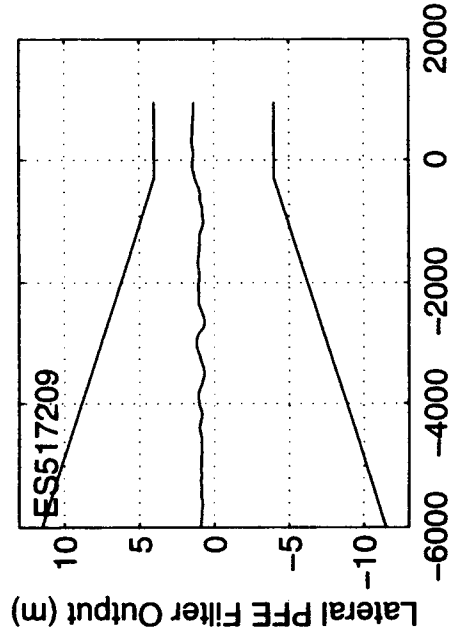
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----

LGRP Xrcs POSITION (m): 301.156  
LGRP Yrcs POSITION (m): -0.822

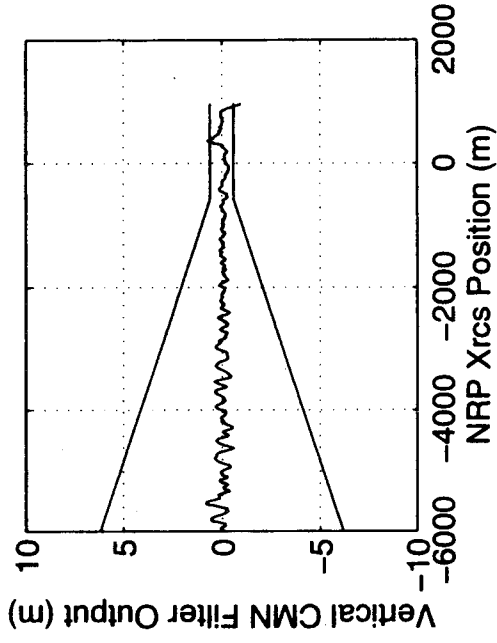
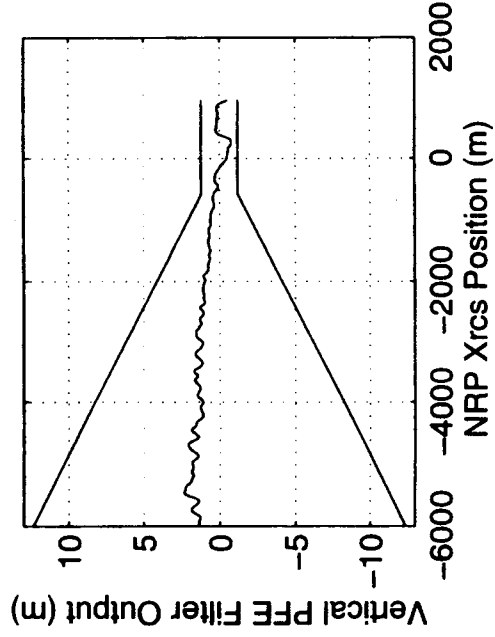
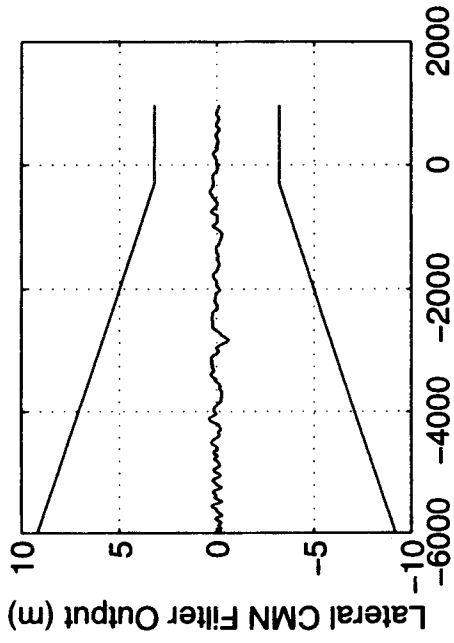




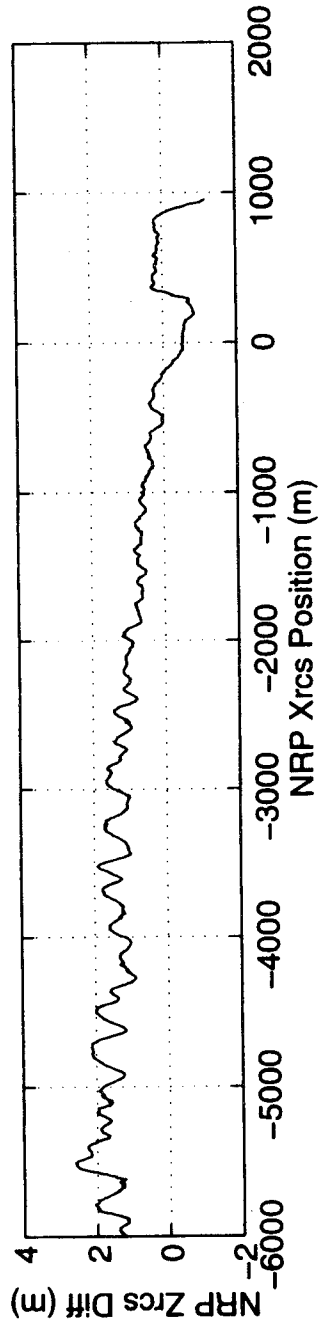
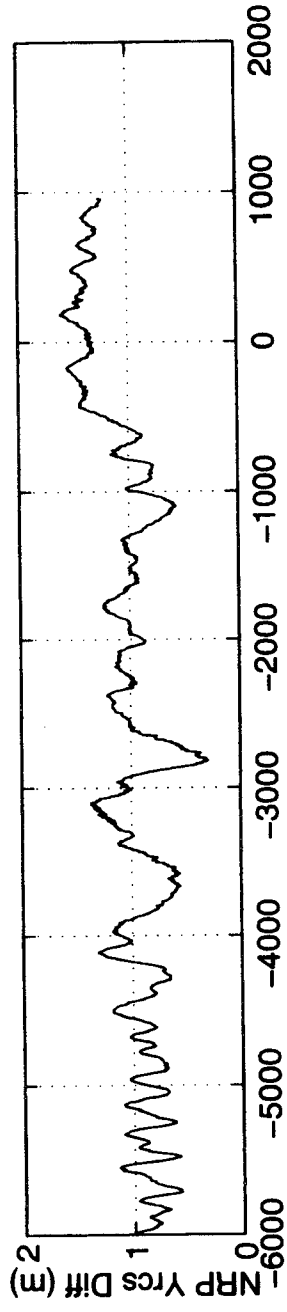
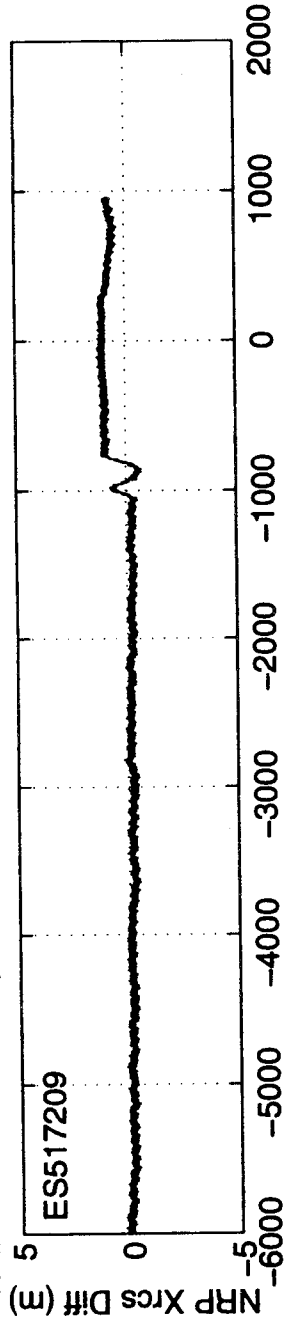
PATH FOLLOWING ERROR



CONTROL MOTION NOISE



NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517210  
START TIME: 333016.792  
STOP TIME: 333168.924

MINIMUM HDOP: 0.7  
MAXIMUM HDOP: 0.7  
AVERAGE HDOP: 0.7

MINIMUM VDOP: 2.3  
MAXIMUM VDOP: 2.5  
AVERAGE VDOP: 2.4

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

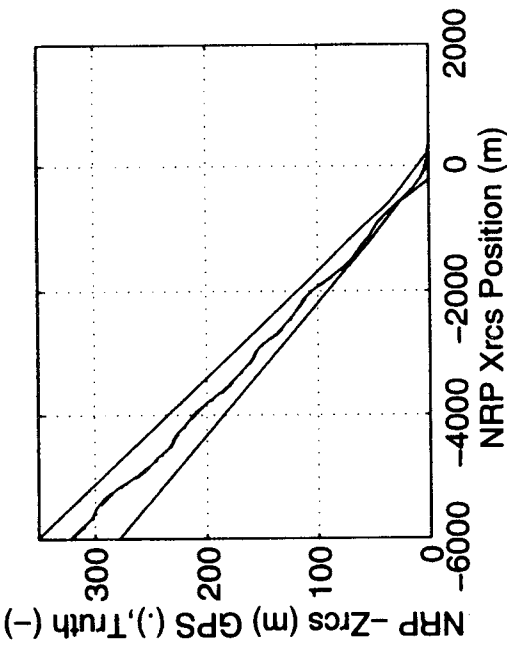
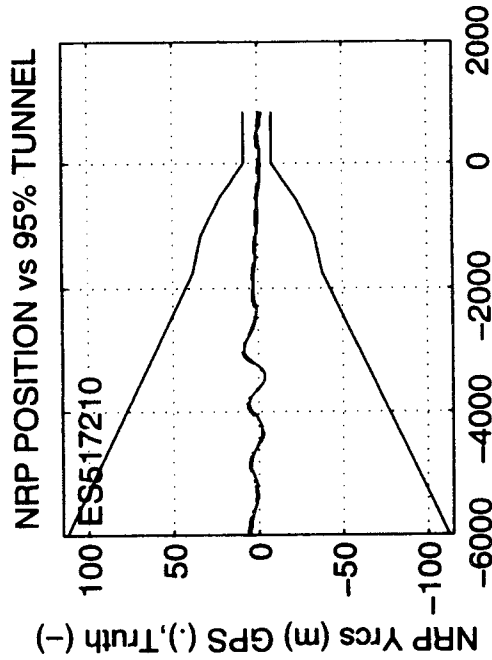
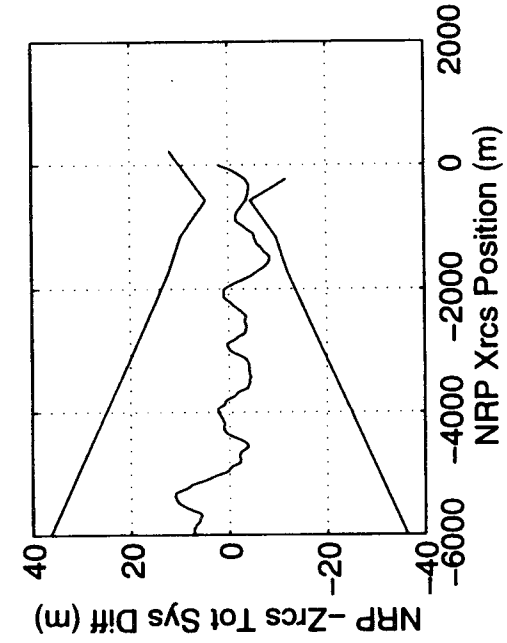
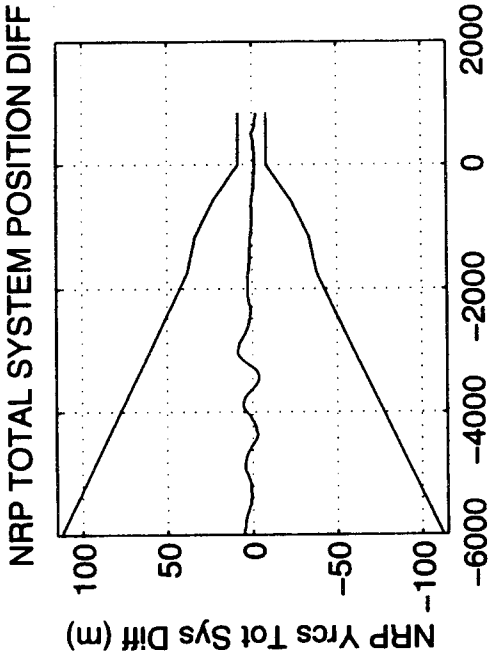
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.825  
NRP Yrcs MEAN DIFFERENCE (m): 1.217  
NRP Zrcs MEAN DIFFERENCE (m): -0.018

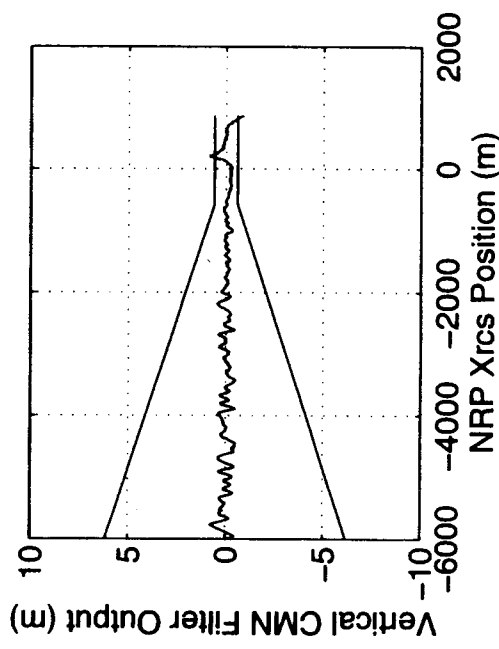
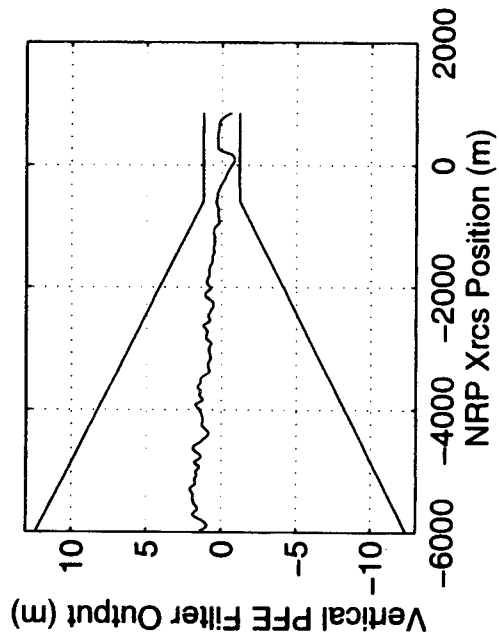
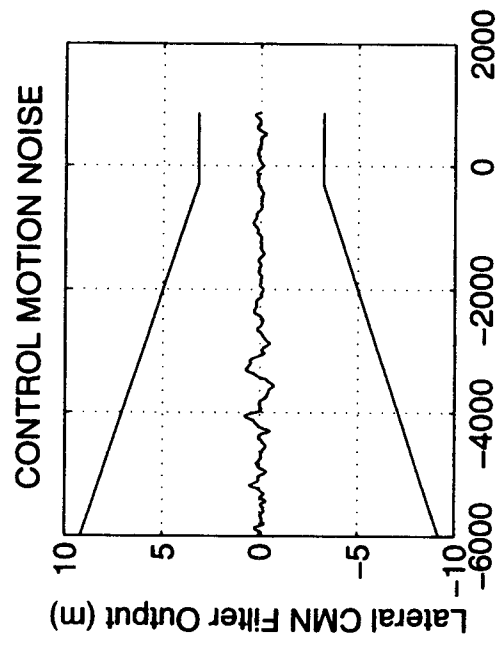
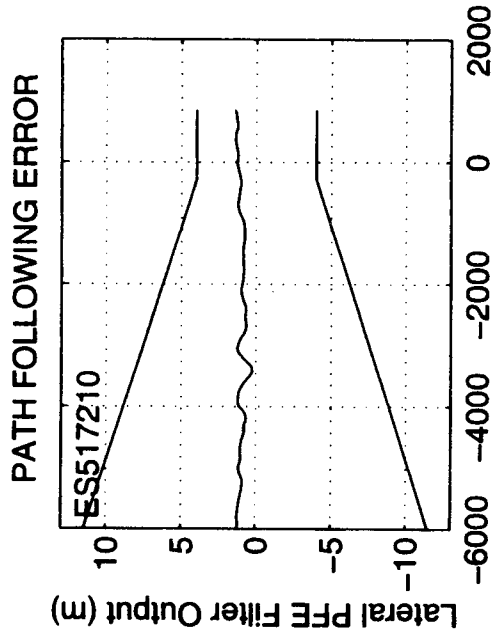
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.424  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.361  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.828

NRP Xrcs 2-RMS DIFFERENCE (m): 1.704  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.461  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.829

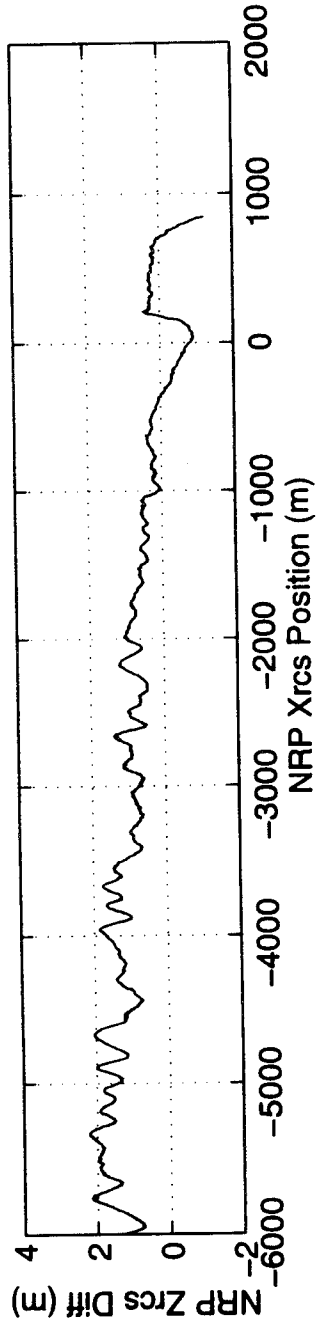
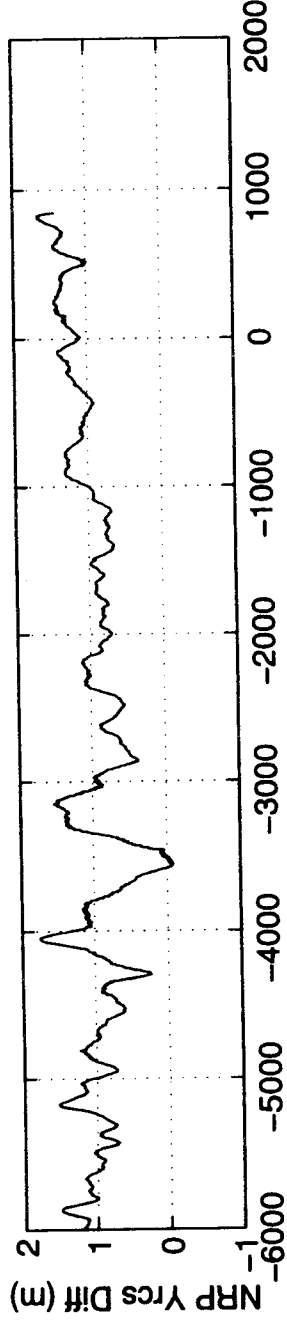
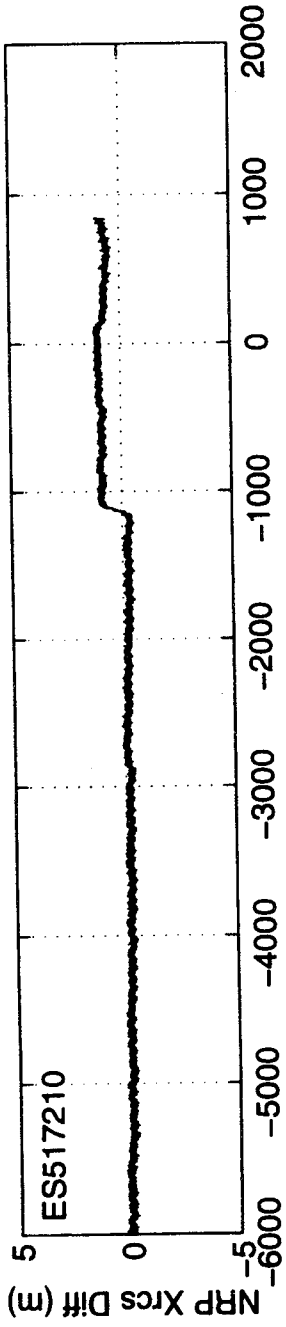
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 149.679  
LGRP Yrcs POSITION (m): -0.888





NRP LONGITUDINAL, LATERAL AND VERTICAL POSITION DIFFERENCES



APPROACH #: ES517211  
START TIME: 333537.528  
STOP TIME: 333690.243

MINIMUM HDOP: 0.8  
MAXIMUM HDOP: 0.8  
AVERAGE HDOP: 0.8

MINIMUM VDOP: 2.7  
MAXIMUM VDOP: 2.9  
AVERAGE VDOP: 2.8

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

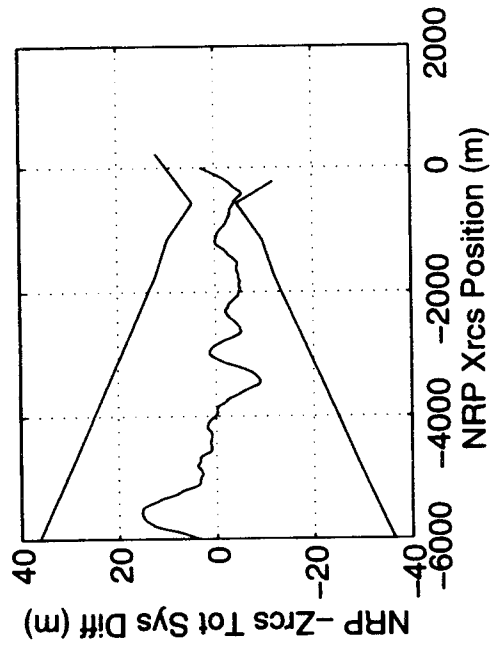
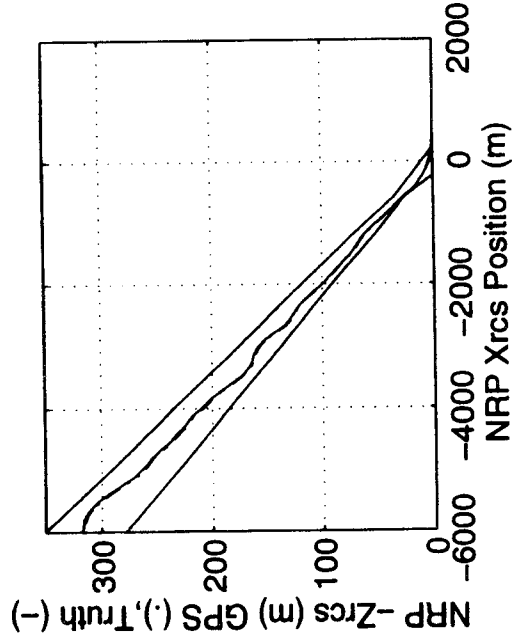
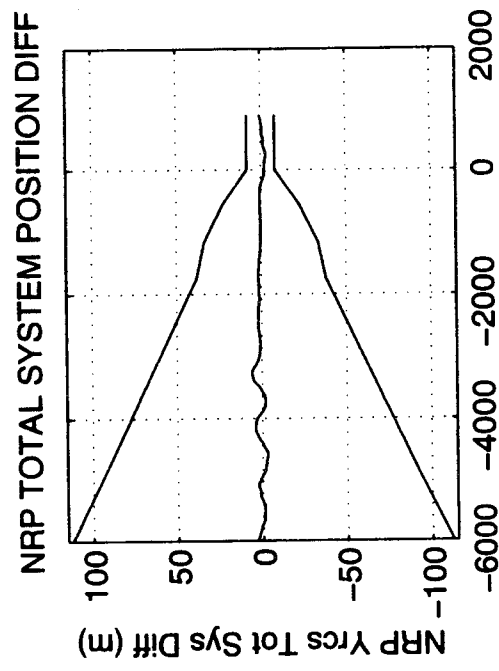
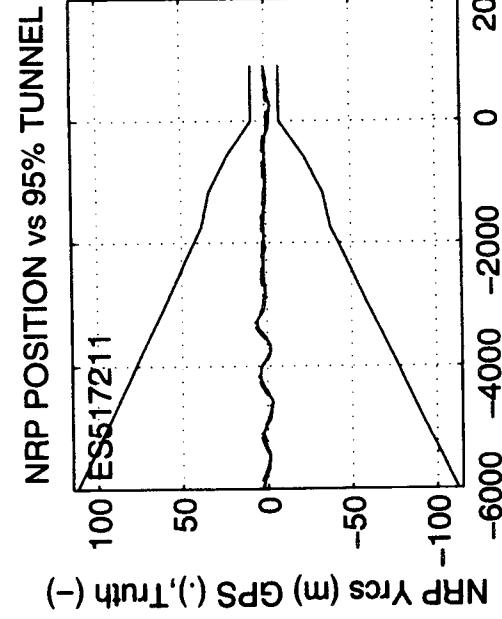
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.724  
NRP Yrcs MEAN DIFFERENCE (m): 1.216  
NRP Zrcs MEAN DIFFERENCE (m): 0.097

NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.729  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.635  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.826

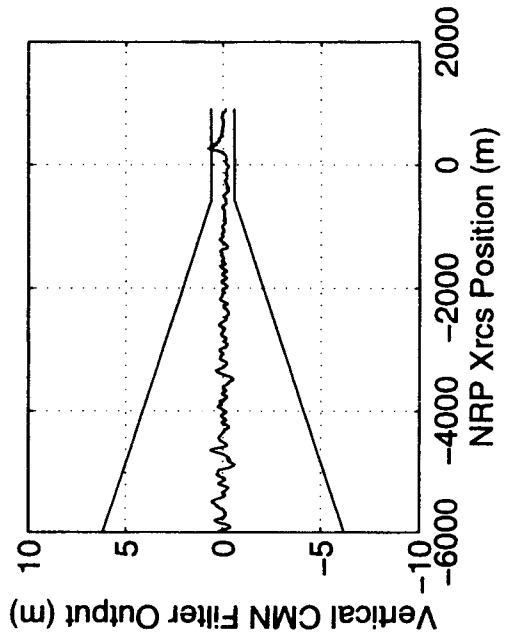
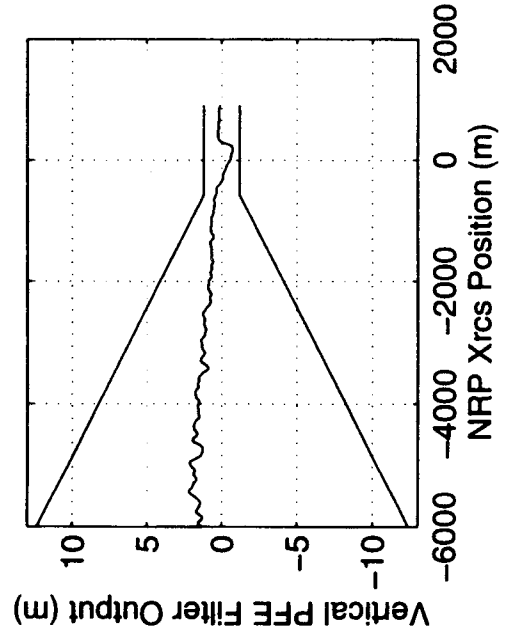
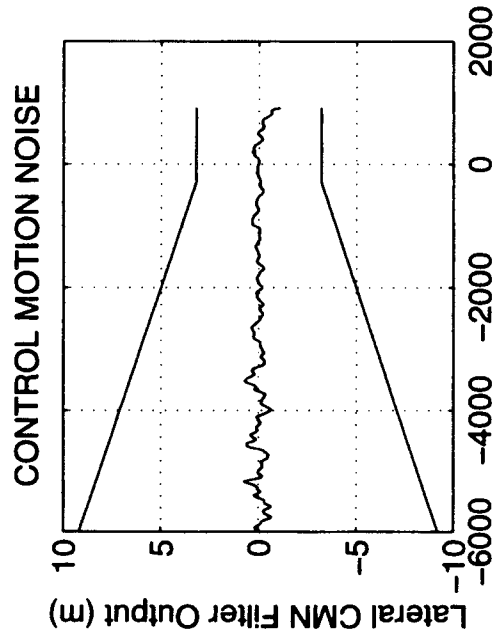
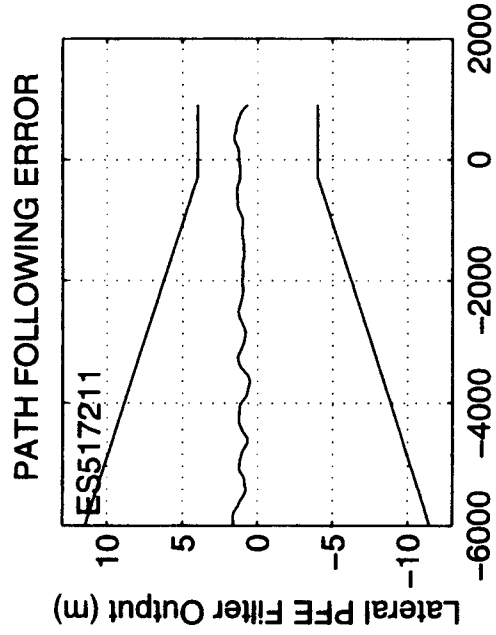
NRP Xrcs 2-RMS DIFFERENCE (m): 1.621  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.514  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.848

-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

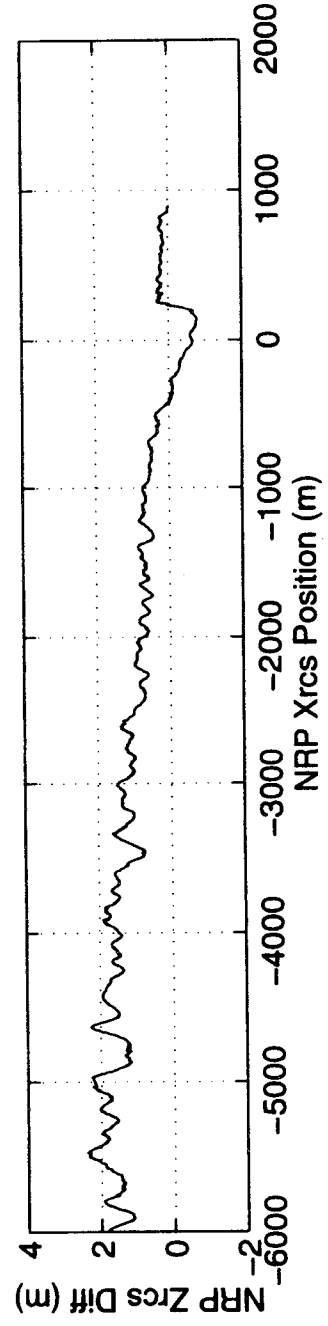
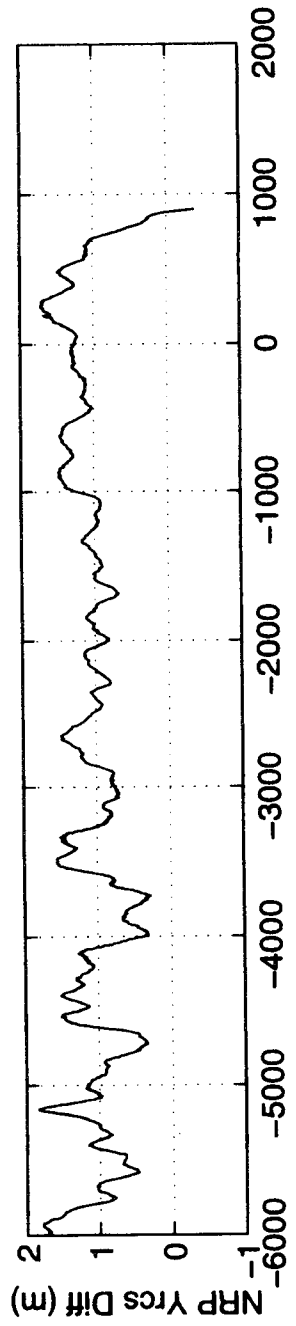
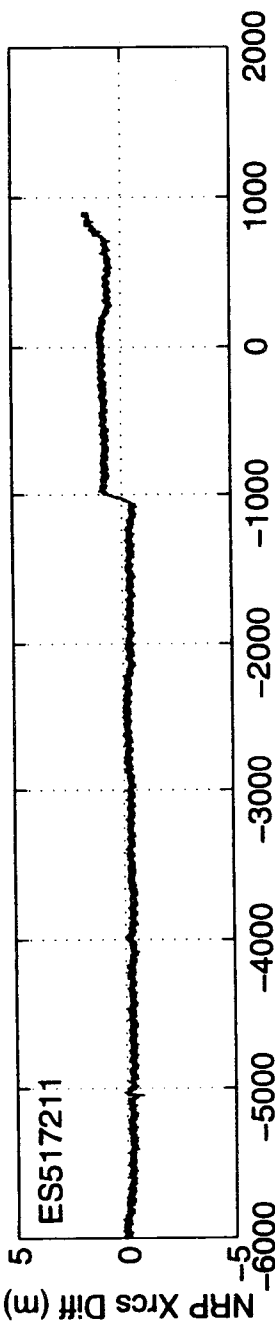
-----  
LGRP Xrcs POSITION (m): 177.744  
LGRP Yrcs POSITION (m): -2.276







NRP LONGITUDINAL, LATERAL AND VERTICAL POSITION DIFFERENCES



APPROACH #: ES517212  
START TIME: 334047.583  
STOP TIME: 334200.385

MINIMUM HDOP: 0.6  
MAXIMUM HDOP: 0.6  
AVERAGE HDOP: 0.6

MINIMUM VDOP: 1.5  
MAXIMUM VDOP: 1.6  
AVERAGE VDOP: 1.6

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
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\*\*\*\*\*  
\* VALID APPROACH \*  
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\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

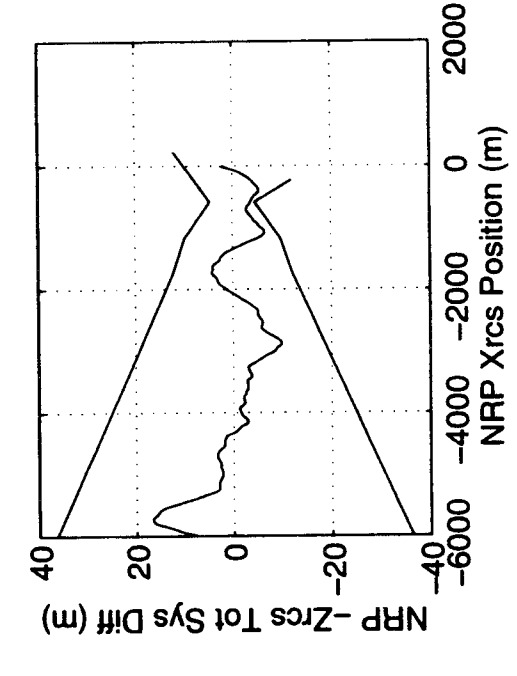
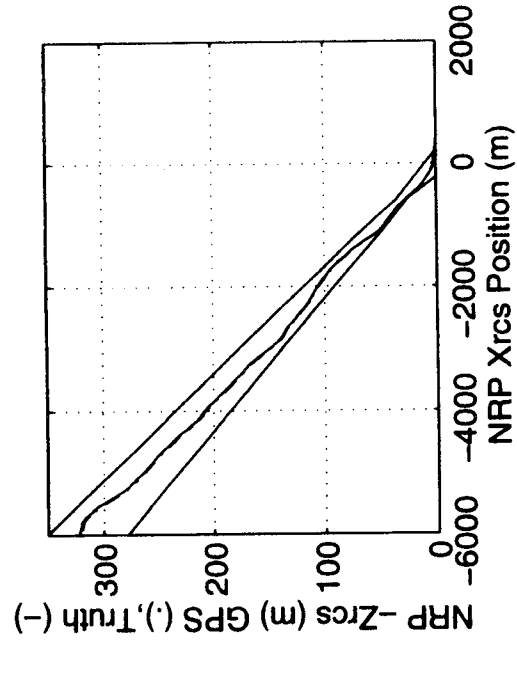
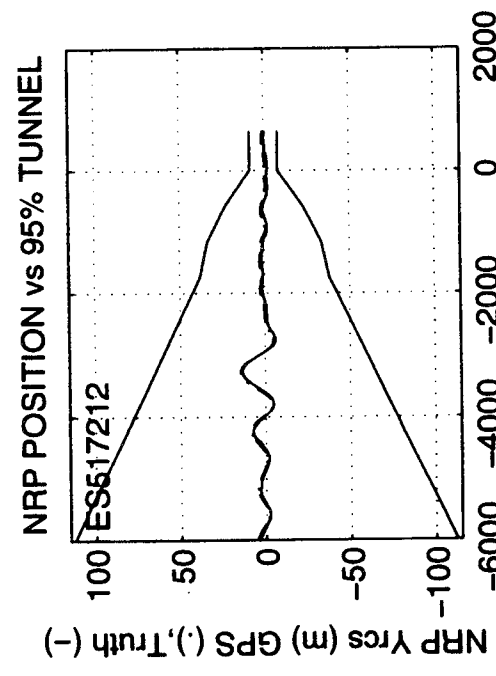
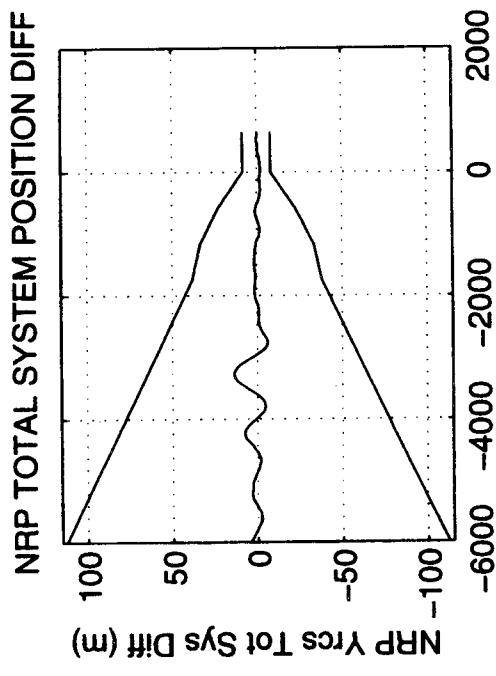
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.654  
NRP Yrcs MEAN DIFFERENCE (m): 1.270  
NRP Zrcs MEAN DIFFERENCE (m): 0.091

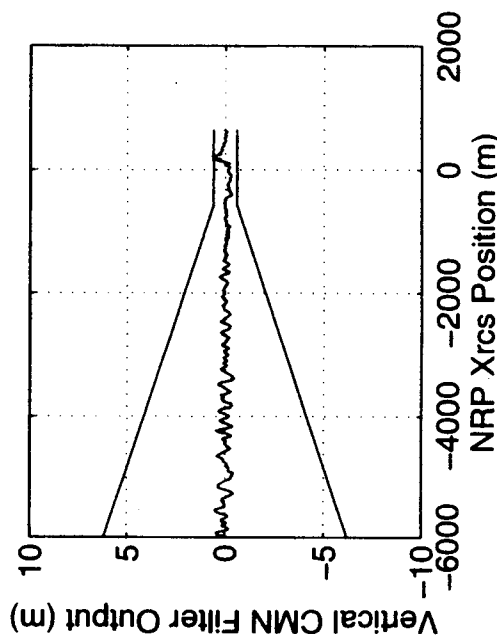
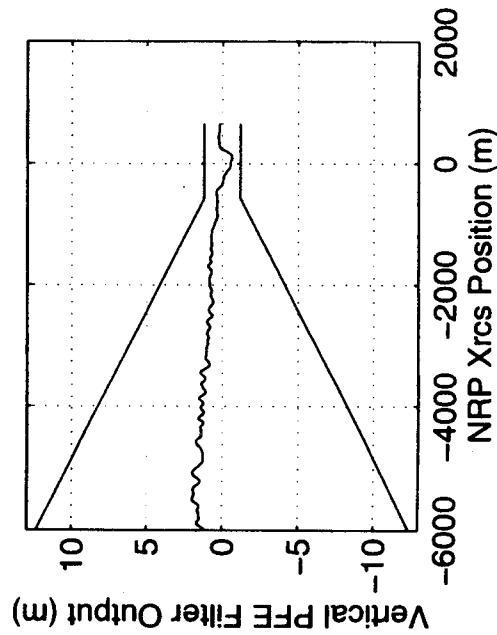
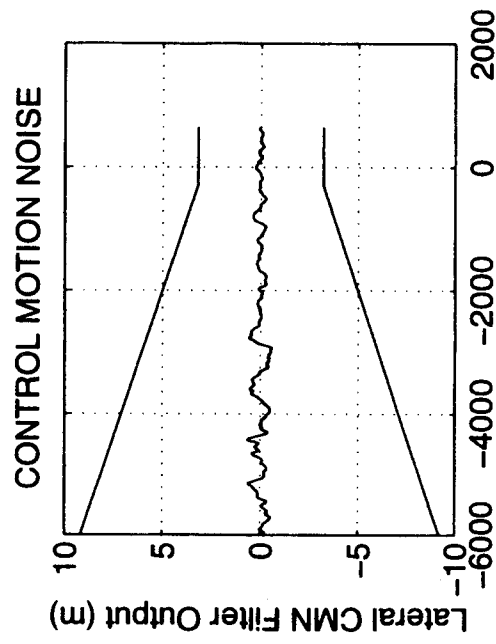
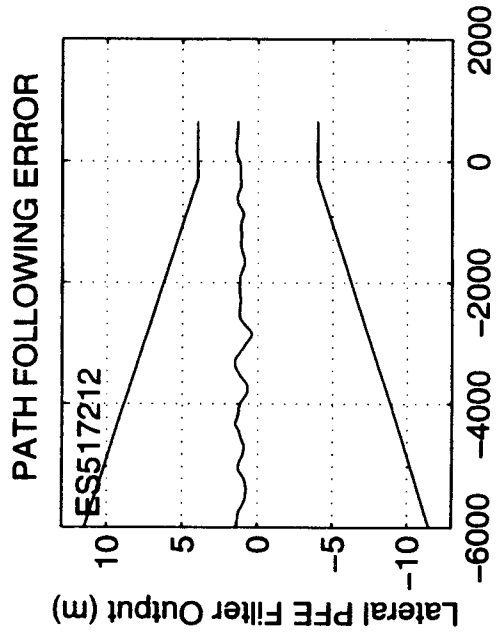
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.839  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.378  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.727

NRP Xrcs 2-RMS DIFFERENCE (m): 1.554  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.569  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.749

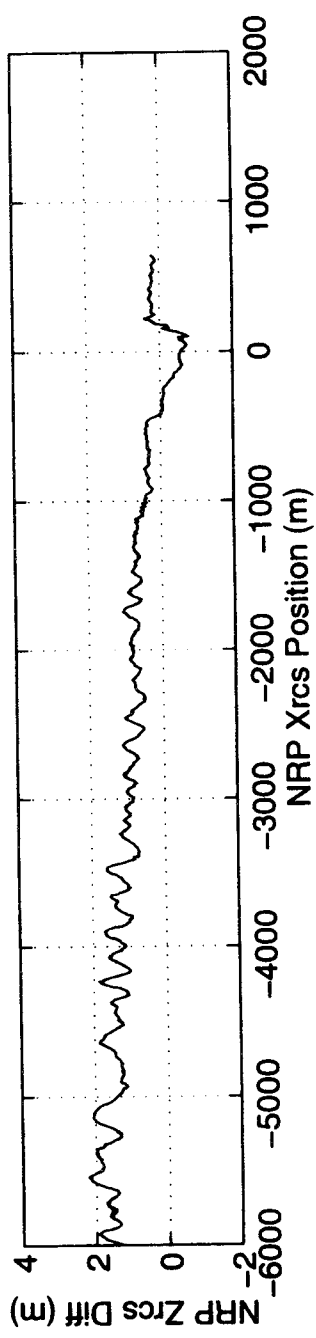
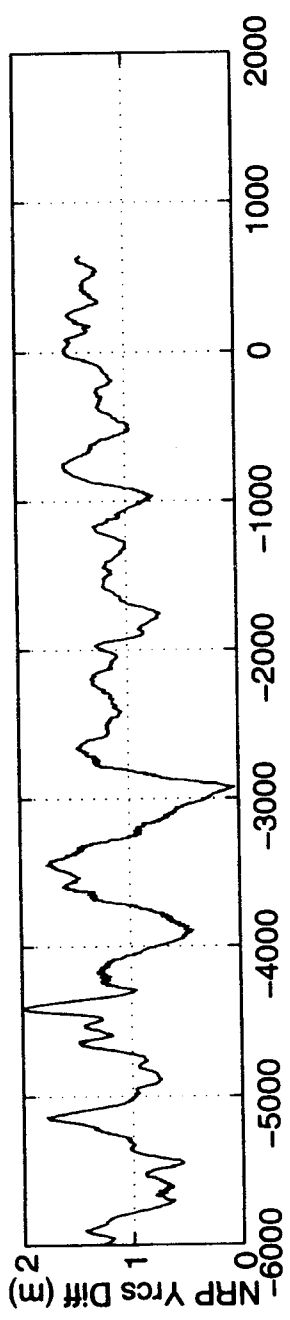
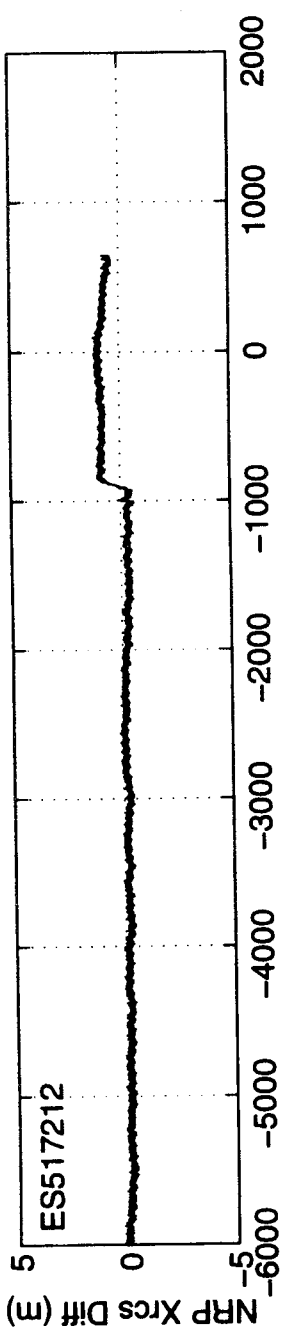
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

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LGRP Xrcs POSITION (m): 135.341  
LGRP Yrcs POSITION (m): -1.459





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517213  
START TIME: 334560.243  
STOP TIME: 334715.462

MINIMUM HDOP: 0.6  
MAXIMUM HDOP: 0.6  
AVERAGE HDOP: 0.6

MINIMUM VDOP: 1.5  
MAXIMUM VDOP: 1.5  
AVERAGE VDOP: 1.5

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
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\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

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TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
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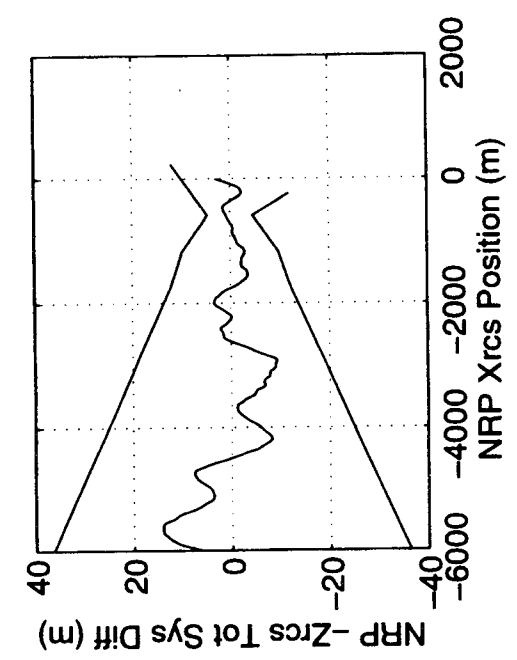
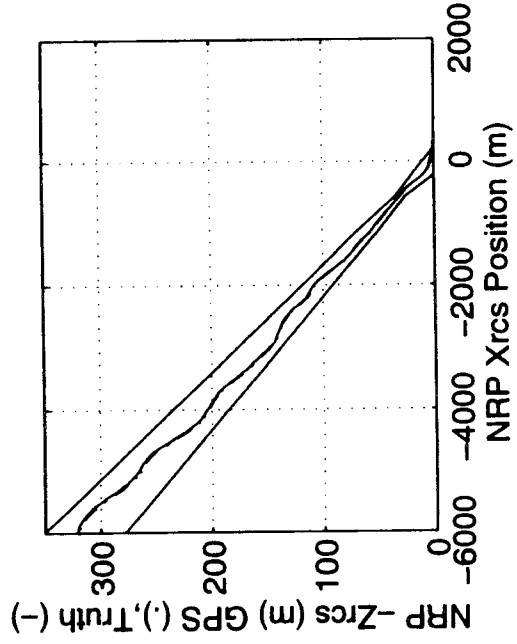
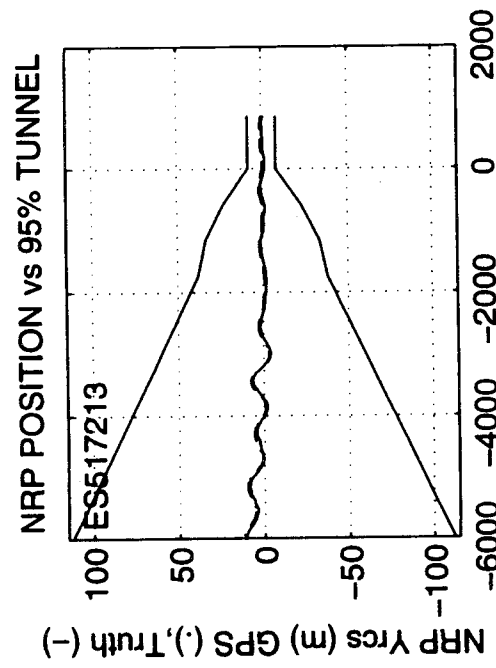
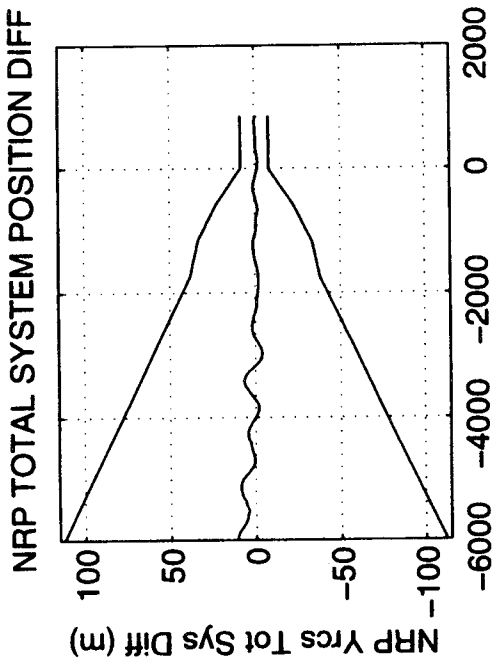
NRP Xrcs MEAN DIFFERENCE (m): 0.748  
NRP Yrcs MEAN DIFFERENCE (m): 1.166  
NRP Zrcs MEAN DIFFERENCE (m): 0.057

NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.797  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.386  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.957

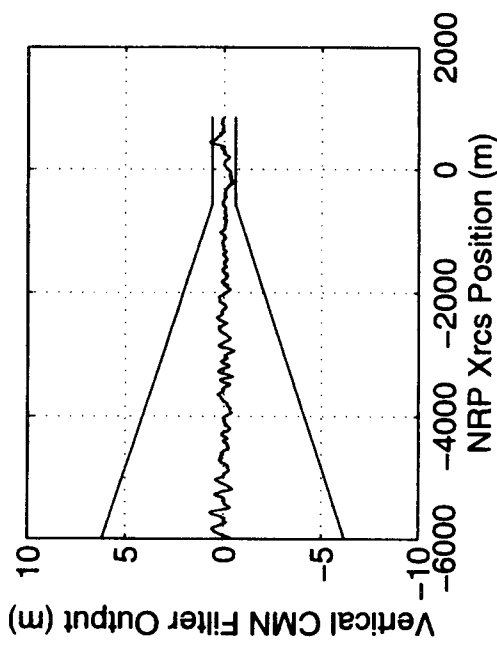
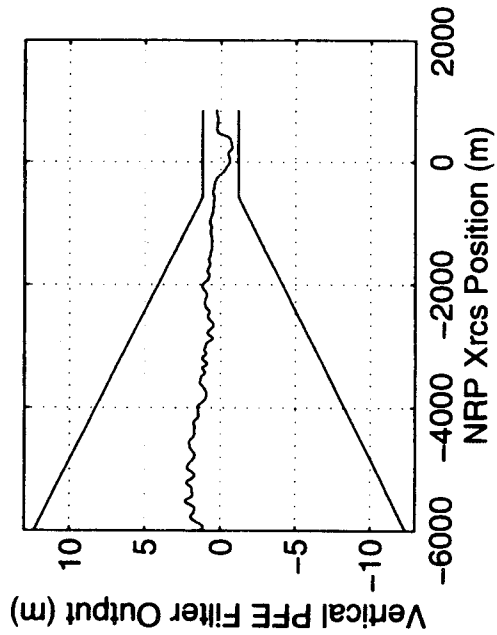
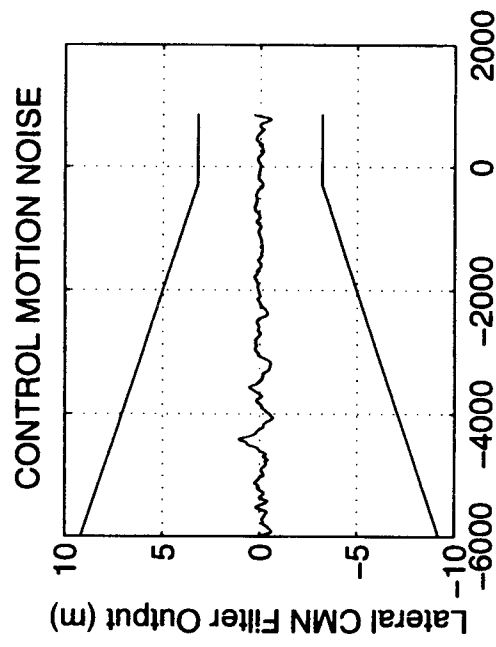
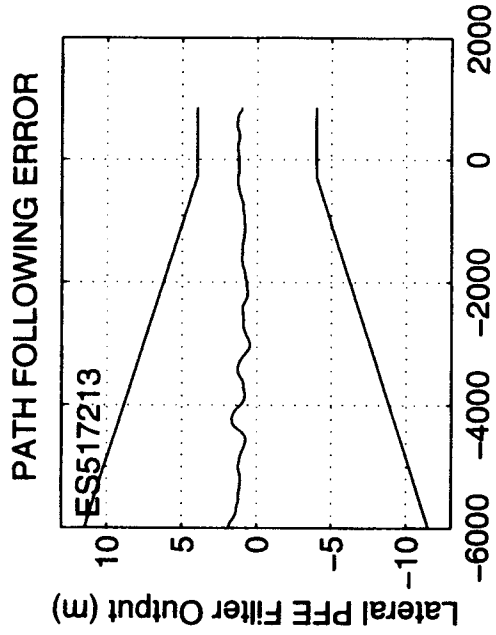
NRP Xrcs 2-RMS DIFFERENCE (m): 1.695  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.363  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.964

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LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
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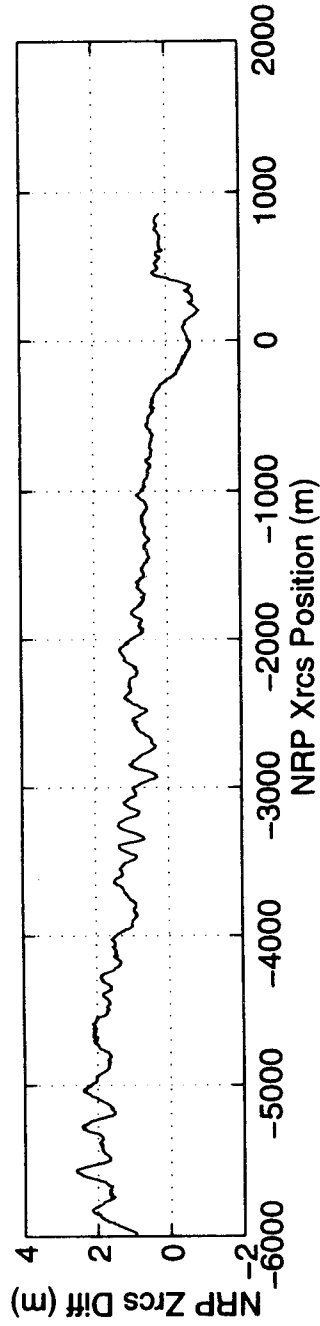
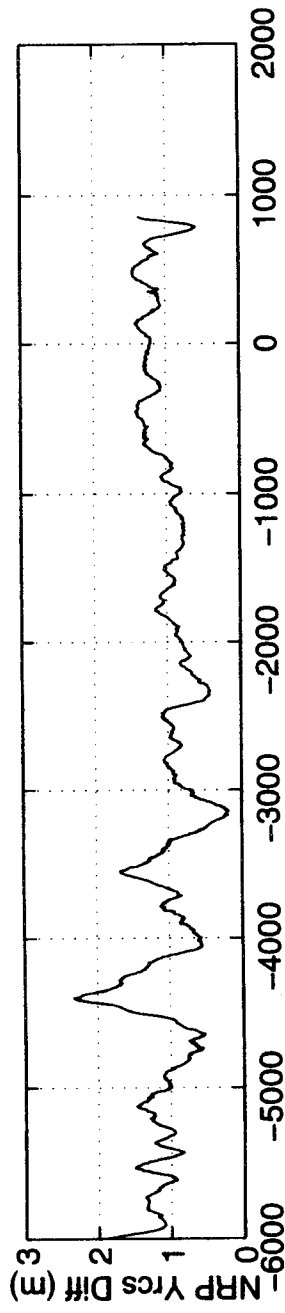
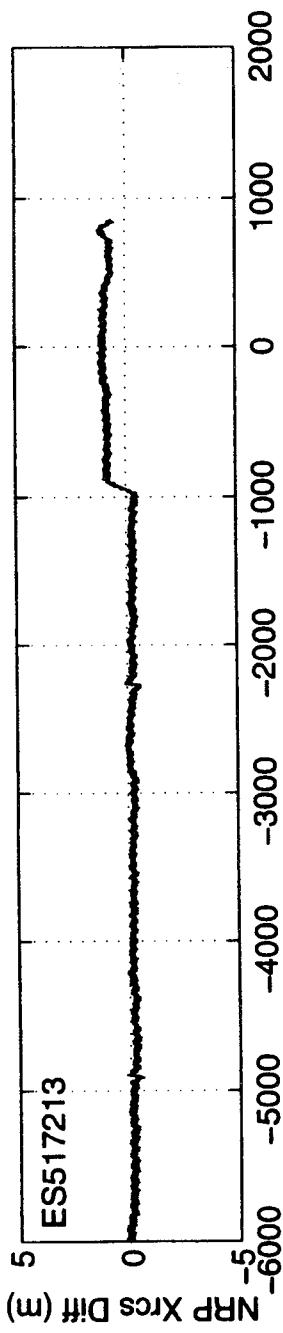
LGRP Xrcs POSITION (m): 334.591  
LGRP Yrcs POSITION (m): -0.084







NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517214  
START TIME: 335071.792  
STOP TIME: 335227.385

MINIMUM HDOP: 0.5  
MAXIMUM HDOP: 0.7  
AVERAGE HDOP: 0.6

MINIMUM VDOP: 1.2  
MAXIMUM VDOP: 1.6  
AVERAGE VDOP: 1.3

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 9  
AVERAGE NUMBER OF SVs: 9

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
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\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
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TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
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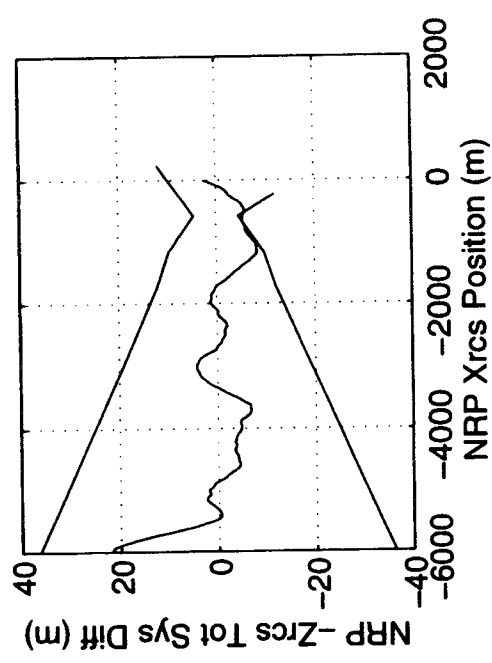
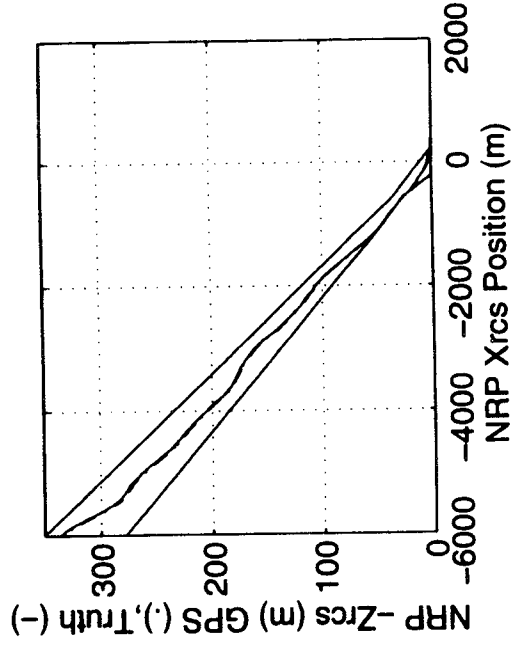
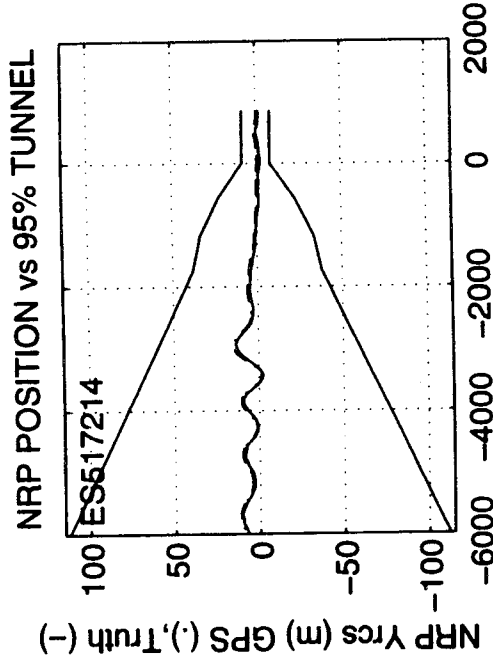
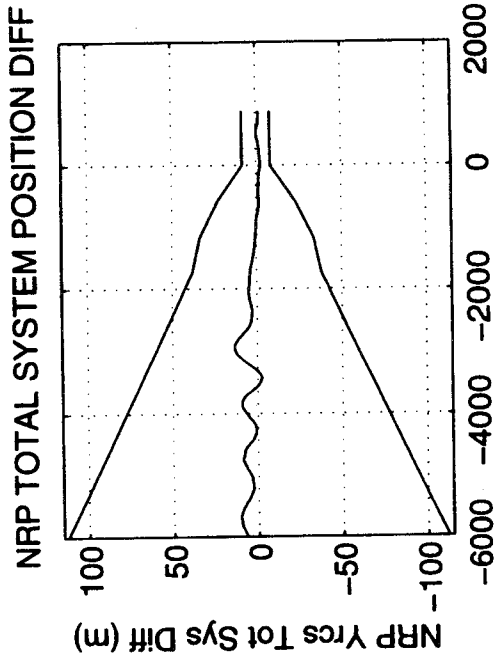
NRP Xrcs MEAN DIFFERENCE (m): 0.717  
NRP Yrcs MEAN DIFFERENCE (m): 1.201  
NRP Zrcs MEAN DIFFERENCE (m): -0.005

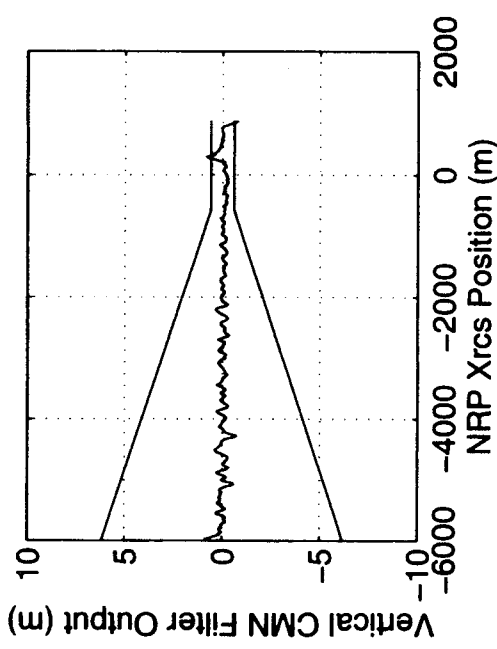
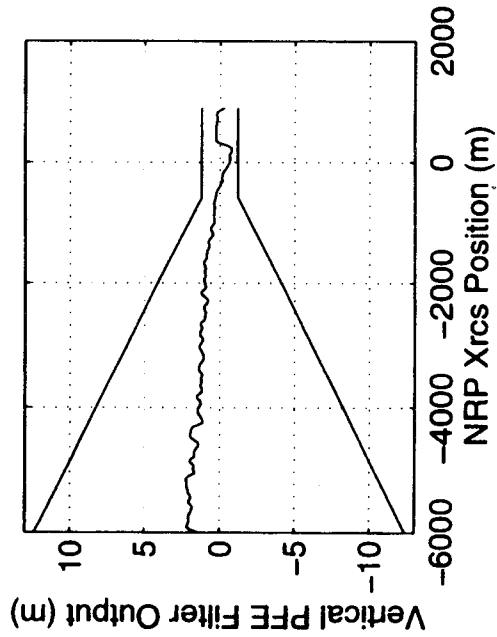
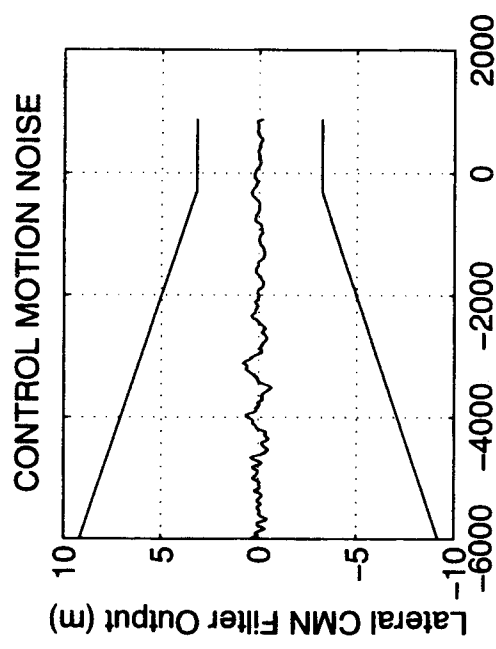
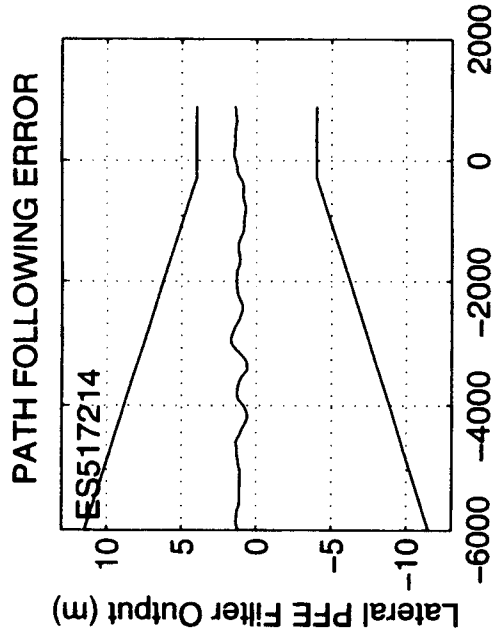
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.940  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.577  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.837

NRP Xrcs 2-RMS DIFFERENCE (m): 1.715  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.471  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.837

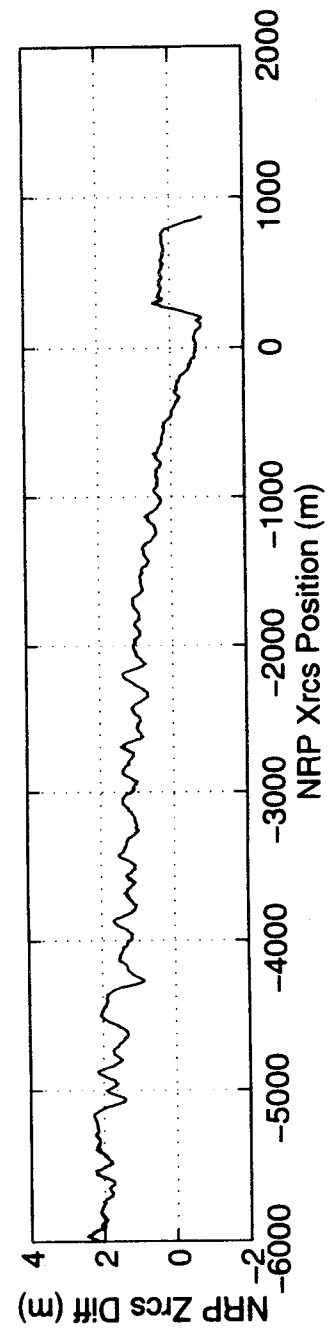
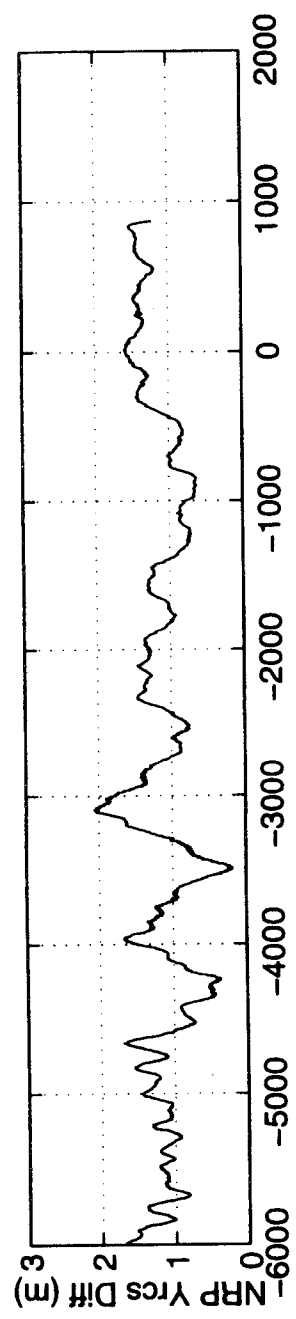
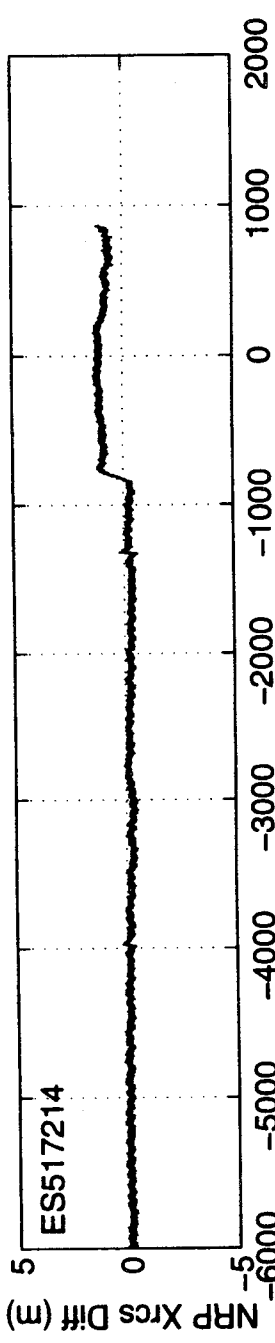
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LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----

LGRP Xrcs POSITION (m): 226.083  
LGRP Yrcs POSITION (m): -1.442





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517215  
START TIME: 335597.056  
STOP TIME: 335750.462

MINIMUM HDOP: 0.7  
MAXIMUM HDOP: 0.7  
AVERAGE HDOP: 0.7

MINIMUM VDOP: 1.6  
MAXIMUM VDOP: 1.7  
AVERAGE VDOP: 1.7

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

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TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
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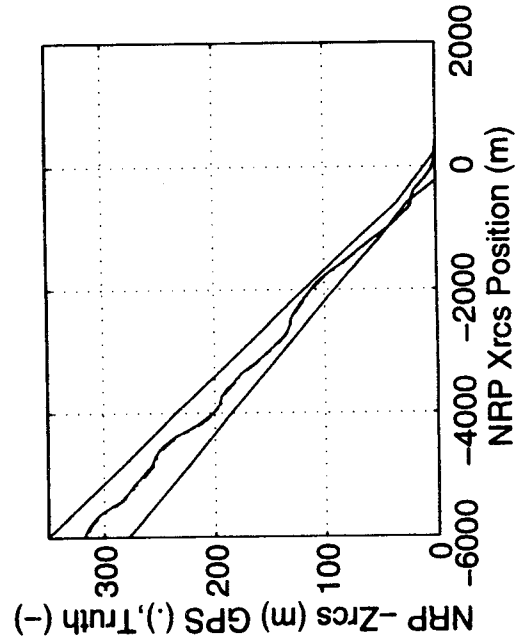
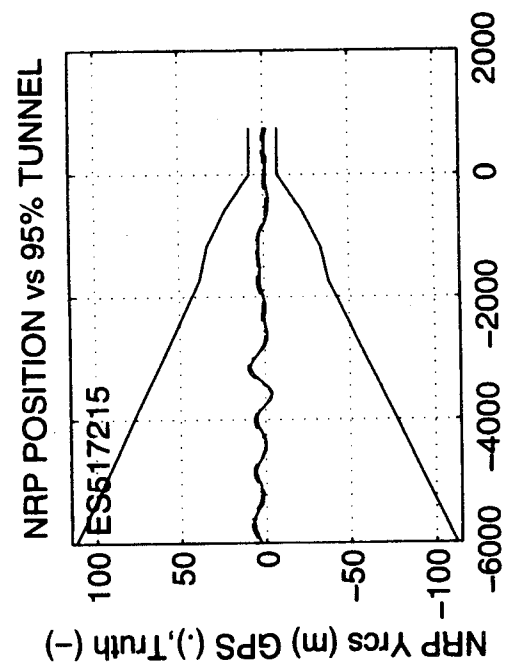
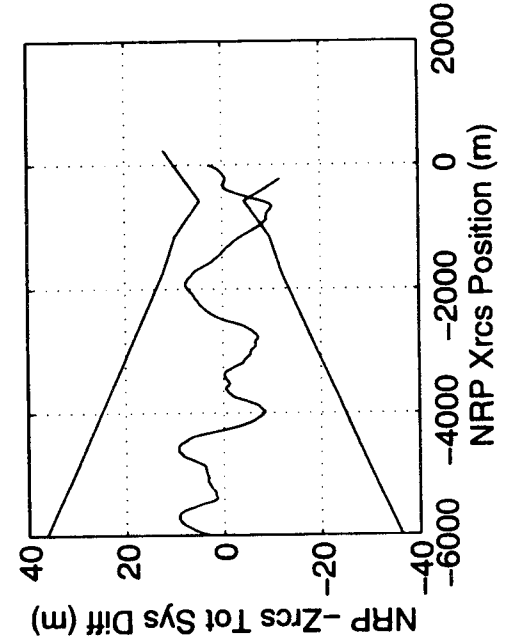
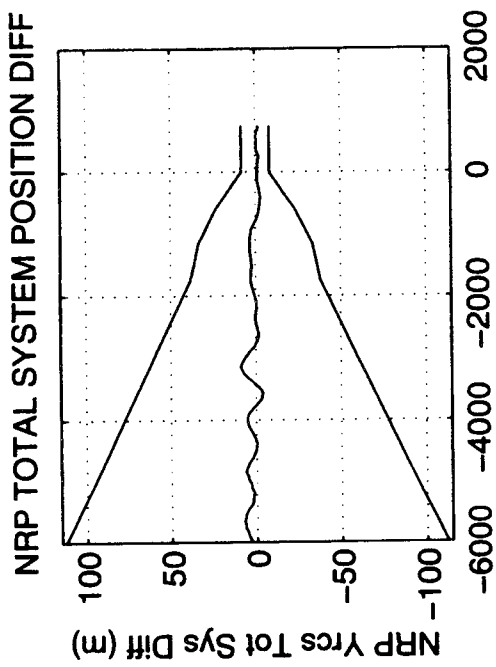
NRP Xrcs MEAN DIFFERENCE (m): 0.720  
NRP Yrcs MEAN DIFFERENCE (m): 1.191  
NRP Zrcs MEAN DIFFERENCE (m): 0.028

NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.967  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.573  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.910

NRP Xrcs 2-RMS DIFFERENCE (m): 1.735  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.450  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.912

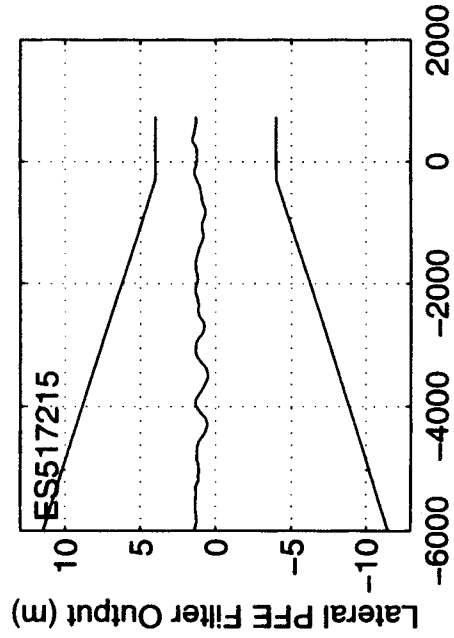
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----

LGRP Xrcs POSITION (m): 162.972  
LGRP Yrcs POSITION (m): -1.037

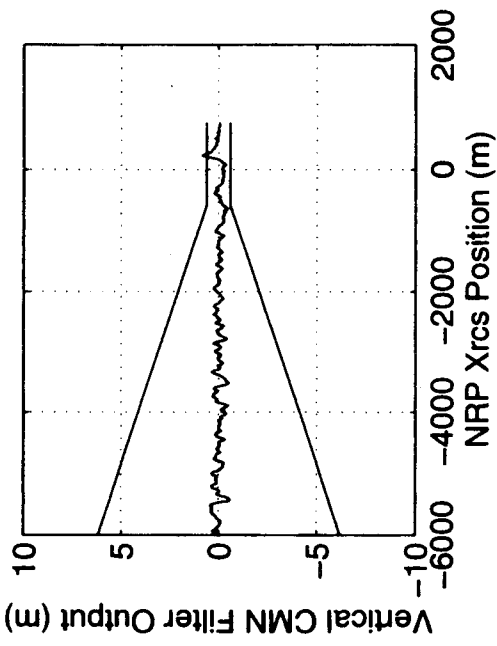
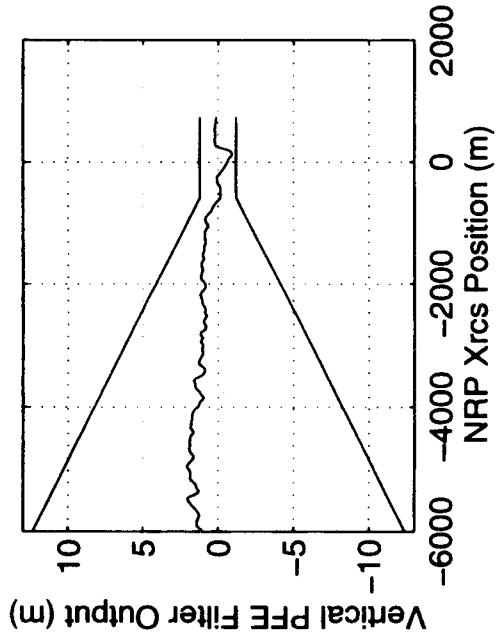
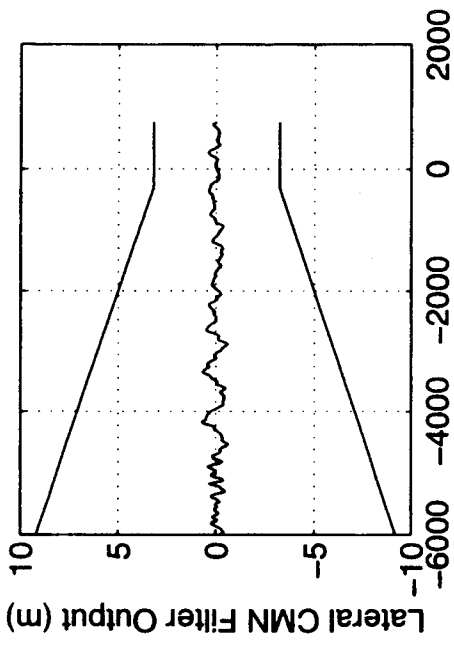




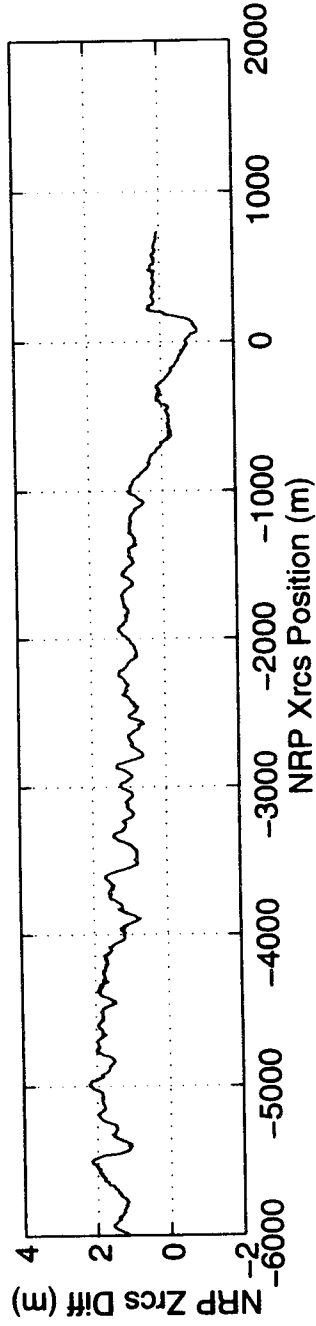
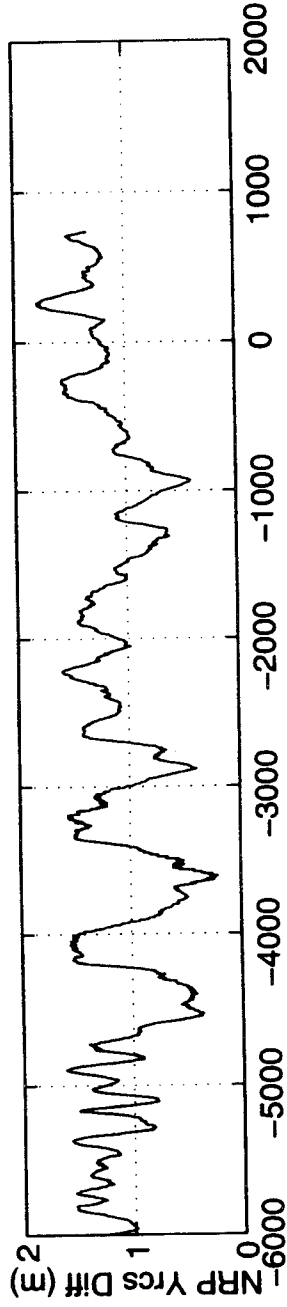
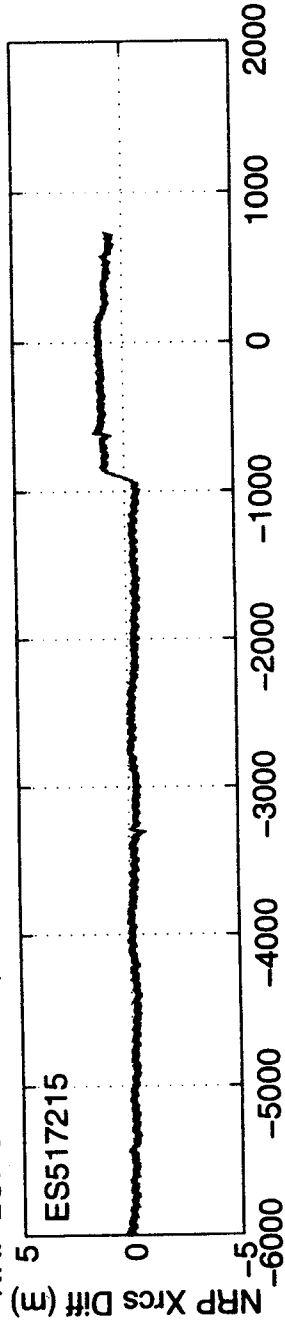
PATH FOLLOWING ERROR



CONTROL MOTION NOISE



NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517216  
START TIME: 336088.396  
STOP TIME: 336235.913

MINIMUM HDOP: 0.7  
MAXIMUM HDOP: 0.8  
AVERAGE HDOP: 0.7

MINIMUM VDOP: 1.7  
MAXIMUM VDOP: 1.8  
AVERAGE VDOP: 1.7

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

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TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
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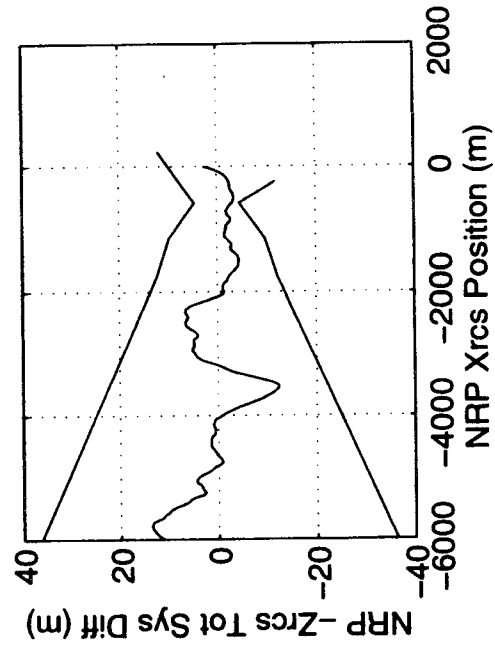
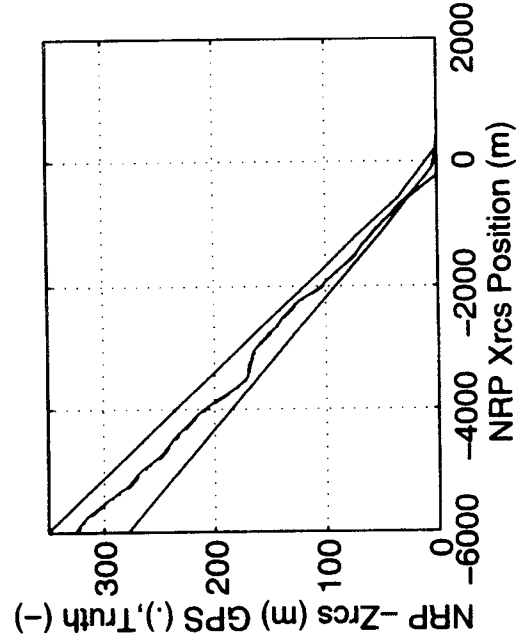
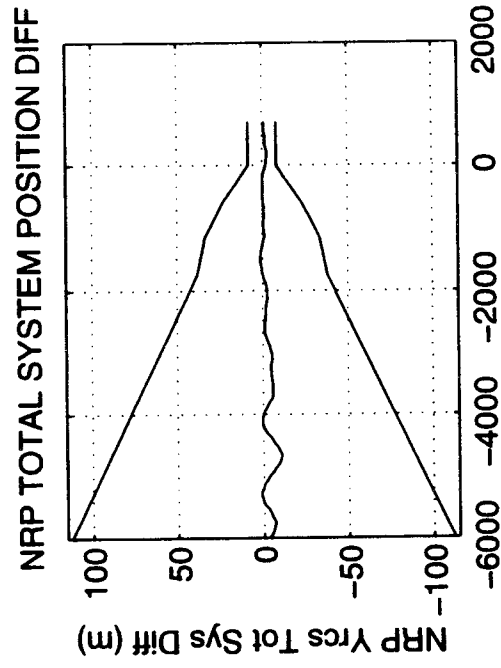
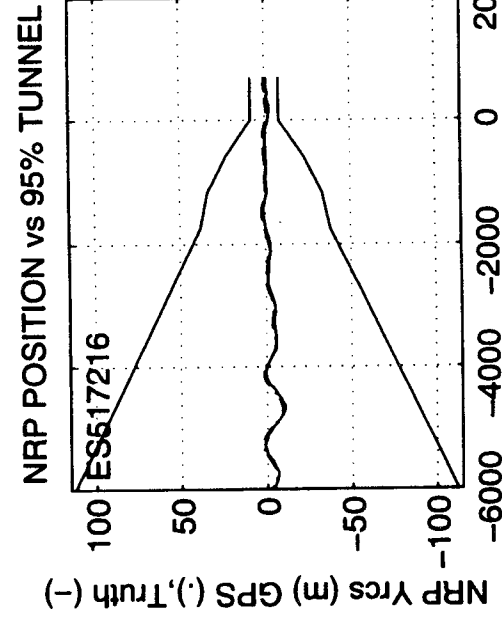
NRP Xrcs MEAN DIFFERENCE (m): 0.751  
NRP Yrcs MEAN DIFFERENCE (m): 1.204  
NRP Zrcs MEAN DIFFERENCE (m): 0.061

NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.910  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.585  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.822

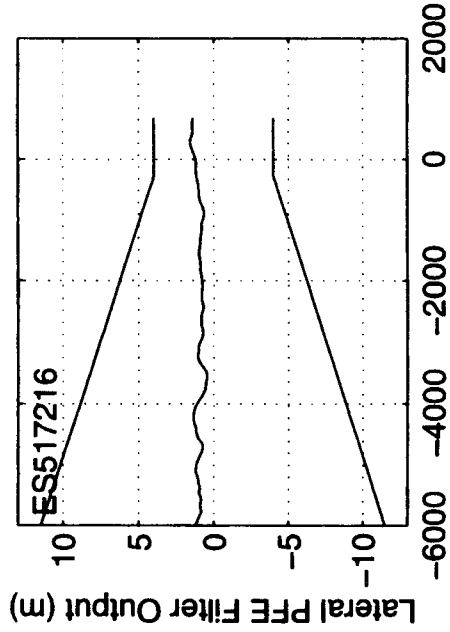
NRP Xrcs 2-RMS DIFFERENCE (m): 1.755  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.478  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.831

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LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
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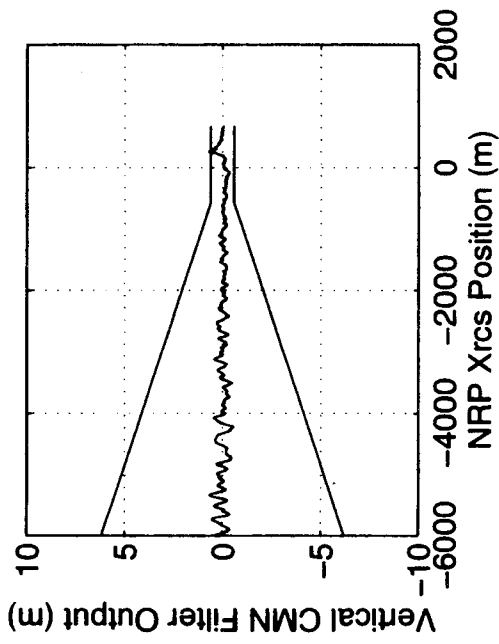
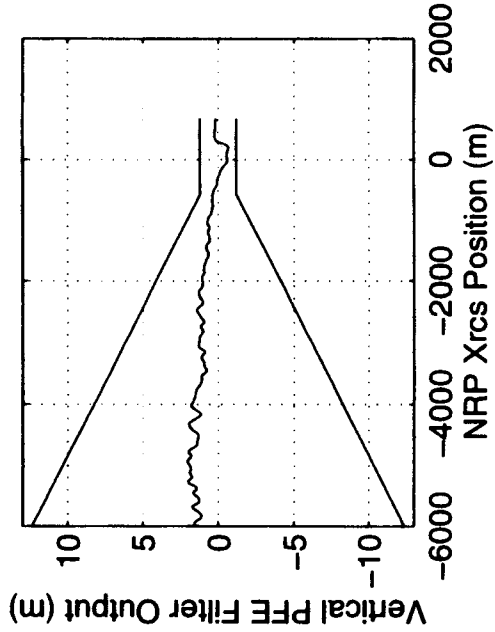
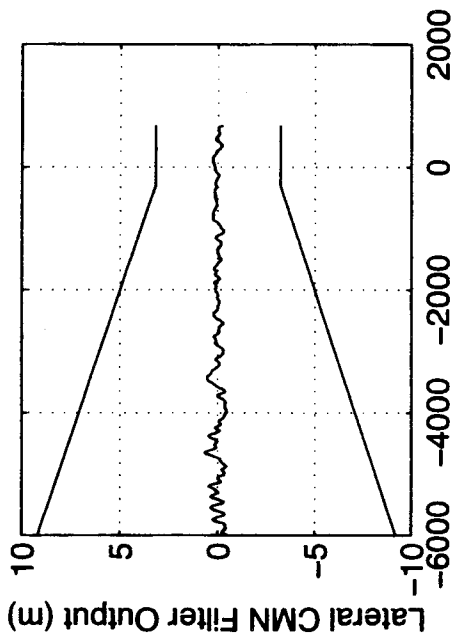
LGRP Xrcs POSITION (m): 235.617  
LGRP Yrcs POSITION (m): -2.115



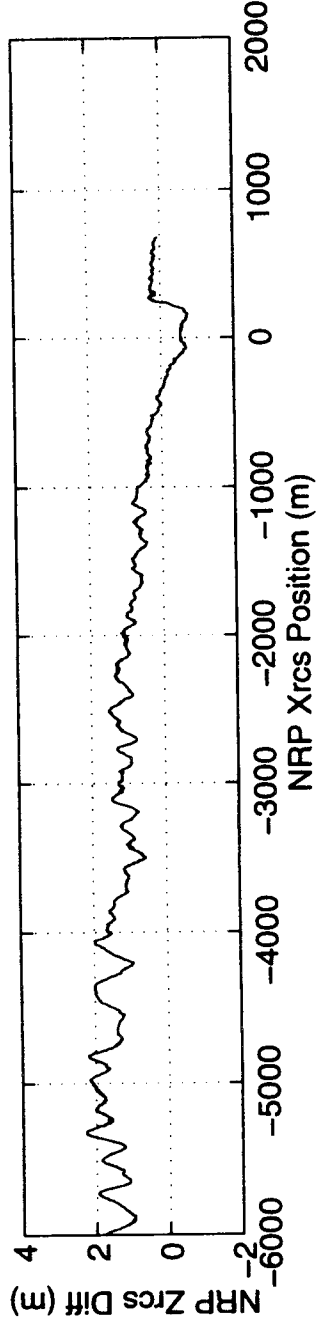
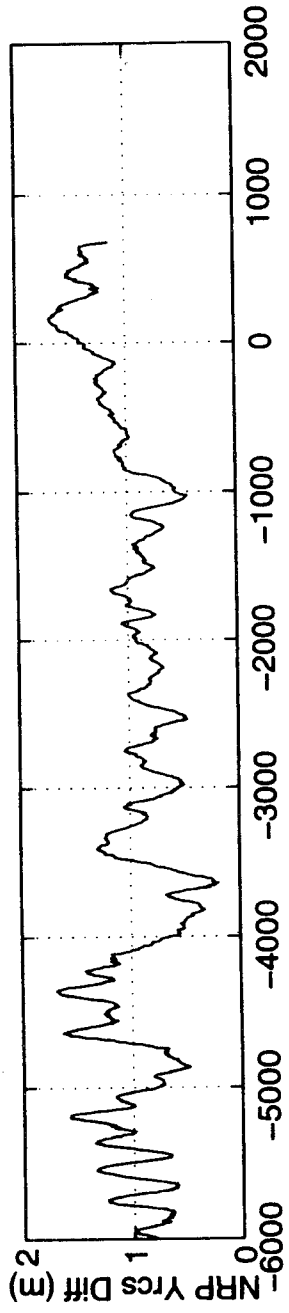
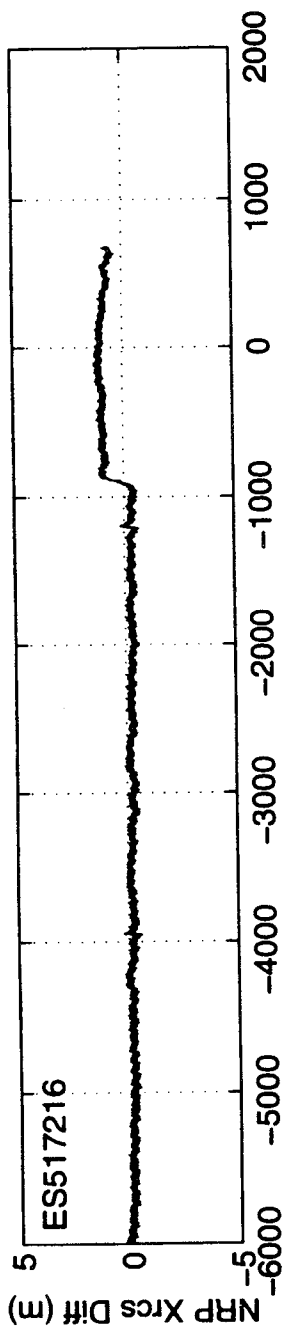
PATH FOLLOWING ERROR



CONTROL MOTION NOISE



NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517217  
START TIME: 336601.264  
STOP TIME: 336755.583

MINIMUM HDOP: 0.8  
MAXIMUM HDOP: 0.9  
AVERAGE HDOP: 0.9

MINIMUM VDOP: 1.8  
MAXIMUM VDOP: 3.1  
AVERAGE VDOP: 2.7

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

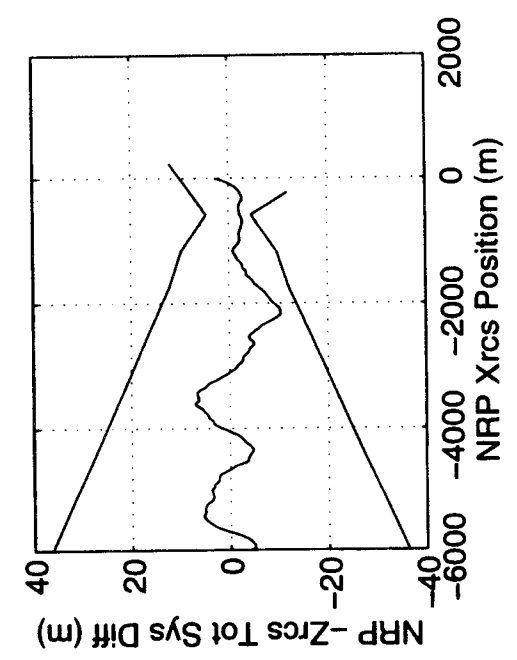
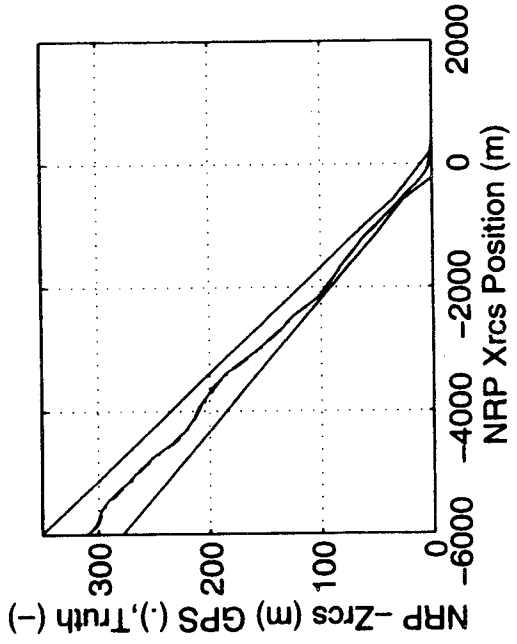
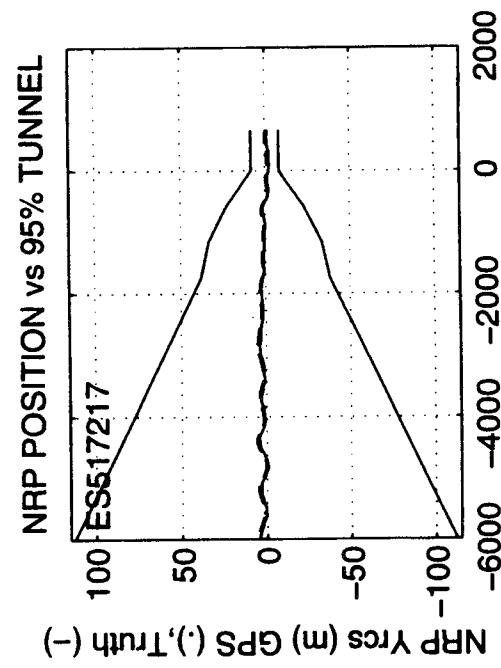
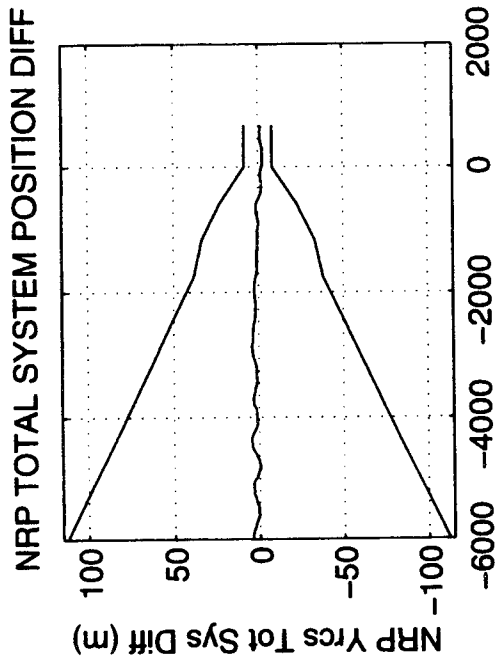
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.682  
NRP Yrcs MEAN DIFFERENCE (m): 1.137  
NRP Zrcs MEAN DIFFERENCE (m): 0.073

NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.801  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.466  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.787

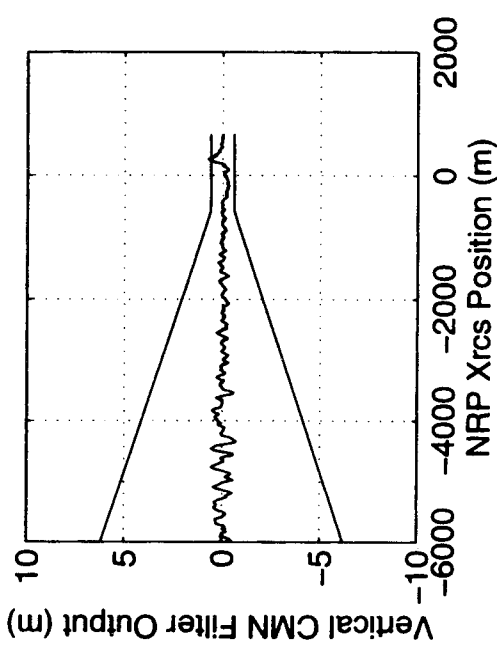
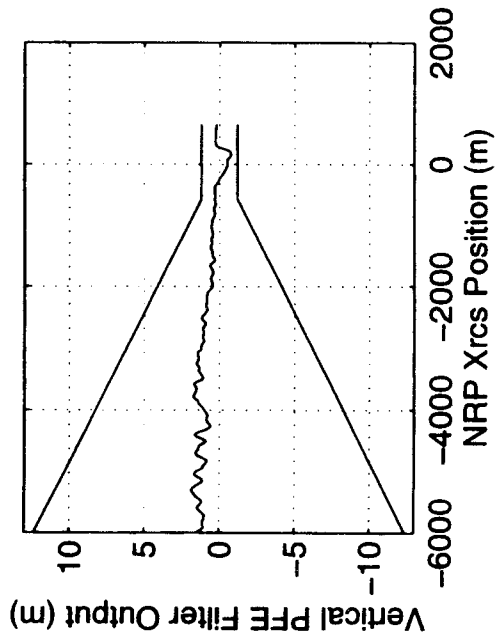
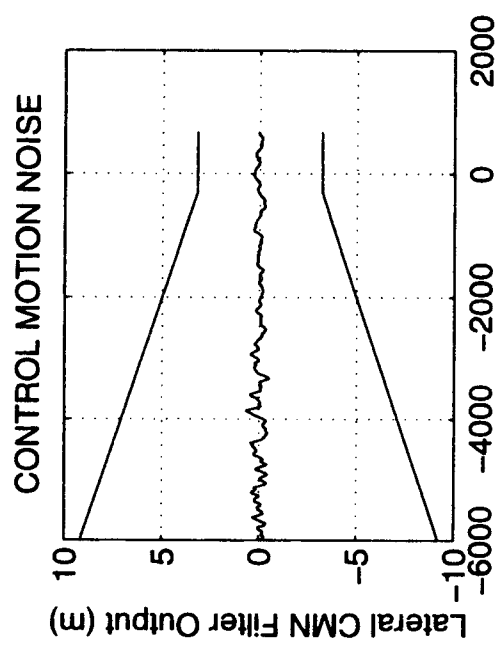
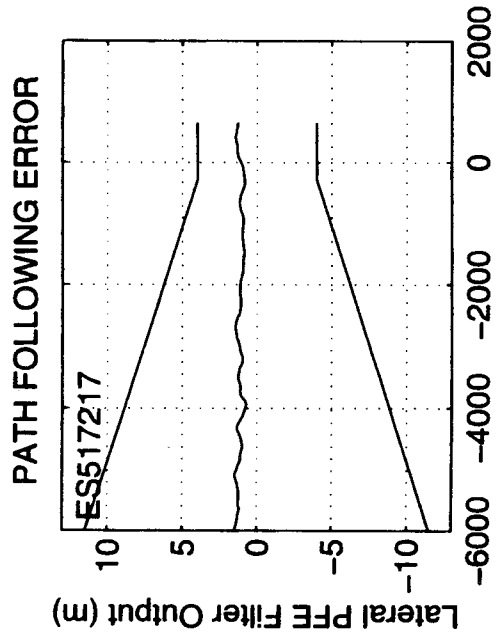
NRP Xrcs 2-RMS DIFFERENCE (m): 1.582  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.322  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.801

-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

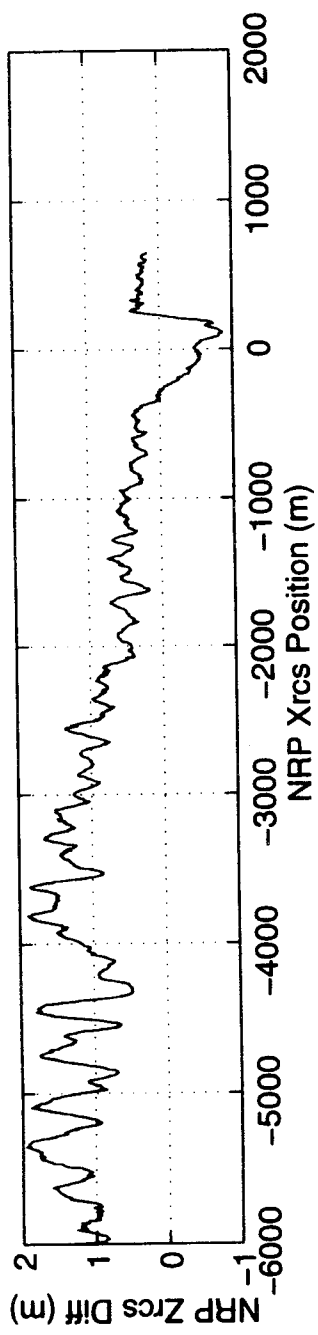
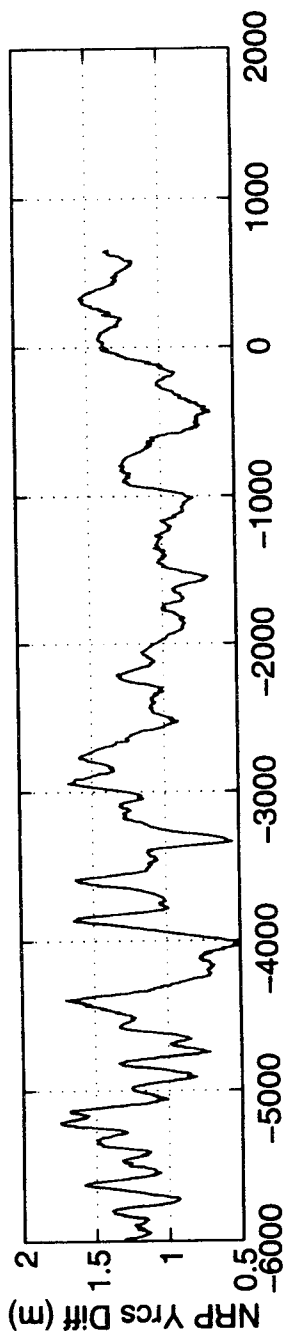
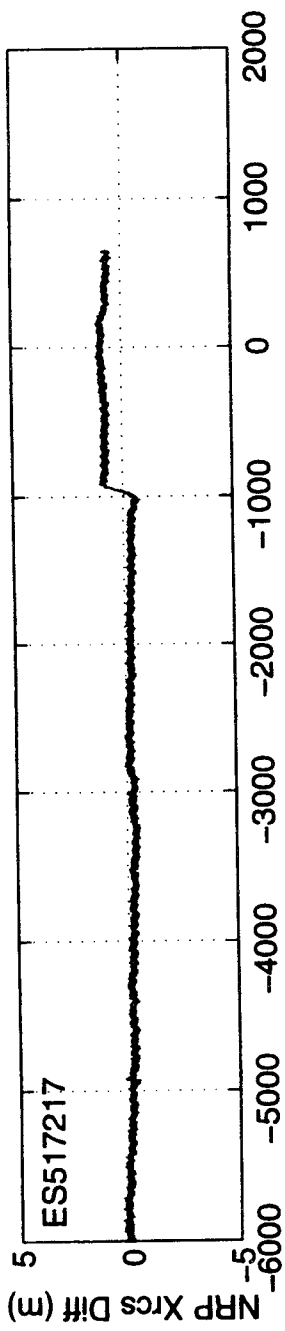
-----  
LGRP Xrcs POSITION (m): 202.738  
LGRP Yrcs POSITION (m): -1.979







NRP LONGITUDINAL, LATERAL AND VERTICAL POSITION DIFFERENCES



APPROACH #: ES517218  
START TIME: 337125.660  
STOP TIME: 337275.319

MINIMUM HDOP: 0.9  
MAXIMUM HDOP: 0.9  
AVERAGE HDOP: 0.9

MINIMUM VDOP: 3.0  
MAXIMUM VDOP: 3.1  
AVERAGE VDOP: 3.1

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* UNSUCCESSFUL APPROACH (MOS 1) DUE TO LESS THAN \*  
\* 95 PERCENT OF ALL OF THE DATA POINTS WITHIN \*  
\* THE VERTICAL FILTER REQUIREMENTS \*  
\*\*\*\*\*

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TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
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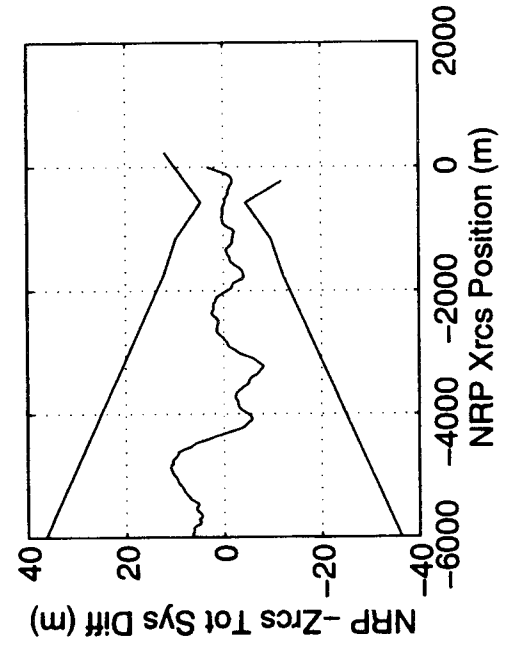
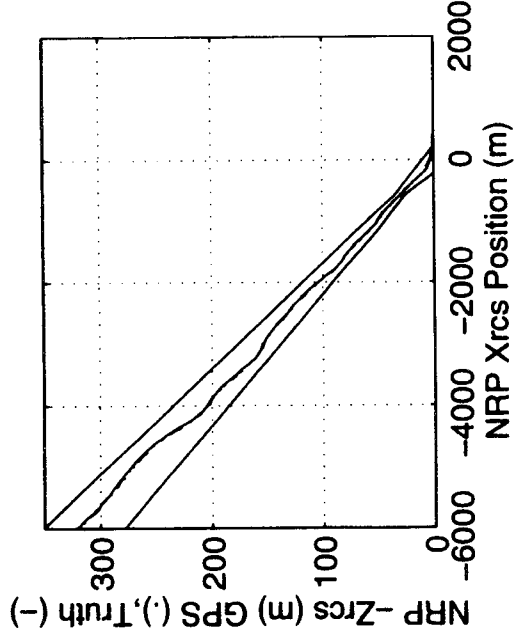
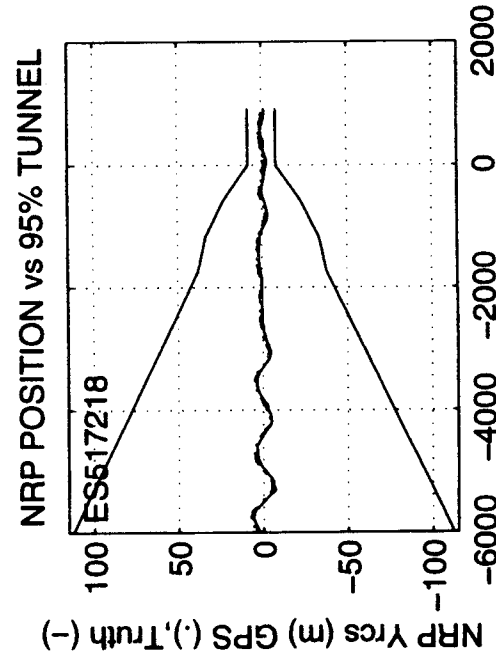
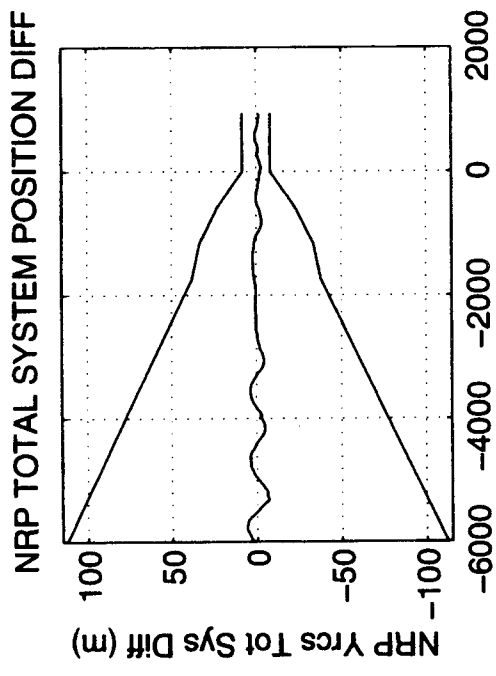
NRP Xrcs MEAN DIFFERENCE (m): 0.621  
NRP Yrcs MEAN DIFFERENCE (m): 1.316  
NRP Zrcs MEAN DIFFERENCE (m): -0.217

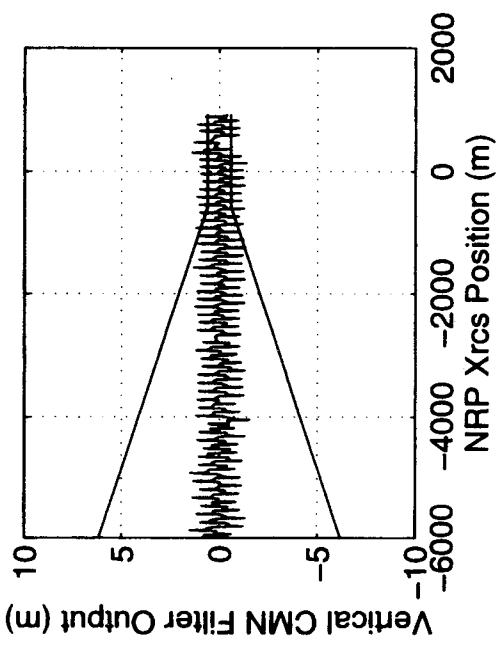
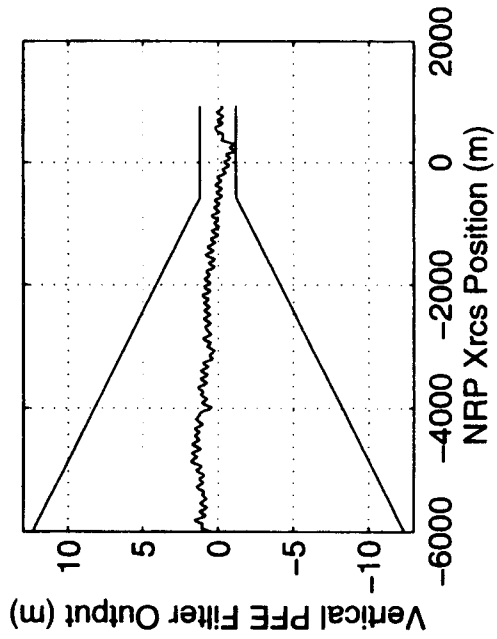
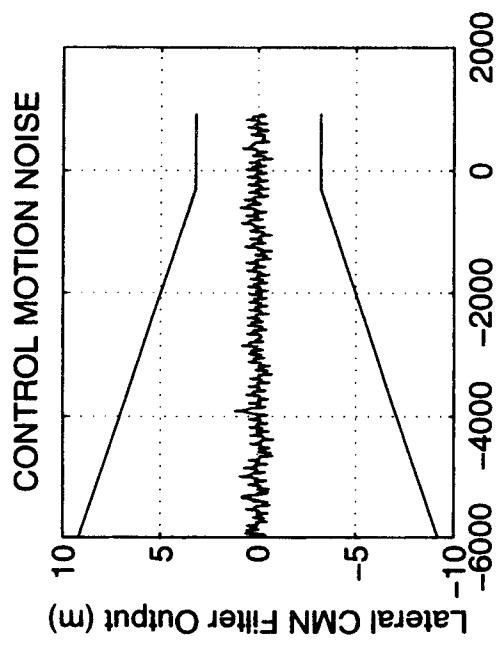
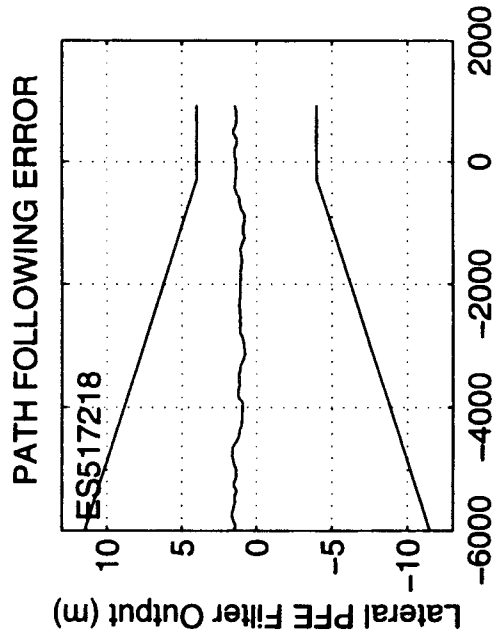
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.893  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.654  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 1.123

NRP Xrcs 2-RMS DIFFERENCE (m): 1.530  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.712  
NRP Zrcs 2-RMS DIFFERENCE (m): 1.204

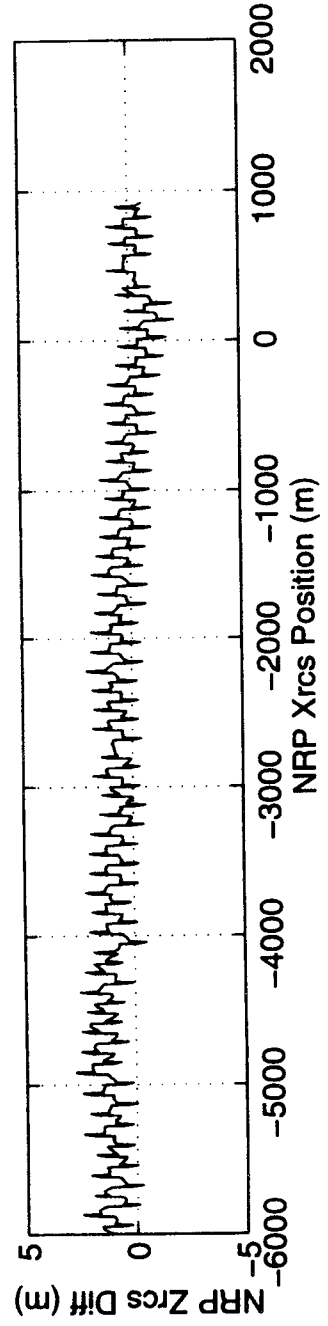
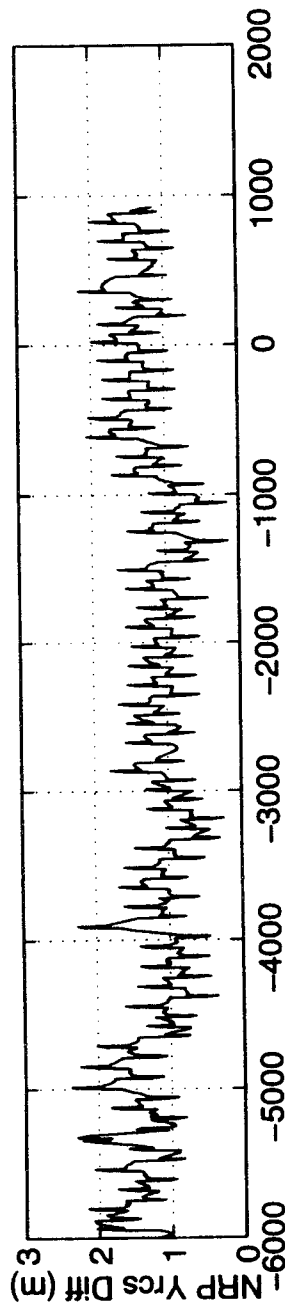
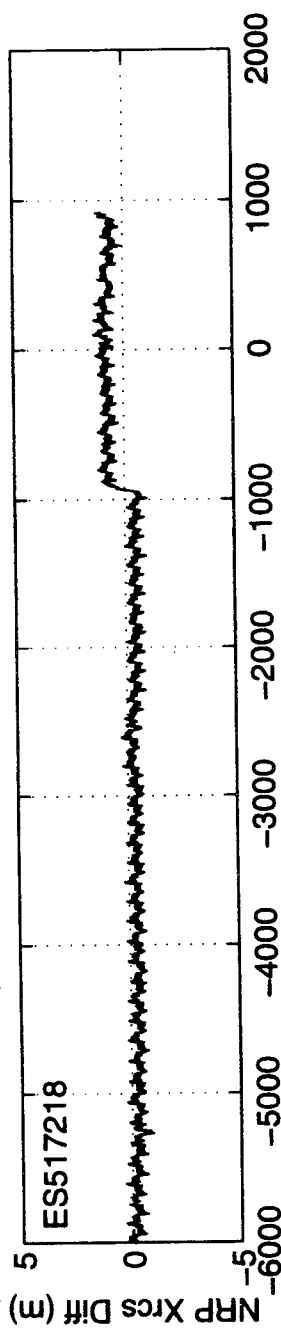
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----

LGRP Xrcs POSITION (m): 341.769  
LGRP Yrcs POSITION (m): -0.530





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517219  
START TIME: 341276.264  
STOP TIME: 341430.309

MINIMUM HDOP: 0.5  
MAXIMUM HDOP: 1.2  
AVERAGE HDOP: 0.7

MINIMUM VDOP: 1.3  
MAXIMUM VDOP: 3.2  
AVERAGE VDOP: 1.7

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 9  
AVERAGE NUMBER OF SVs: 9

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* UNSUCCESSFUL APPROACH (MOS 6) DUE TO  
\* FALSE LATERAL INTEGRITY ALARMS: 20  
\* UNDER NORMAL OPERATIONS  
\*\*\*\*\*

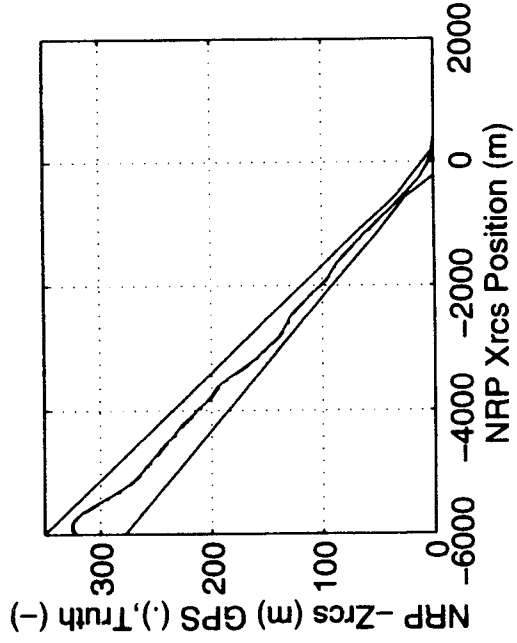
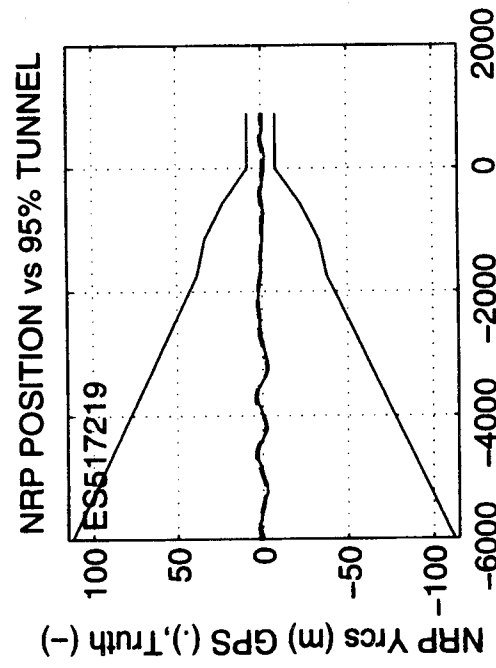
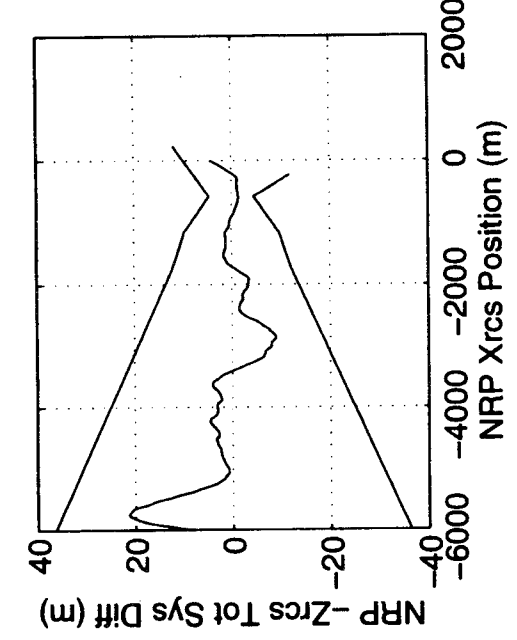
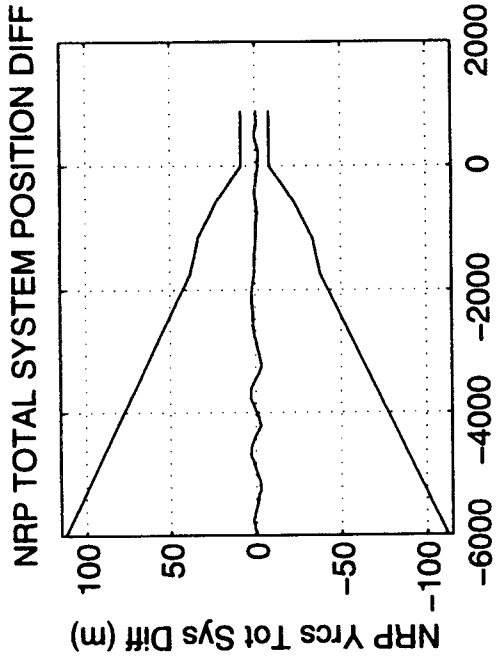
TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

-----  
NRP Xrcs MEAN DIFFERENCE (m) : 0.486  
NRP Yrcs MEAN DIFFERENCE (m) : 1.161  
NRP Zrcs MEAN DIFFERENCE (m) : 0.130

NRP Xrcs 2-SIGMA DIFFERENCE (m) : 1.208  
NRP Yrcs 2-SIGMA DIFFERENCE (m) : 0.439  
NRP Zrcs 2-SIGMA DIFFERENCE (m) : 0.935

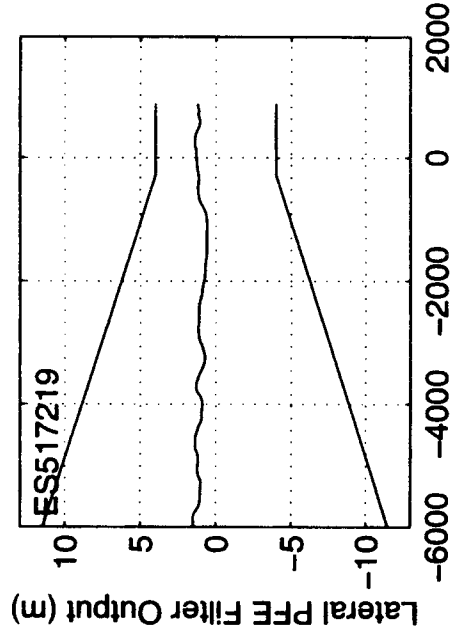
NRP Xrcs 2-RMS DIFFERENCE (m) : 1.550  
NRP Yrcs 2-RMS DIFFERENCE (m) : 2.364  
NRP Zrcs 2-RMS DIFFERENCE (m) : 0.971

-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----  
LGRP Xrcs POSITION (m) : 462.258  
LGRP Yrcs POSITION (m) : 0.645

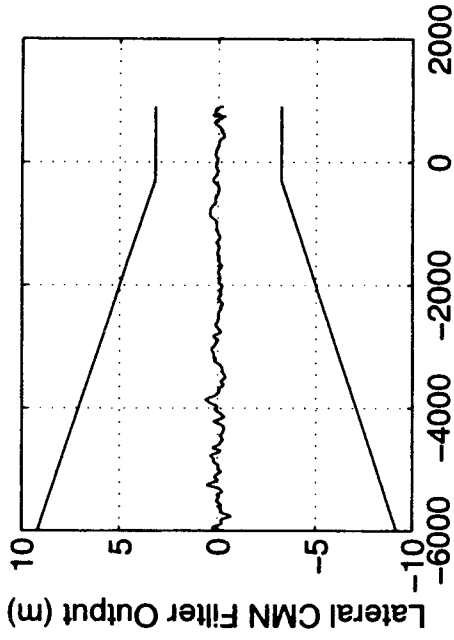




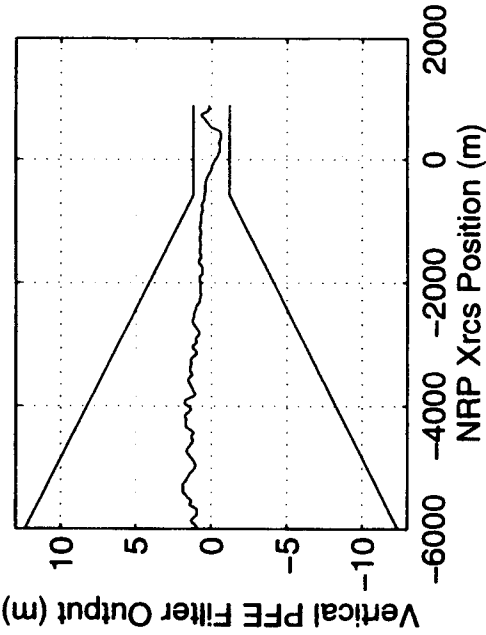
PATH FOLLOWING ERROR



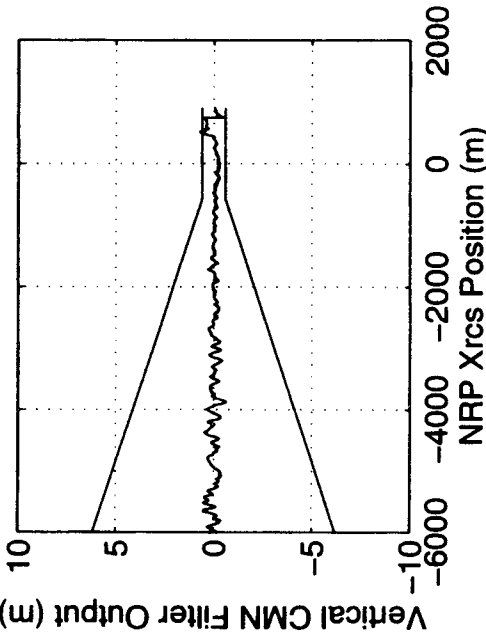
CONTROL MOTION NOISE



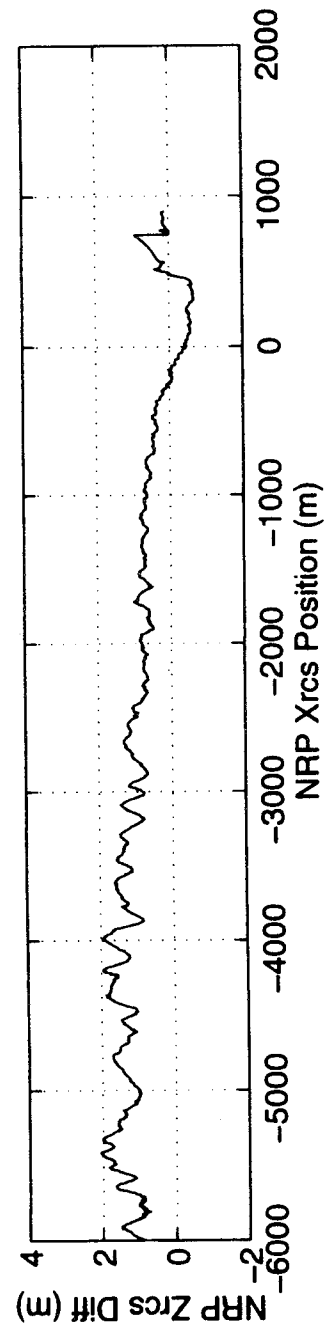
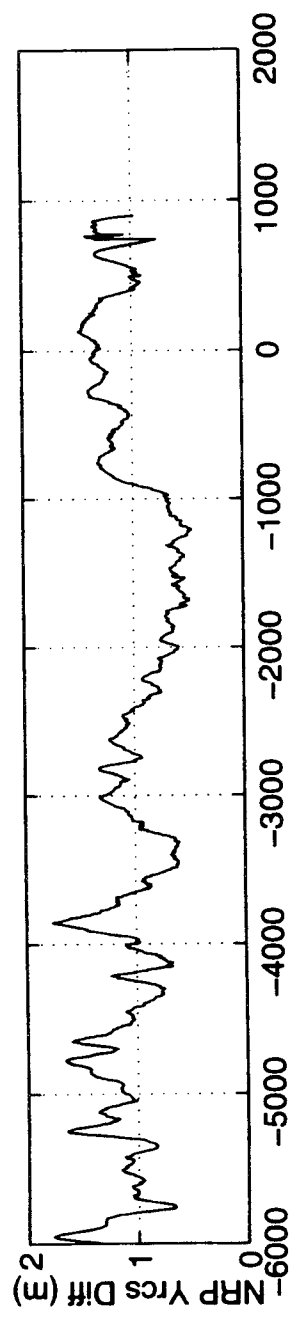
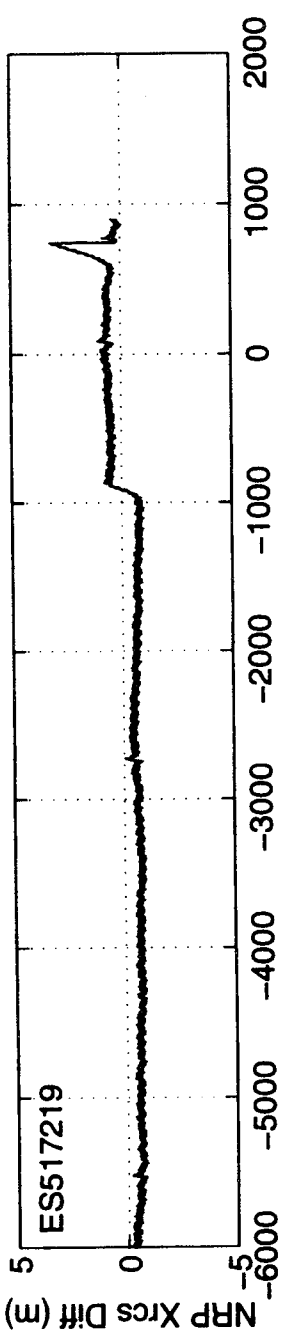
Vertical PFE Filter Output (m)



Vertical CMN Filter Output (m)



NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517220  
START TIME: 341831.594  
STOP TIME: 341988.517

MINIMUM HDOP: 0.6  
MAXIMUM HDOP: 0.6  
AVERAGE HDOP: 0.6

MINIMUM VDOP: 1.6  
MAXIMUM VDOP: 1.7  
AVERAGE VDOP: 1.7

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

-----  
TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
-----

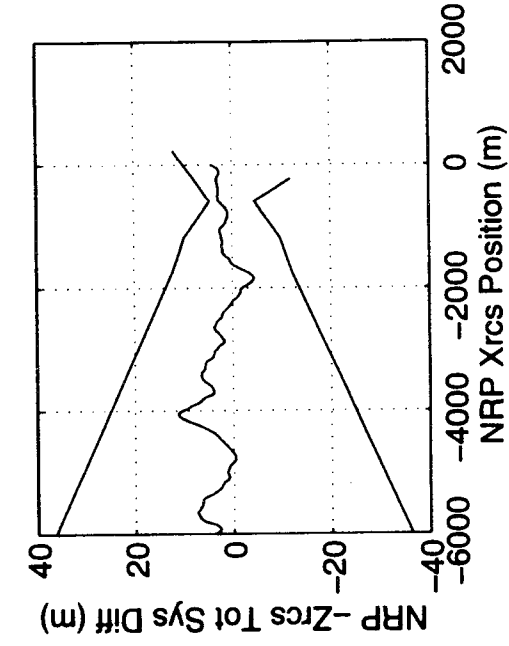
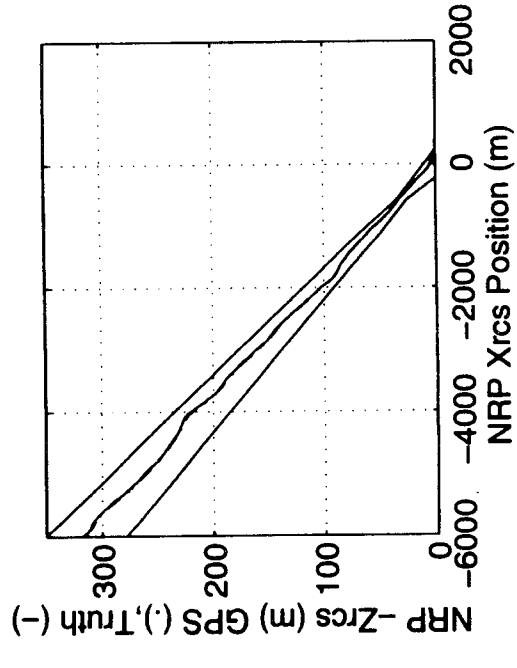
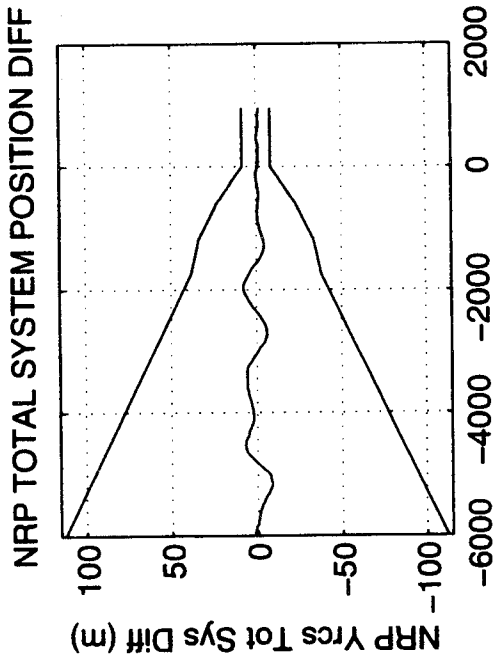
NRP Xrcs MEAN DIFFERENCE (m): 0.388  
NRP Yrcs MEAN DIFFERENCE (m): 1.287  
NRP Zrcs MEAN DIFFERENCE (m): 0.028

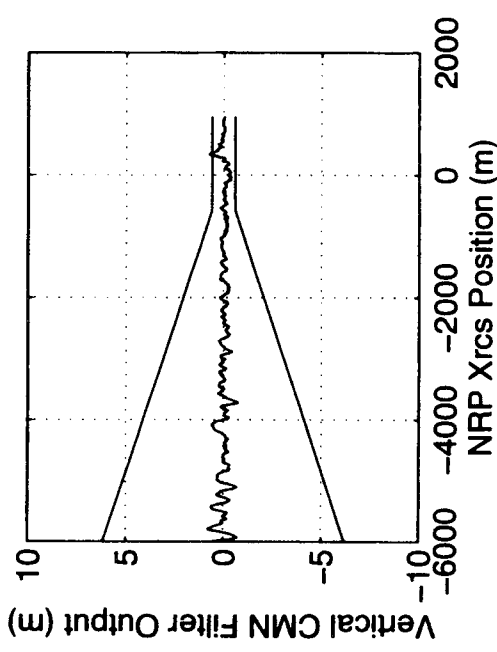
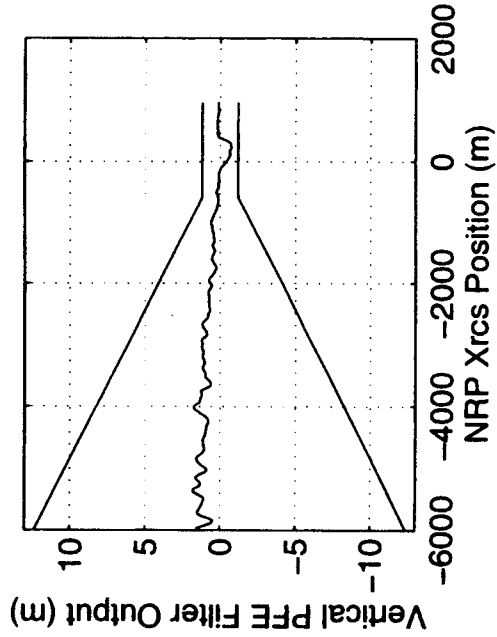
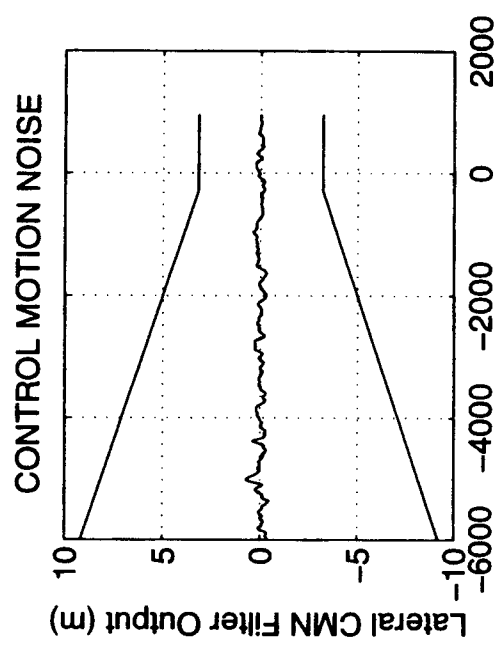
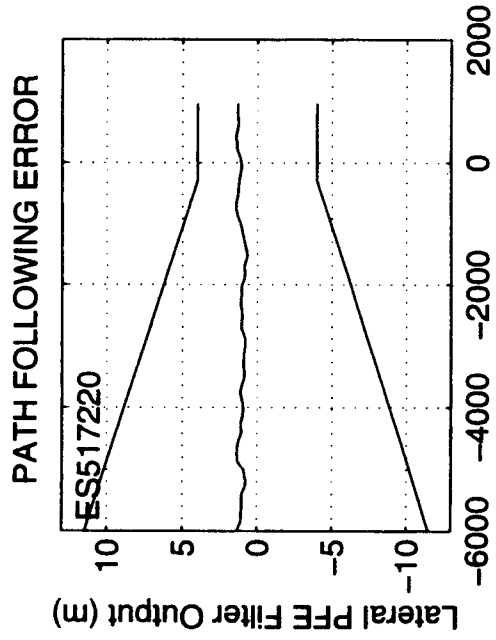
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.725  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.285  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.723

NRP Xrcs 2-RMS DIFFERENCE (m): 1.062  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.590  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.726

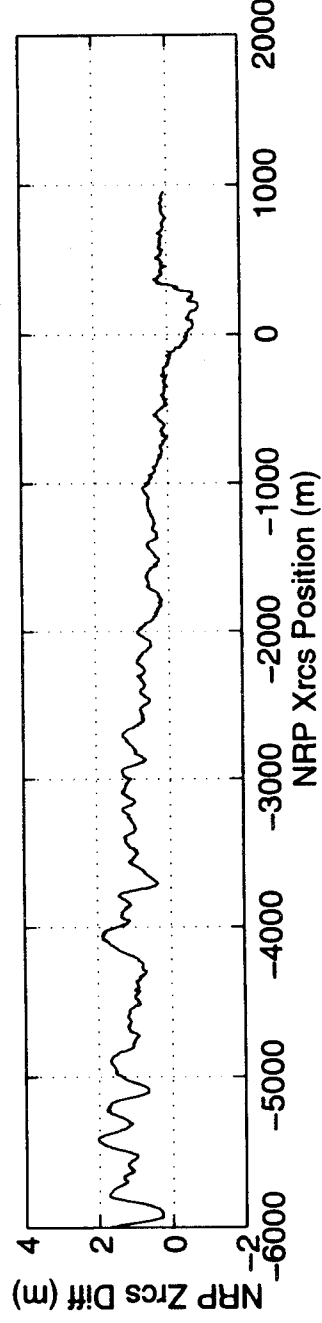
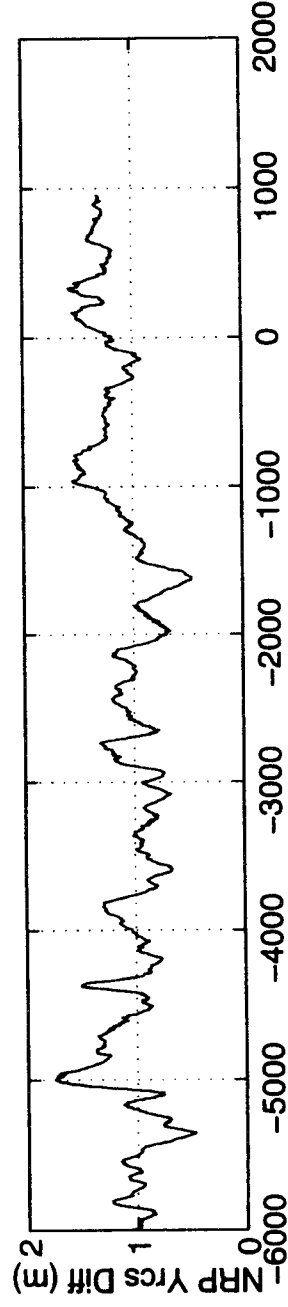
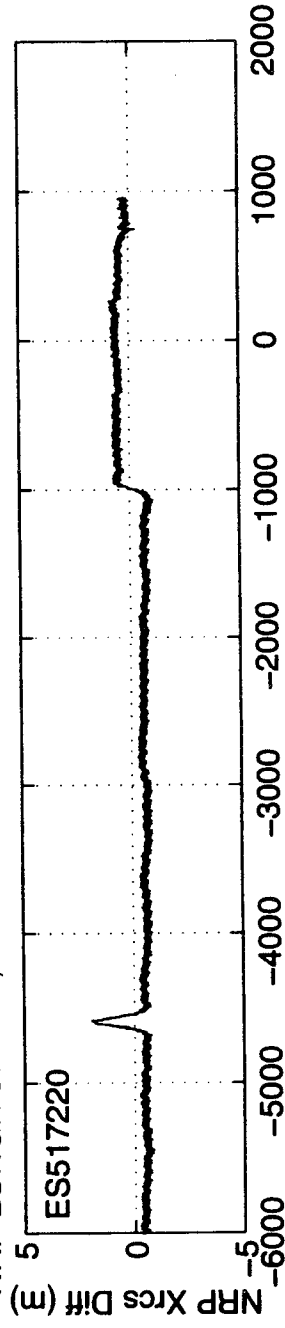
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----

LGRP Xrcs POSITION (m): 316.266  
LGRP Yrcs POSITION (m): -0.810





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517221  
START TIME: 342361.198  
STOP TIME: 342519.990

MINIMUM HDOP: 0.6  
MAXIMUM HDOP: 0.6  
AVERAGE HDOP: 0.6

MINIMUM VDOP: 1.8  
MAXIMUM VDOP: 1.8  
AVERAGE VDOP: 1.8

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

-----  
TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
-----

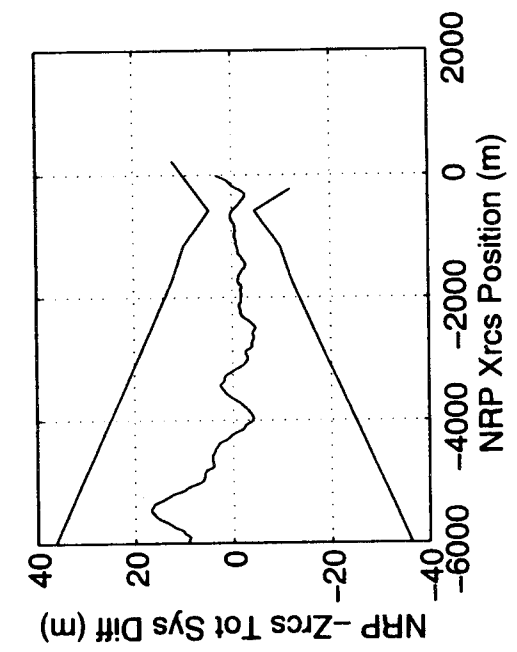
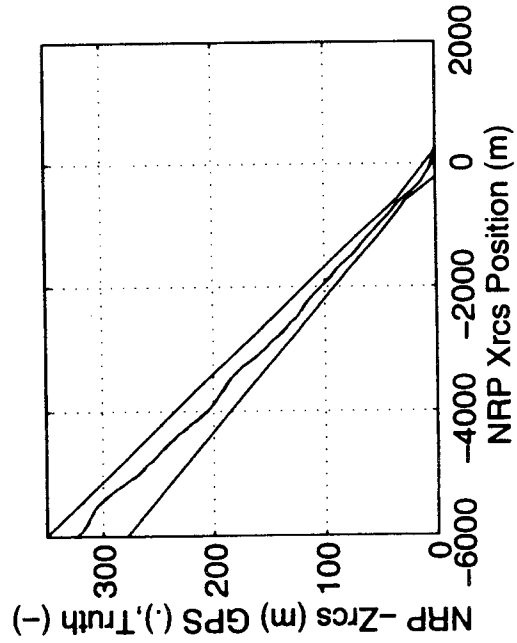
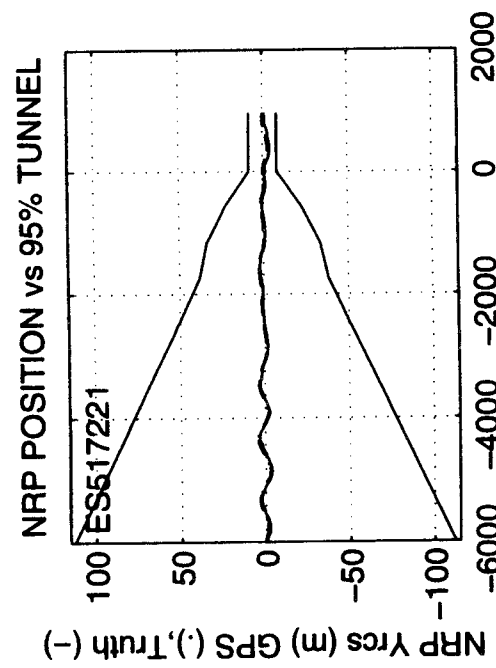
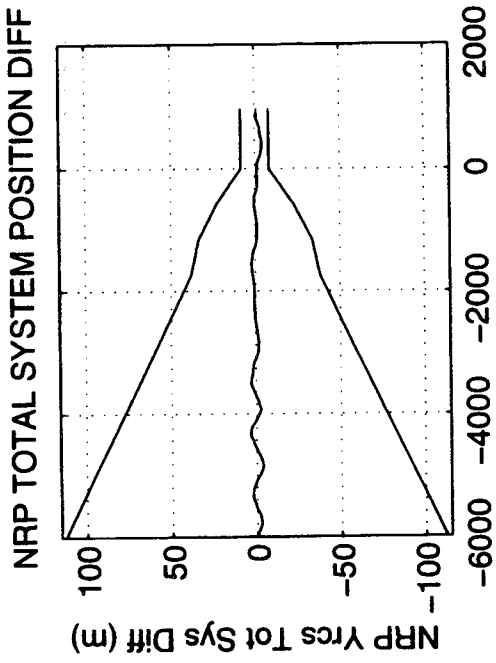
NRP Xrcs MEAN DIFFERENCE (m): 0.442  
NRP Yrcs MEAN DIFFERENCE (m): 1.225  
NRP Zrcs MEAN DIFFERENCE (m): -0.114

NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.577  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.430  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.837

NRP Xrcs 2-RMS DIFFERENCE (m): 1.056  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.487  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.868

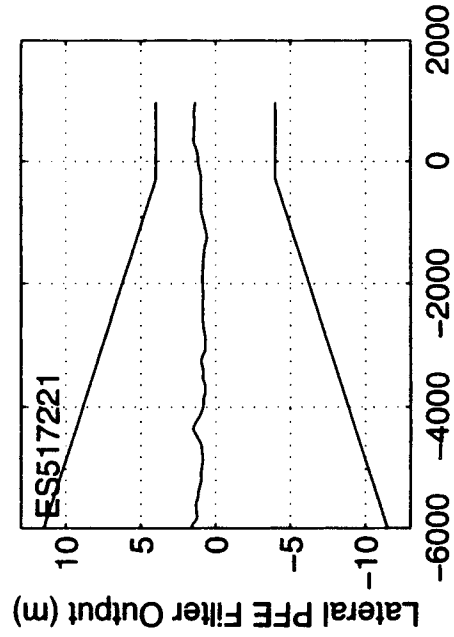
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----

LGRP Xrcs POSITION (m): 351.948  
LGRP Yrcs POSITION (m): -3.666

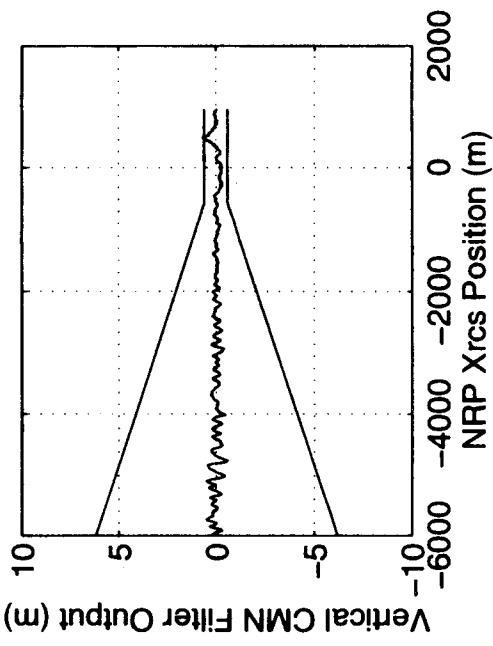
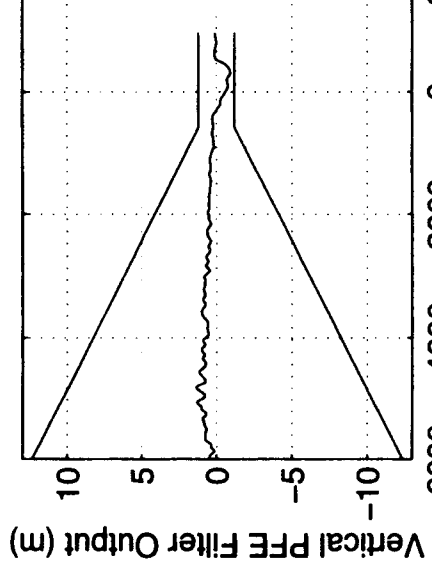
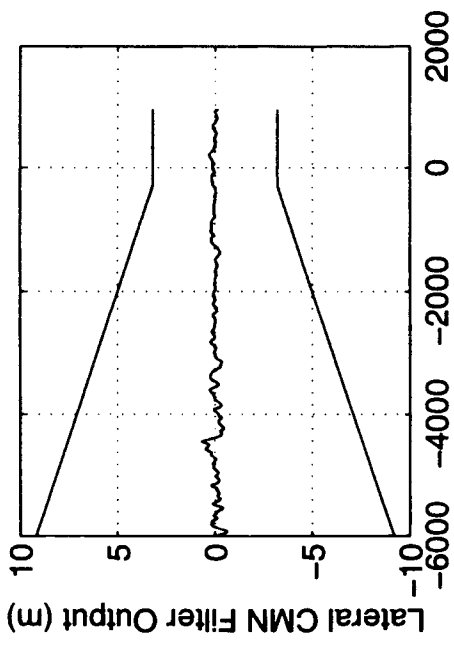




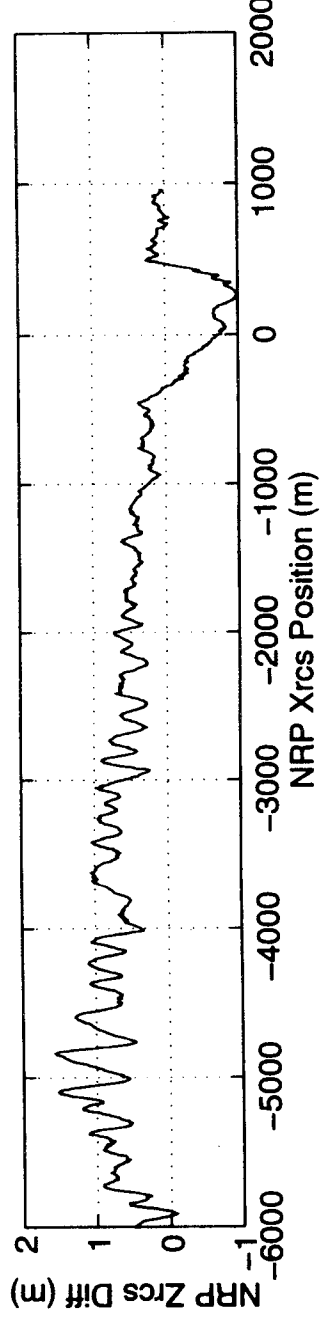
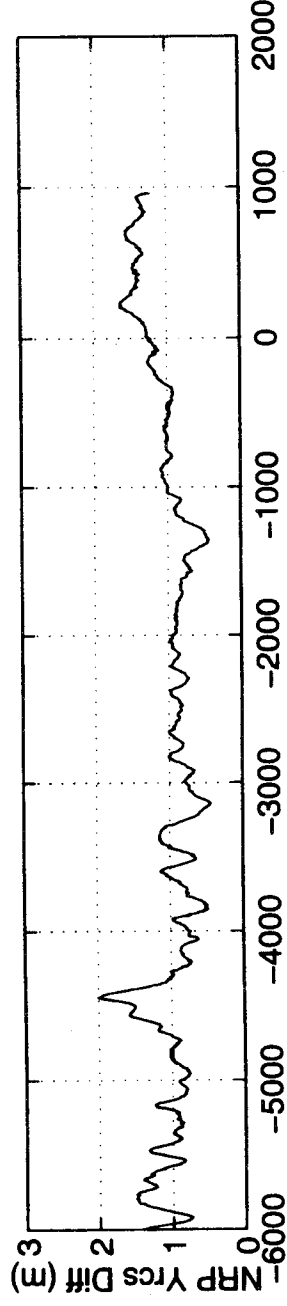
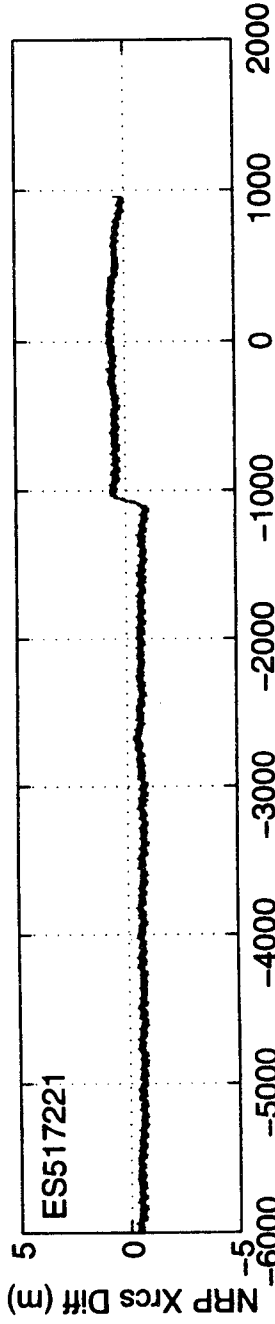
PATH FOLLOWING ERROR



CONTROL MOTION NOISE



NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517222  
START TIME: 342906.122  
STOP TIME: 343062.122

MINIMUM HDOP: 0.6  
MAXIMUM HDOP: 0.6  
AVERAGE HDOP: 0.6

MINIMUM VDOP: 2.5  
MAXIMUM VDOP: 2.6  
AVERAGE VDOP: 2.5

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

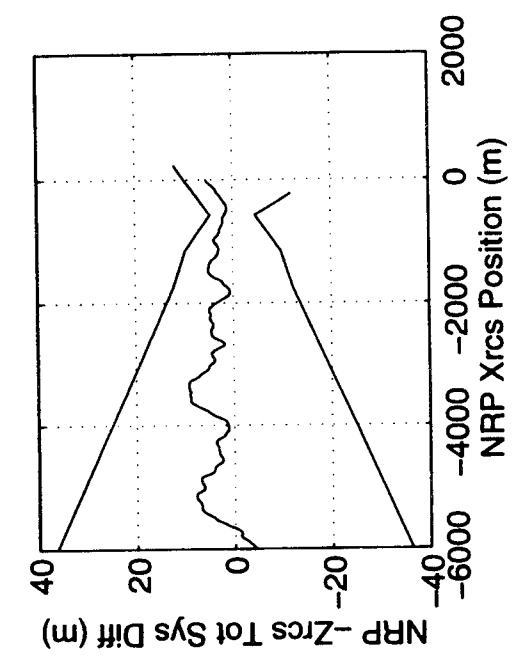
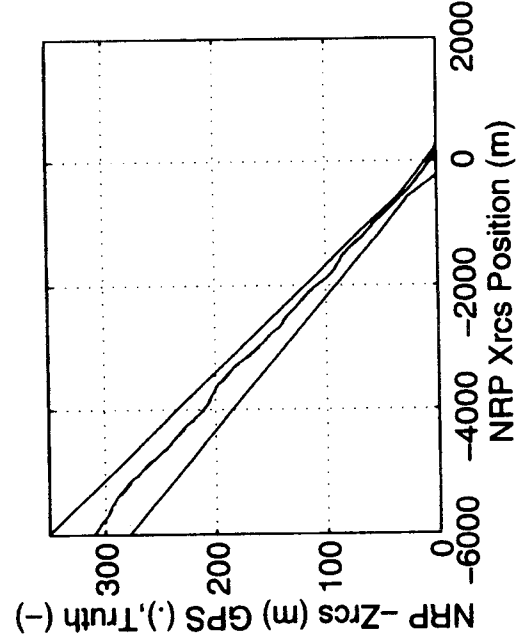
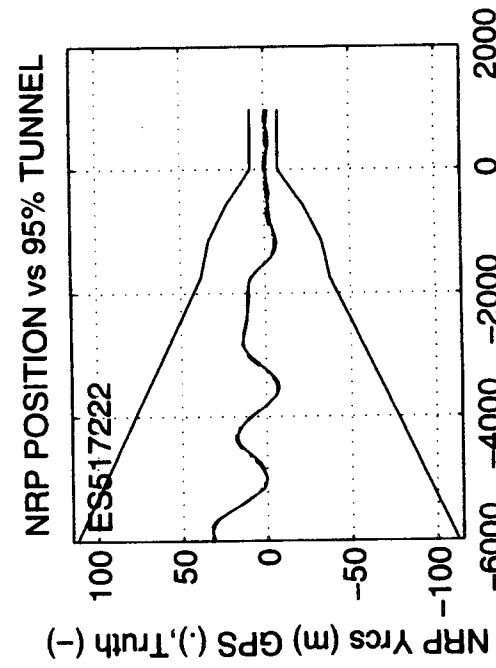
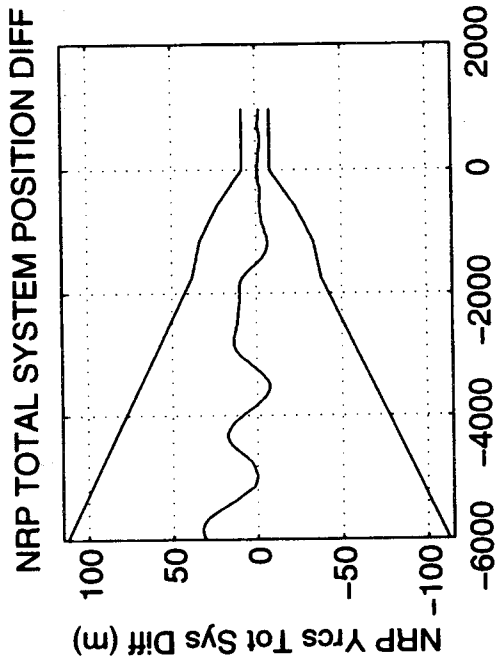
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.337  
NRP Yrcs MEAN DIFFERENCE (m): 1.272  
NRP Zrcs MEAN DIFFERENCE (m): -0.077

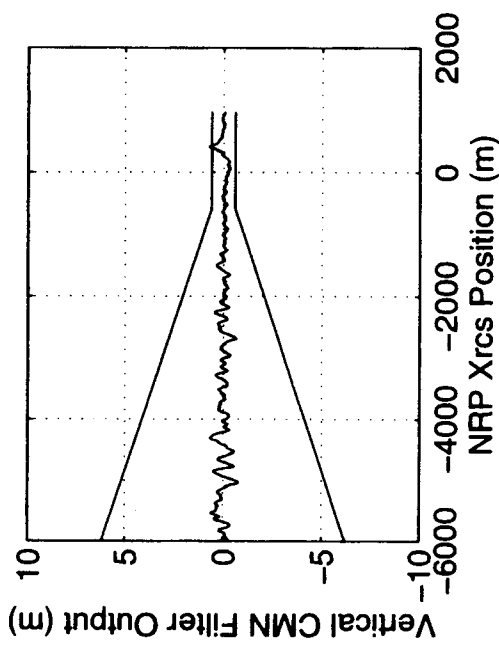
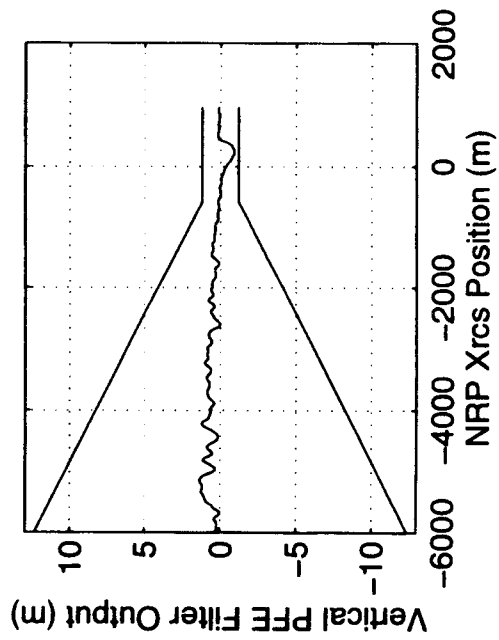
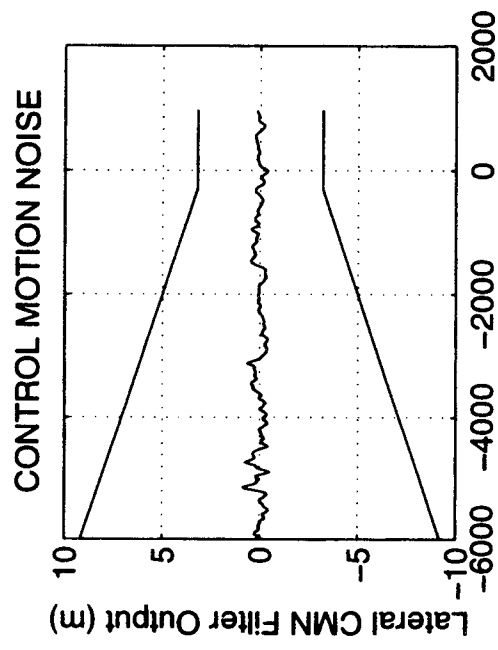
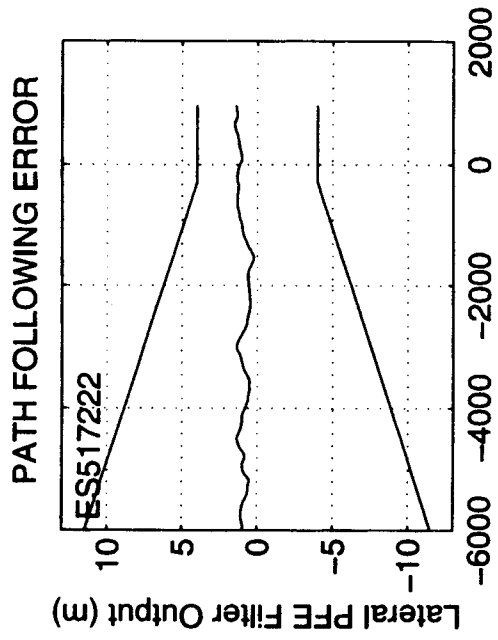
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.716  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.365  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.717

NRP Xrcs 2-RMS DIFFERENCE (m): 0.984  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.570  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.733

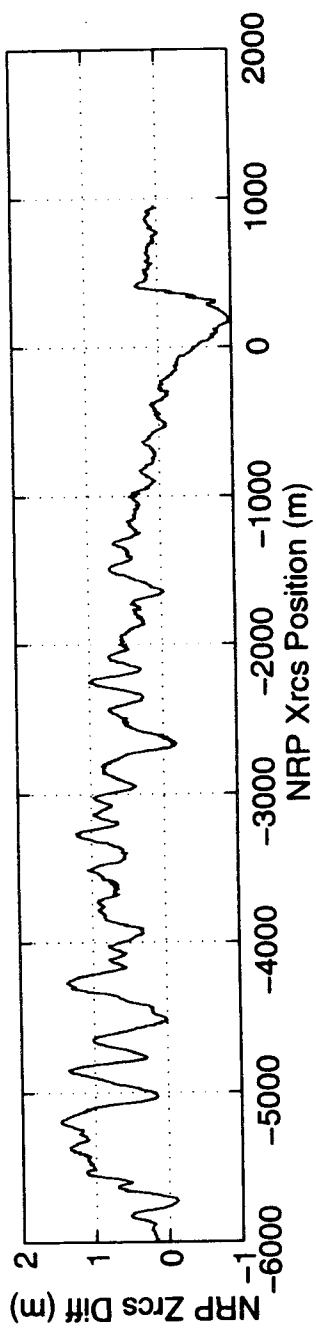
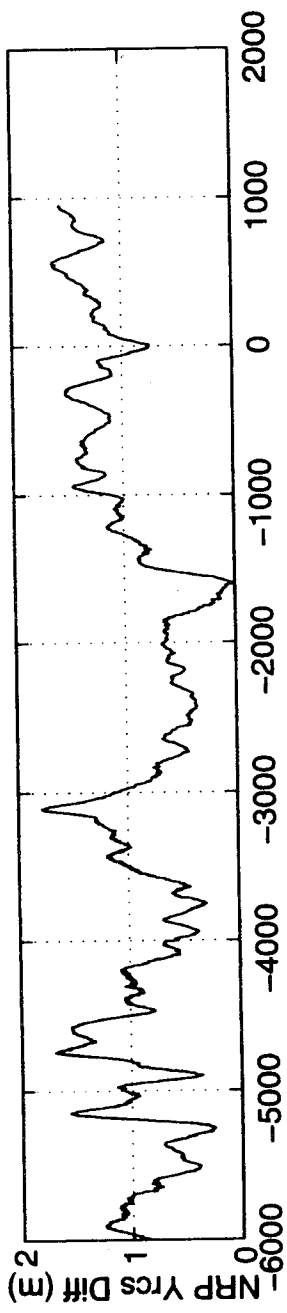
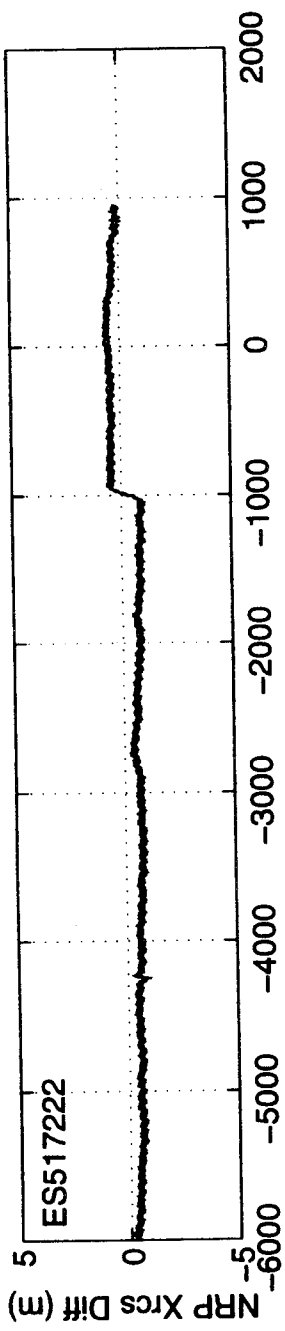
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 315.455  
LGRP Yrcs POSITION (m): -1.552





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517223  
START TIME: 343435.451  
STOP TIME: 343589.715

MINIMUM HDOP: 0.6  
MAXIMUM HDOP: 0.6  
AVERAGE HDOP: 0.6

MINIMUM VDOP: 2.7  
MAXIMUM VDOP: 2.8  
AVERAGE VDOP: 2.7

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

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TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
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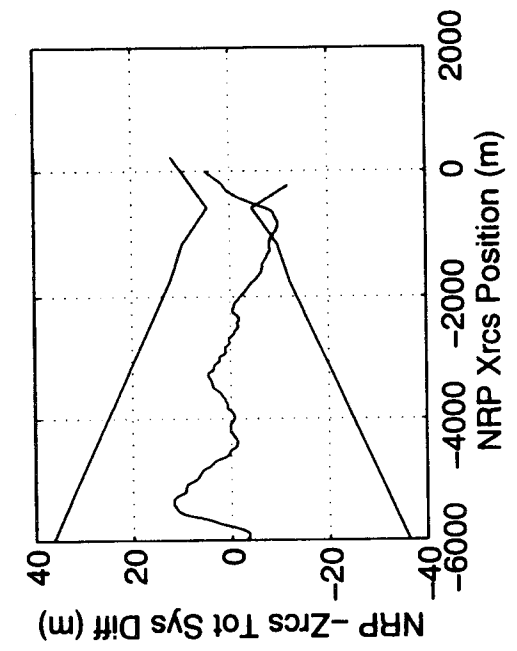
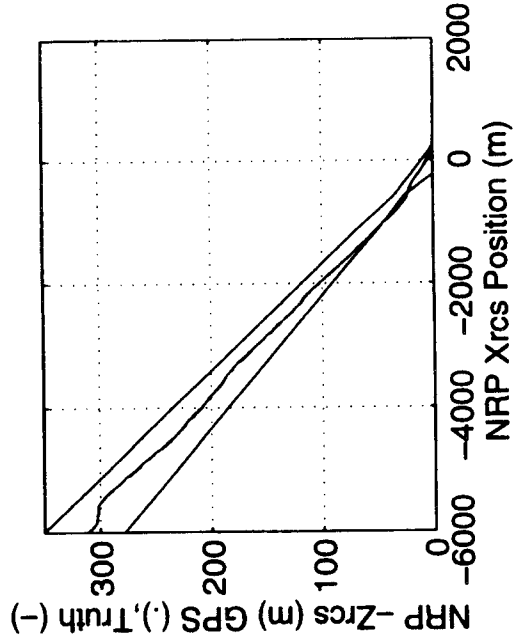
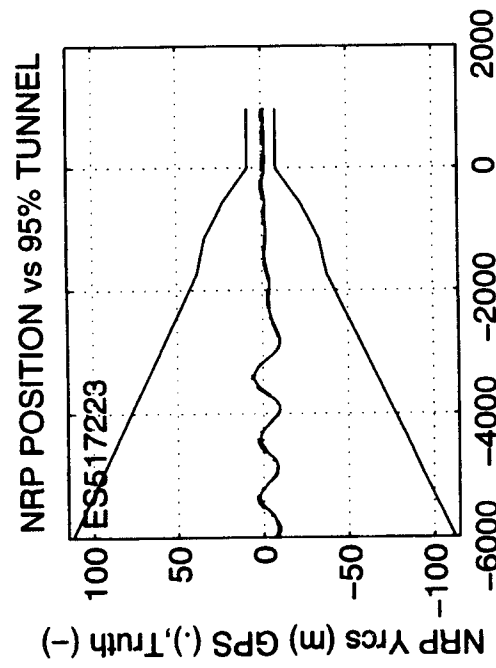
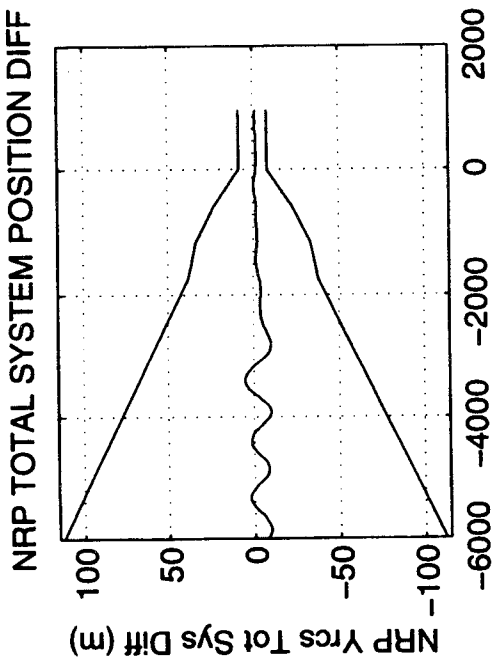
NRP Xrcs MEAN DIFFERENCE (m): 0.420  
NRP Yrcs MEAN DIFFERENCE (m): 1.164  
NRP Zrcs MEAN DIFFERENCE (m): -0.178

NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.687  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.703  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.573

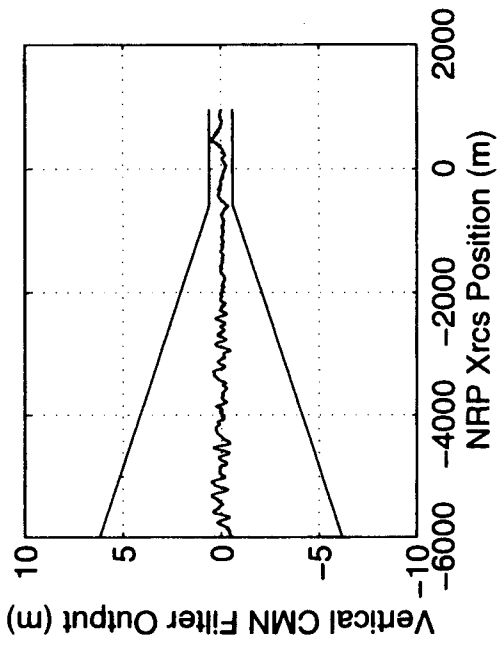
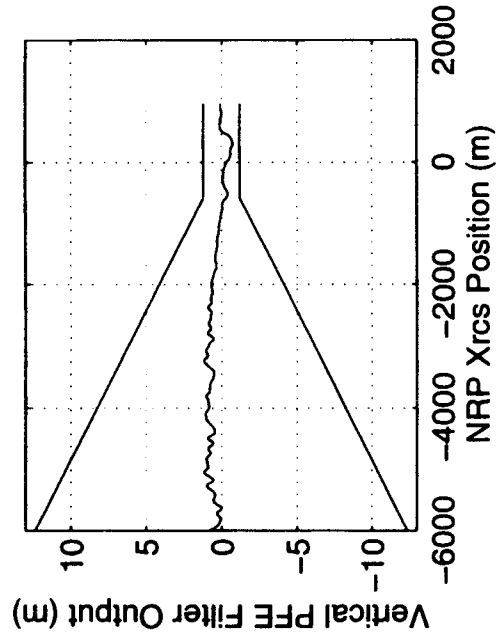
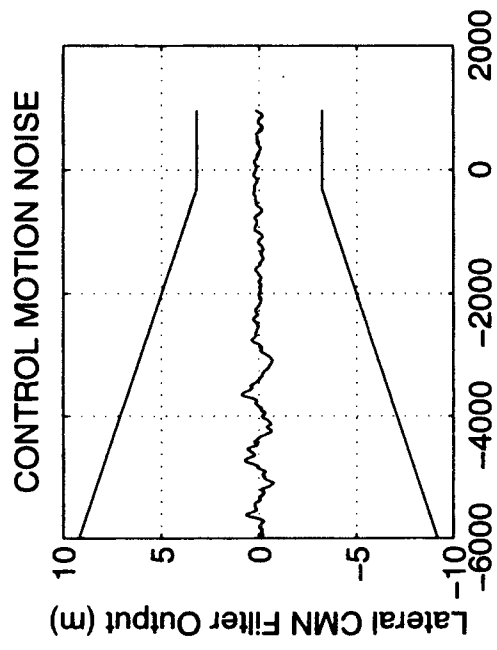
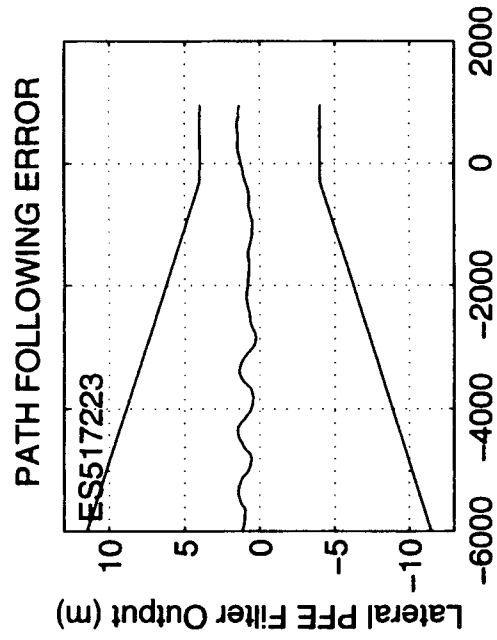
NRP Xrcs 2-RMS DIFFERENCE (m): 1.086  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.431  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.674

-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----

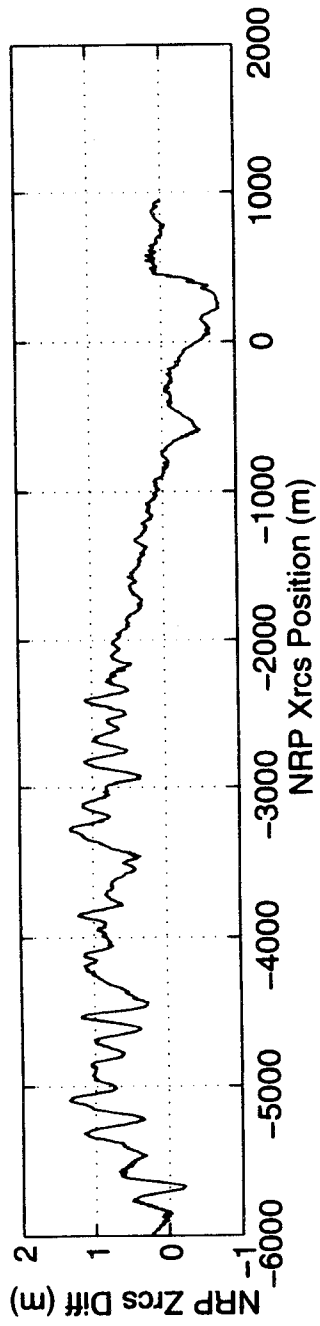
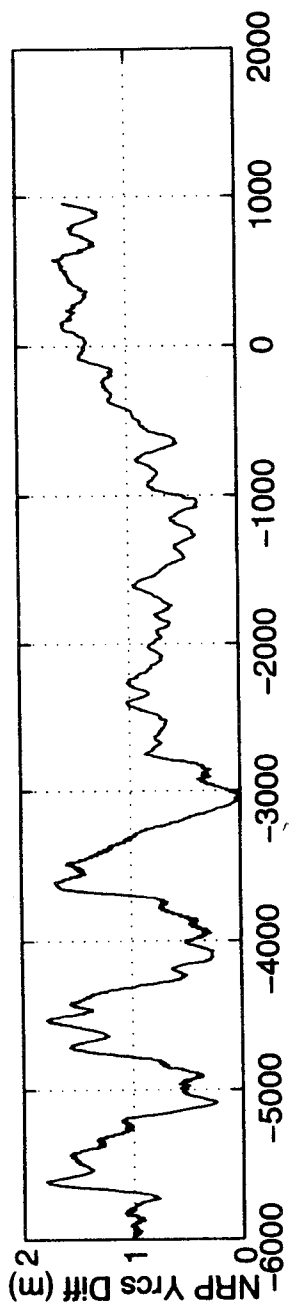
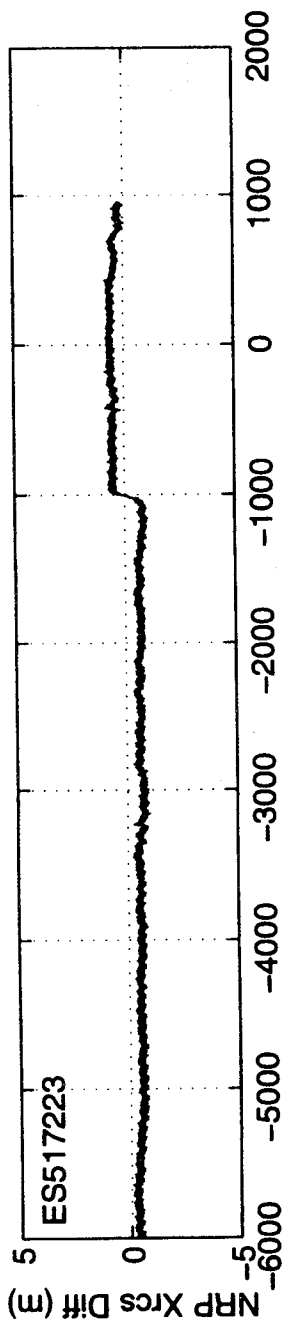
LGRP Xrcs POSITION (m): 384.845  
LGRP Yrcs POSITION (m): -1.405







NRP LONGITUDINAL, LATERAL AND VERTICAL POSITION DIFFERENCES



APPROACH #: ES517224  
START TIME: 343997.924  
STOP TIME: 344150.254

MINIMUM HDOP: 0.6  
MAXIMUM HDOP: 0.7  
AVERAGE HDOP: 0.6

MINIMUM VDOP: 2.7  
MAXIMUM VDOP: 2.8  
AVERAGE VDOP: 2.8

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

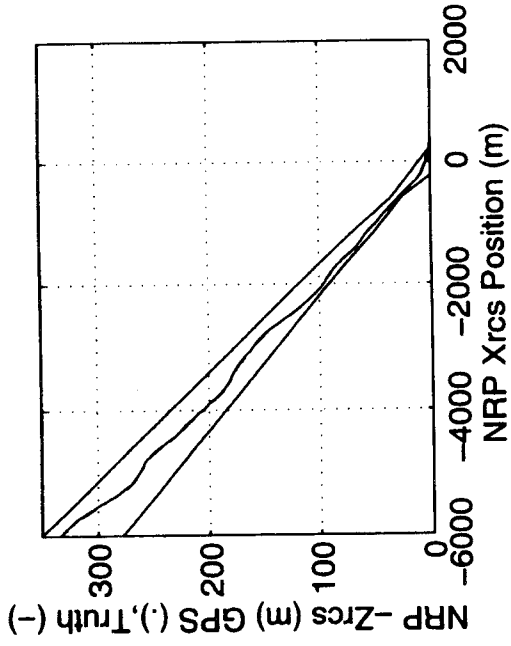
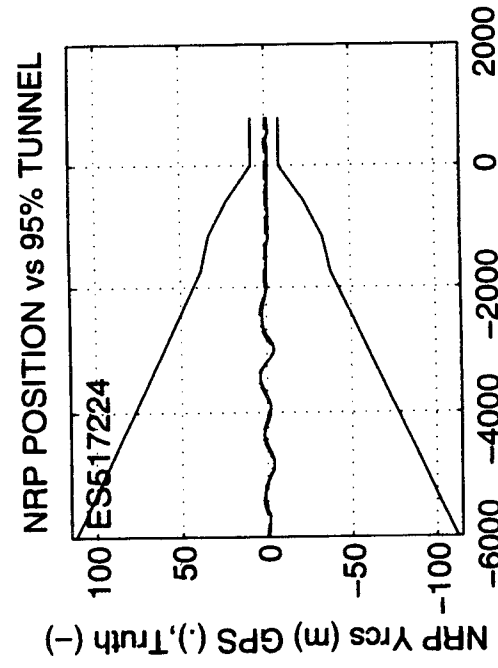
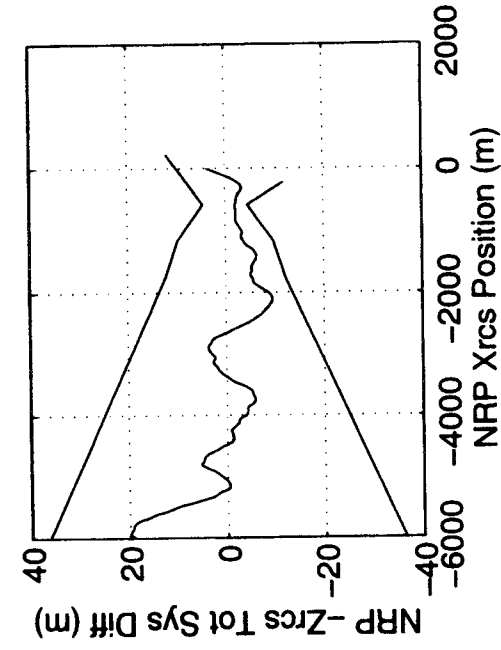
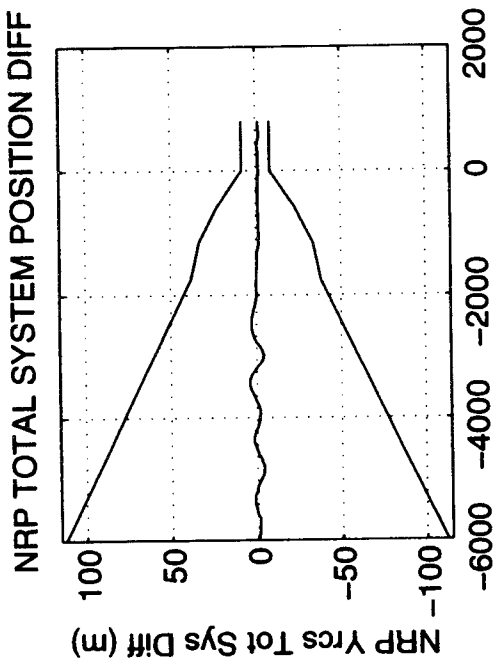
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.428  
NRP Yrcs MEAN DIFFERENCE (m): 1.252  
NRP Zrcs MEAN DIFFERENCE (m): -0.064

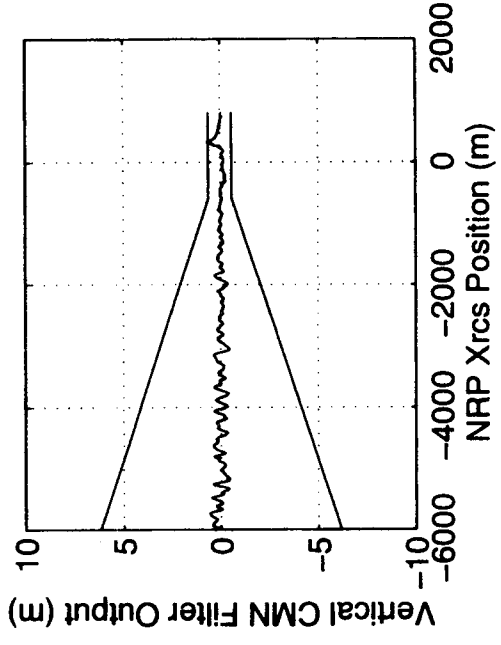
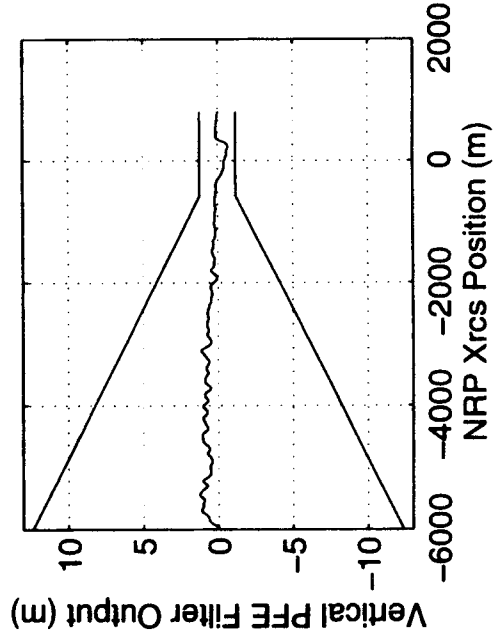
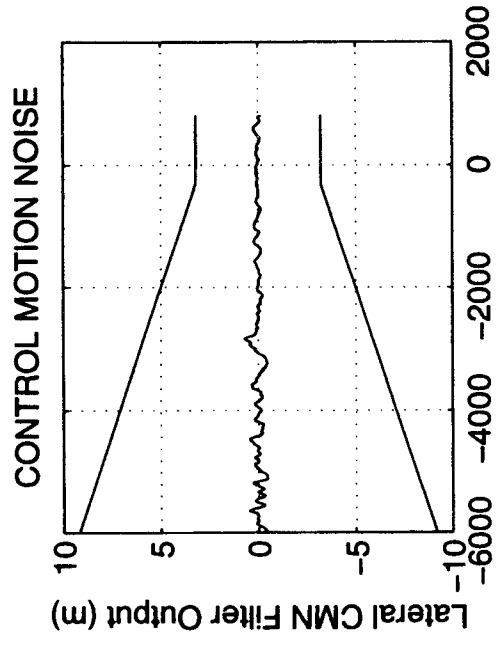
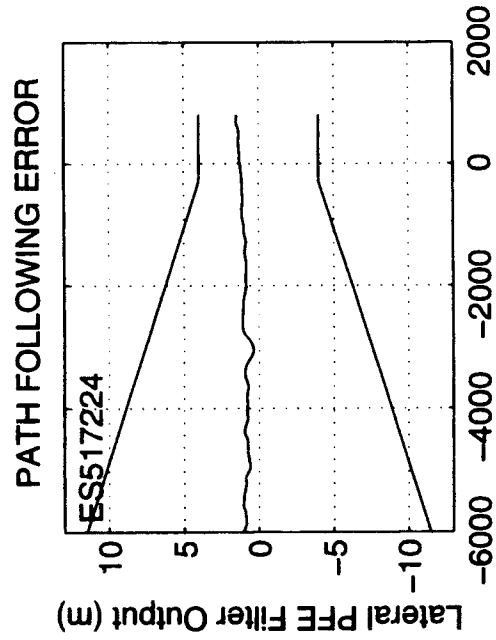
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.595  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.333  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.604

NRP Xrcs 2-RMS DIFFERENCE (m): 1.042  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.527  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.617

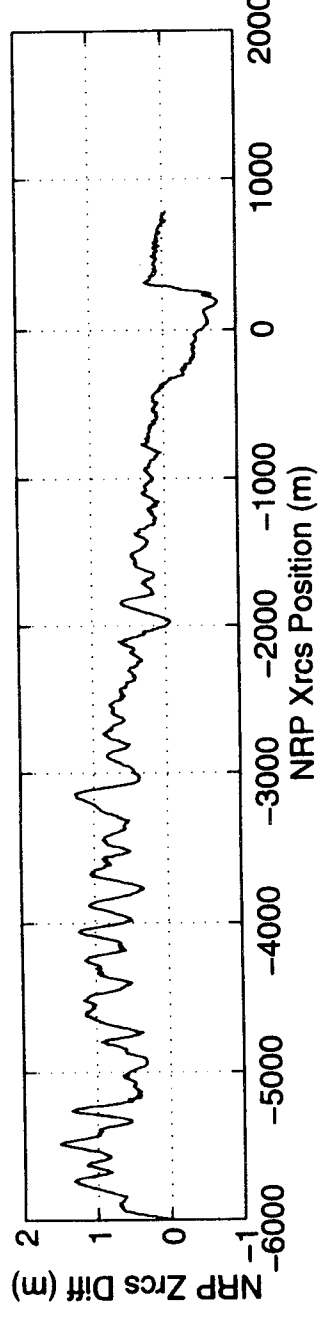
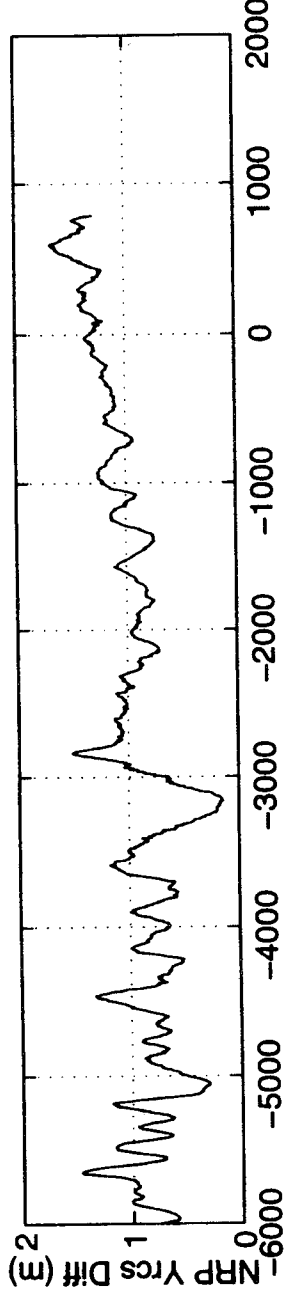
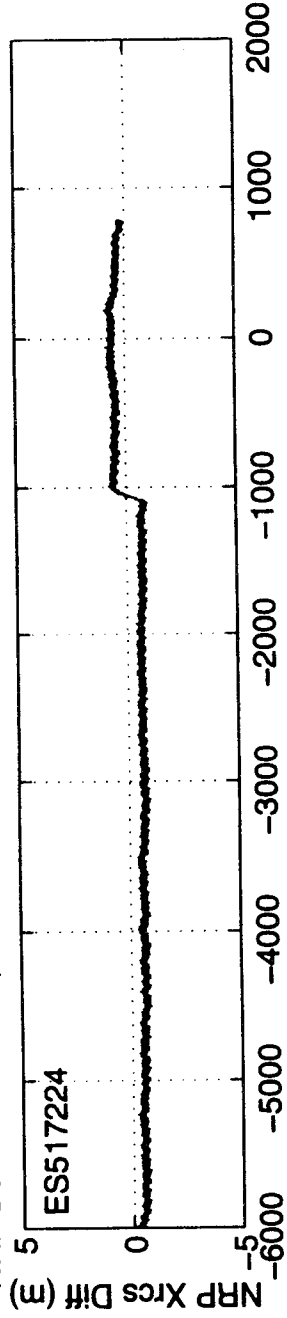
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 342.140  
LGRP Yrcs POSITION (m): -0.748





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517225  
START TIME: 344523.451  
STOP TIME: 344680.660

MINIMUM HDOP: 0.6  
MAXIMUM HDOP: 0.7  
AVERAGE HDOP: 0.7

MINIMUM VDOP: 1.8  
MAXIMUM VDOP: 2.7  
AVERAGE VDOP: 2.4

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

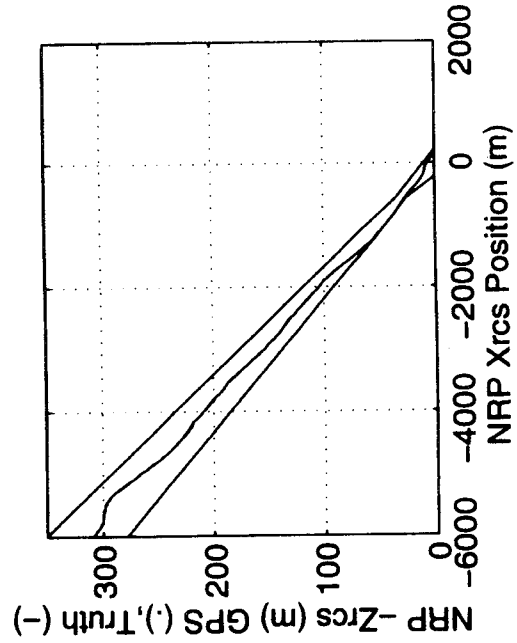
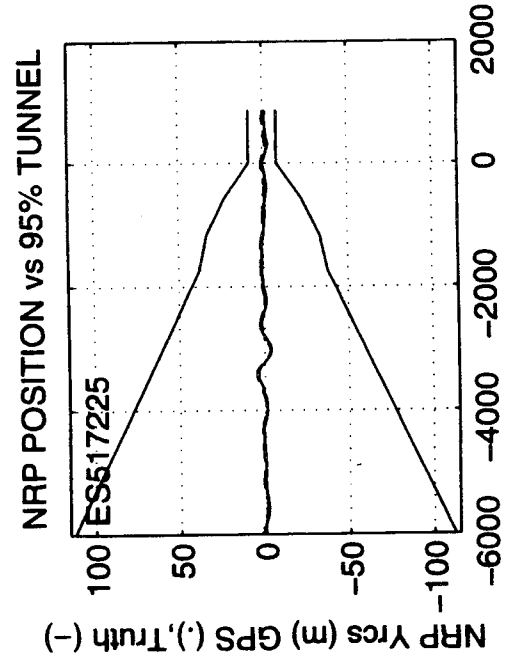
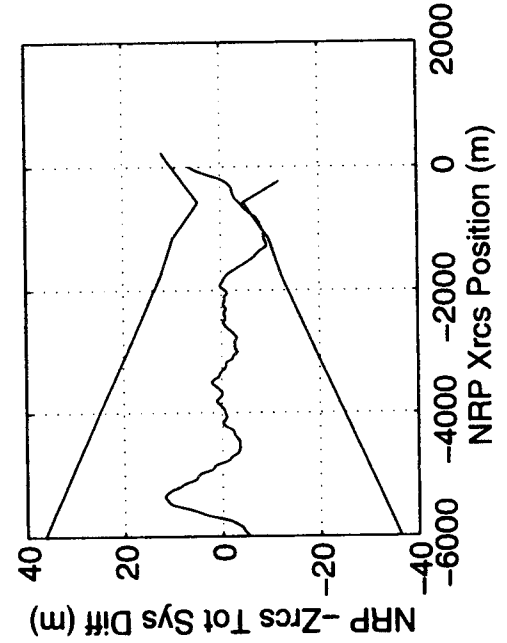
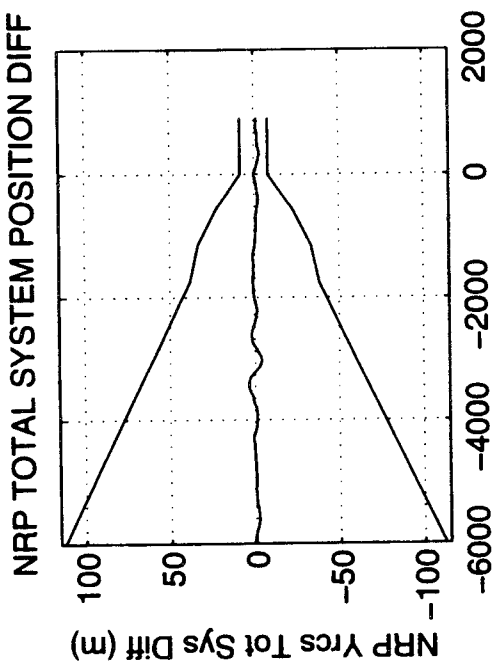
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.368  
NRP Yrcs MEAN DIFFERENCE (m): 1.248  
NRP Zrcs MEAN DIFFERENCE (m): -0.198

NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.768  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.498  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.685

NRP Xrcs 2-RMS DIFFERENCE (m): 1.064  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.545  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.791

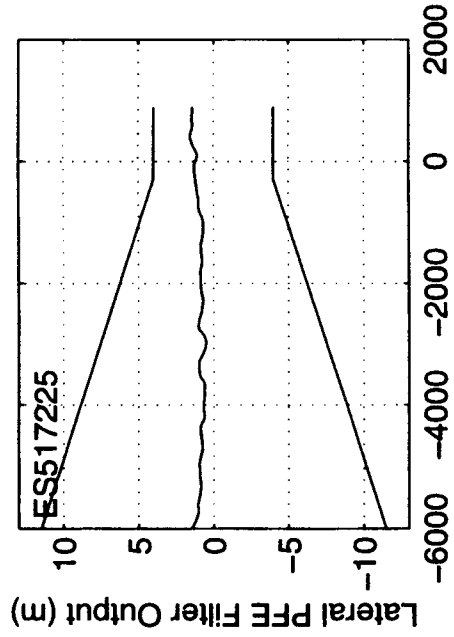
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 332.181  
LGRP Yrcs POSITION (m): -2.730

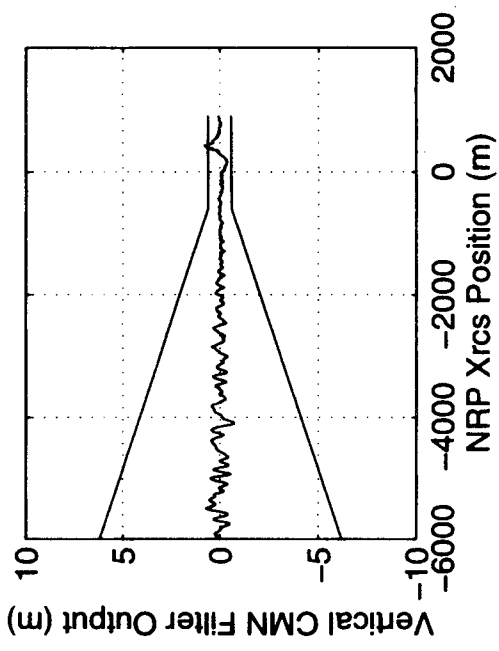
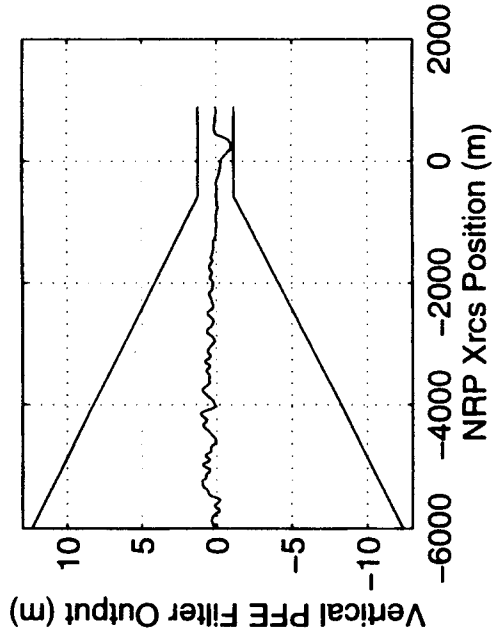
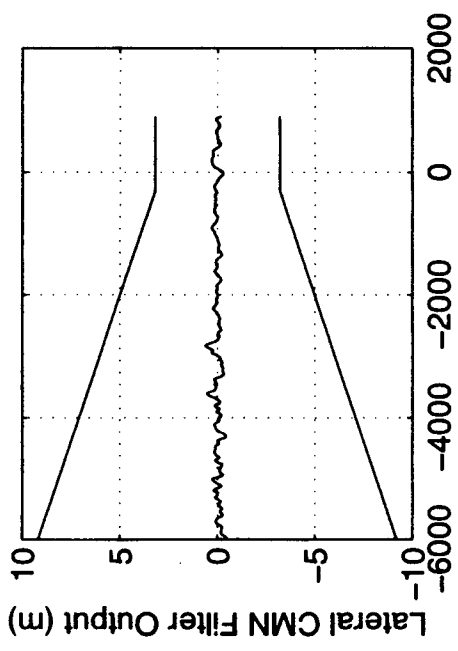




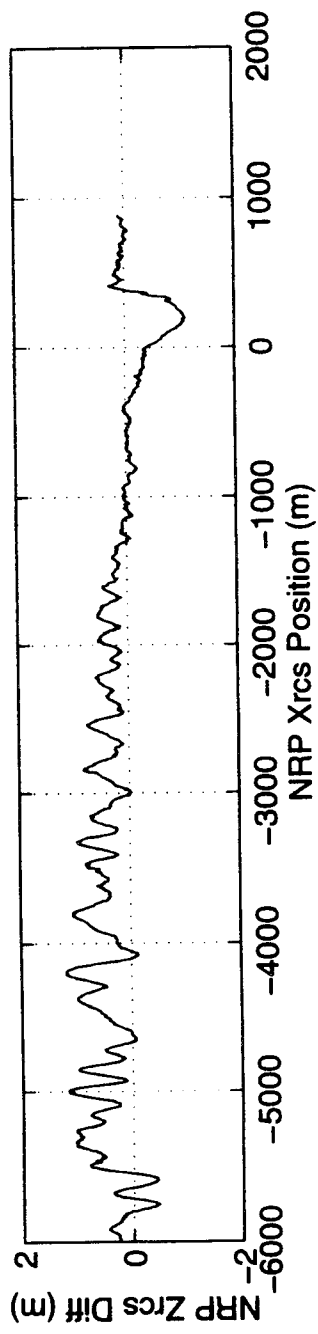
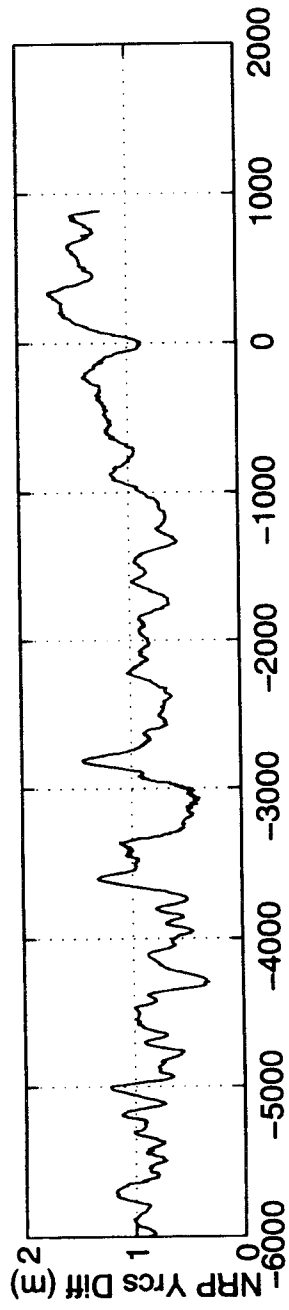
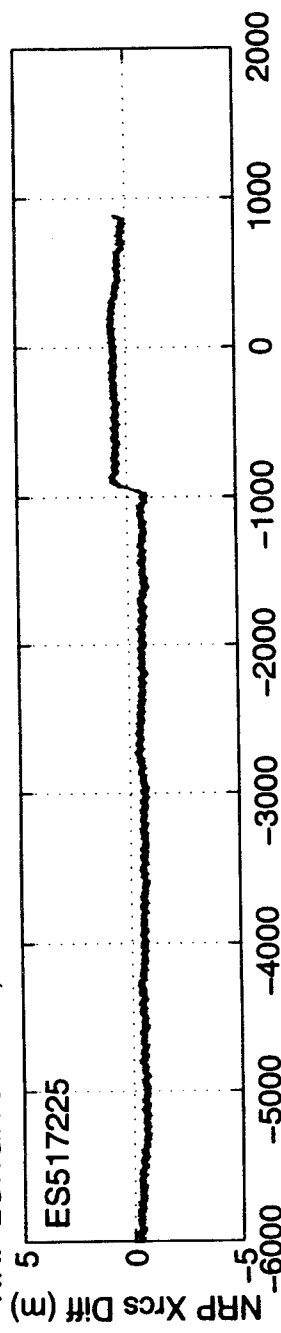
PATH FOLLOWING ERROR



CONTROL MOTION NOISE



NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517226  
START TIME: 345067.264  
STOP TIME: 345223.792

MINIMUM HDOP: 0.6  
MAXIMUM HDOP: 0.7  
AVERAGE HDOP: 0.7

MINIMUM VDOP: 1.7  
MAXIMUM VDOP: 2.5  
AVERAGE VDOP: 2.1

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.393  
NRP Yrcs MEAN DIFFERENCE (m): 1.191  
NRP Zrcs MEAN DIFFERENCE (m): 0.038

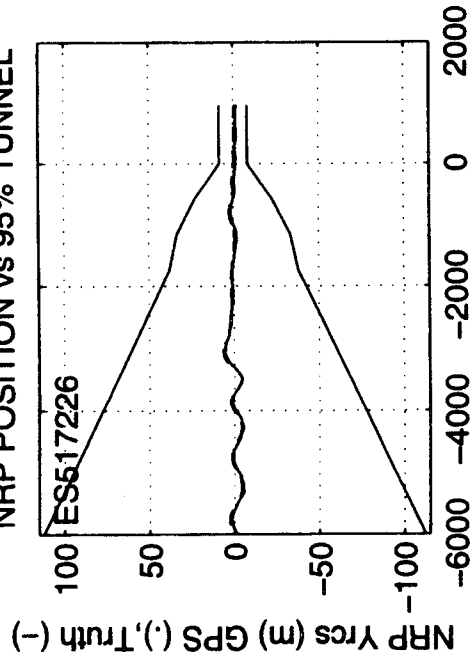
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.312  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.373  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.668

NRP Xrcs 2-RMS DIFFERENCE (m): 0.846  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.411  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.672

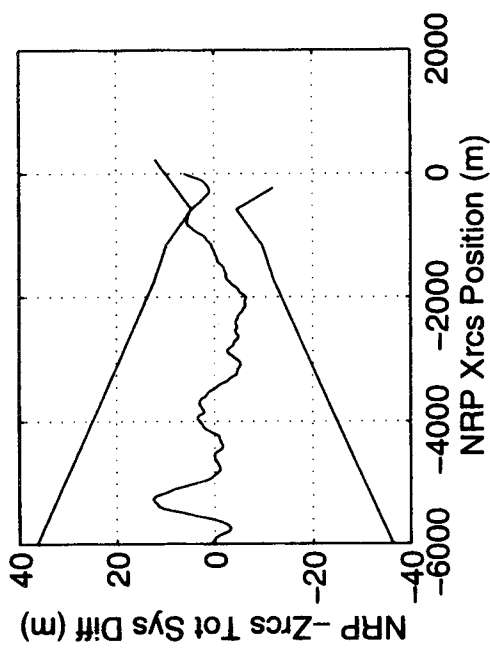
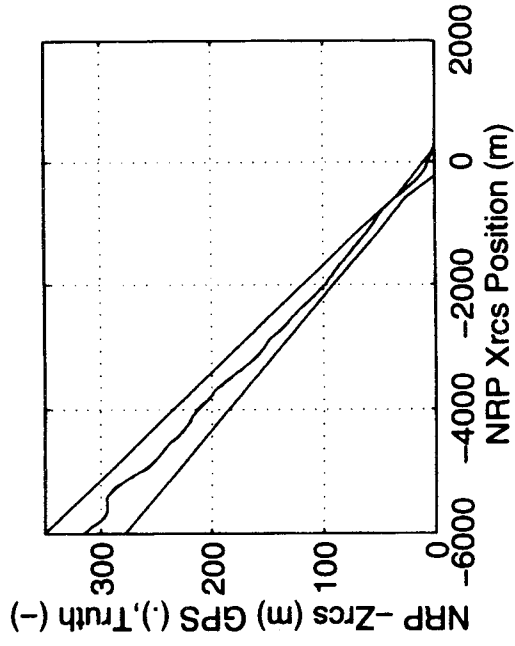
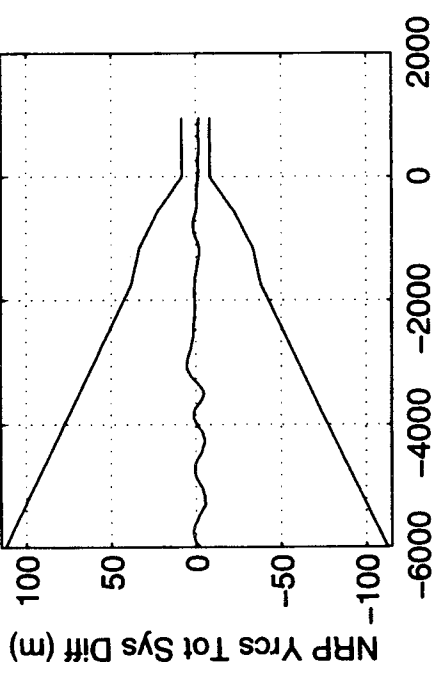
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

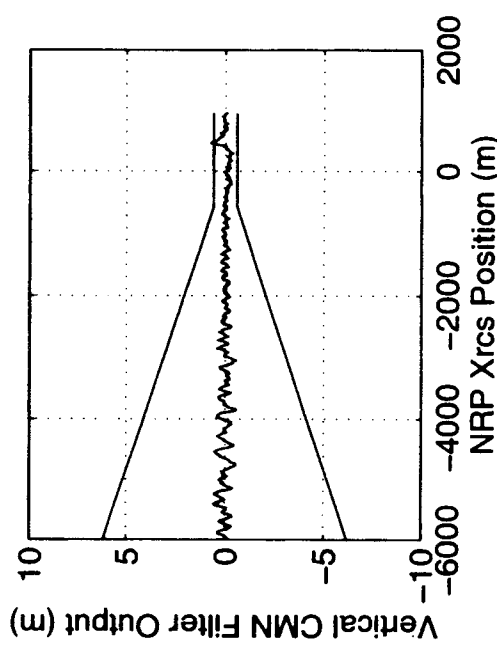
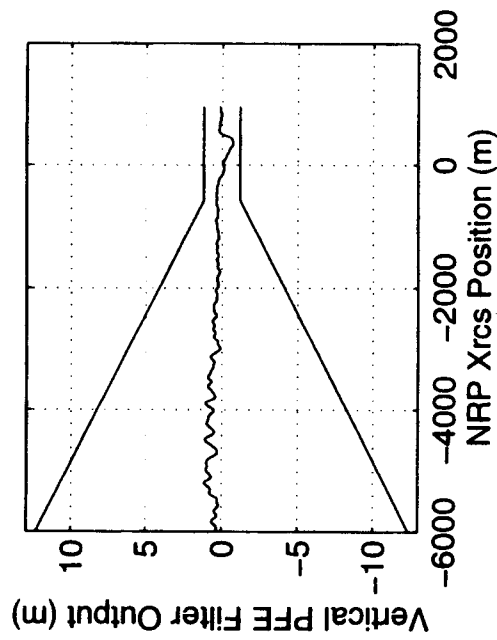
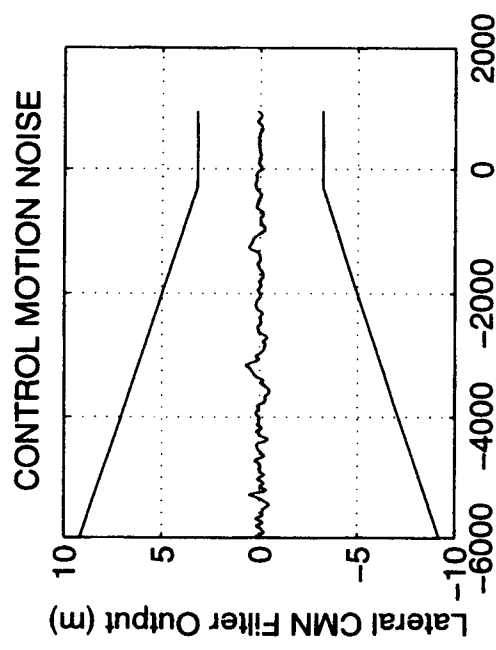
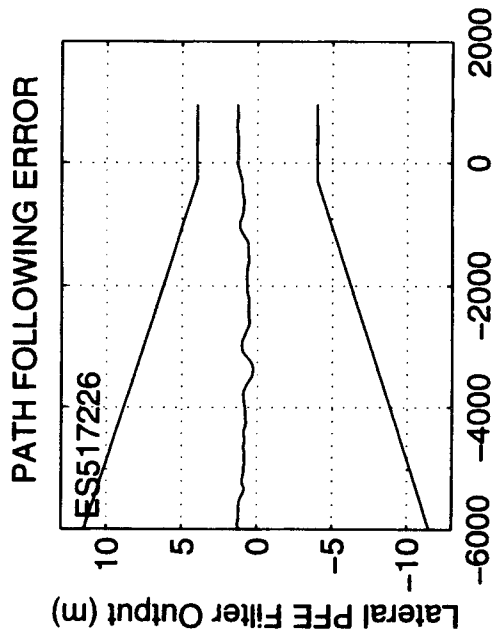
LGRP Xrcs POSITION (m): 384.394  
LGRP Yrcs POSITION (m): -1.143

NRP POSITION vs 95% TUNNEL

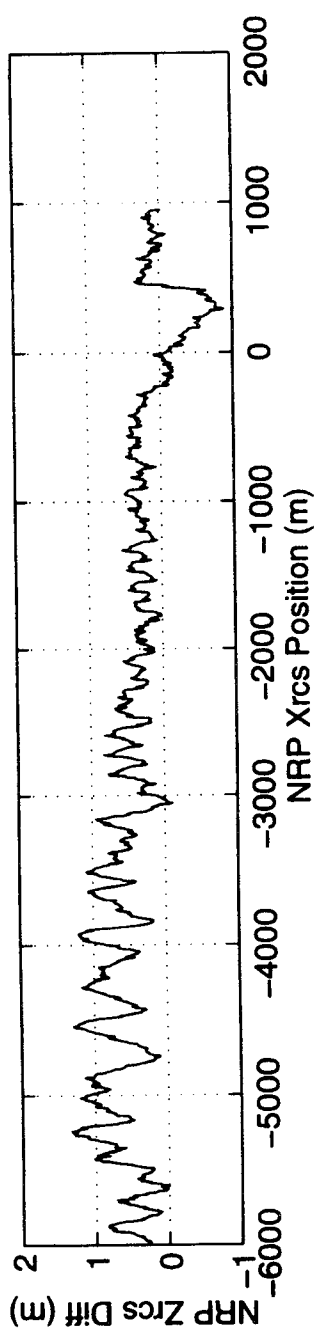
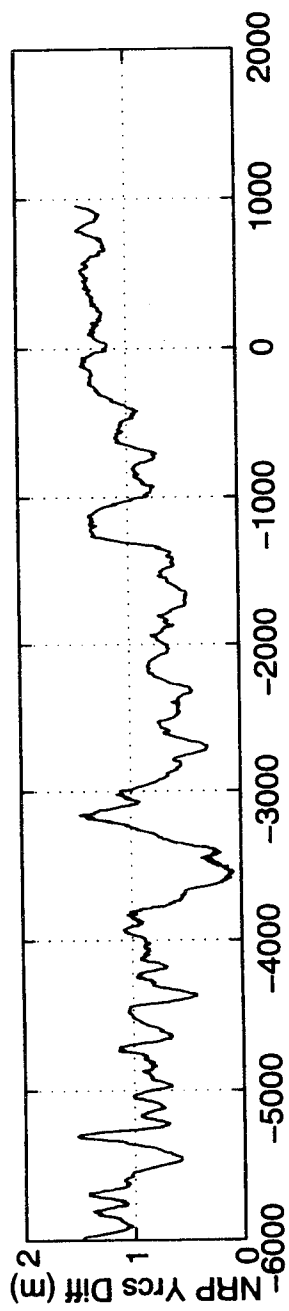
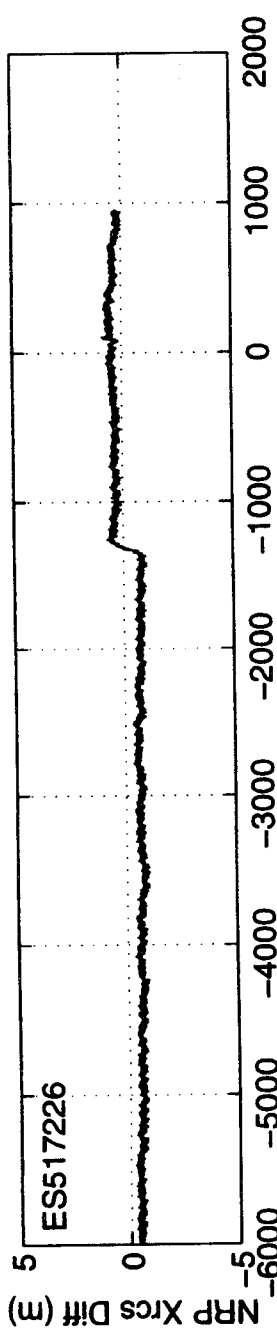


NRP TOTAL SYSTEM POSITION DIFF





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517228  
START TIME: 346155.056  
STOP TIME: 346315.715

MINIMUM HDOP: 0.6  
MAXIMUM HDOP: 0.6  
AVERAGE HDOP: 0.6

MINIMUM VDOP: 1.5  
MAXIMUM VDOP: 1.6  
AVERAGE VDOP: 1.6

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

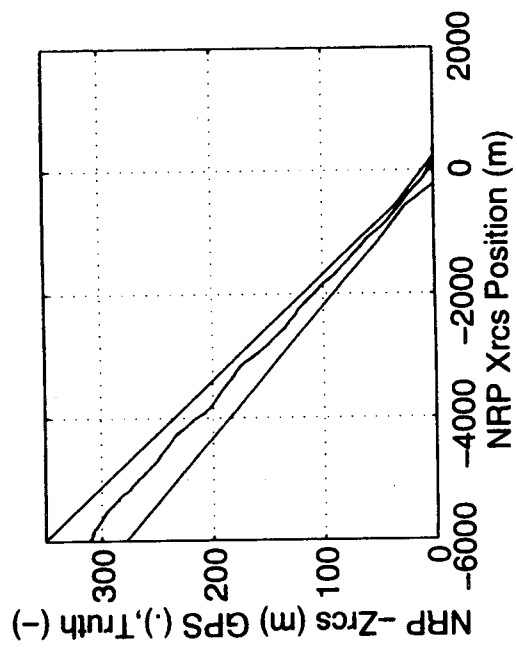
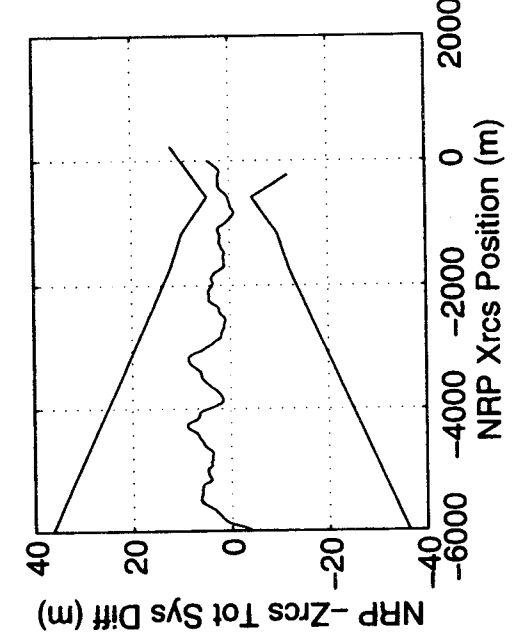
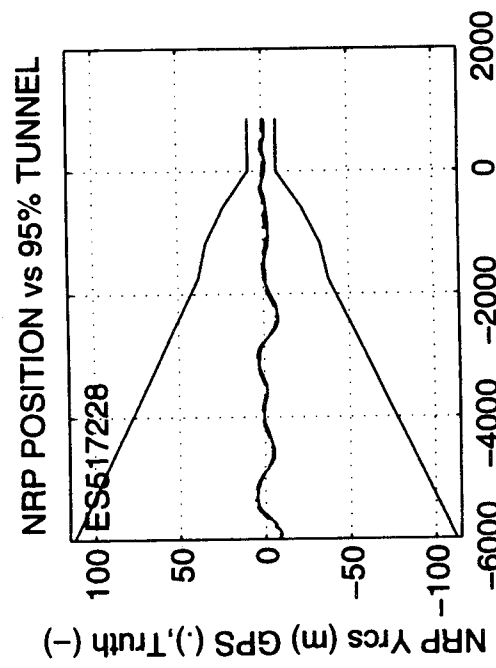
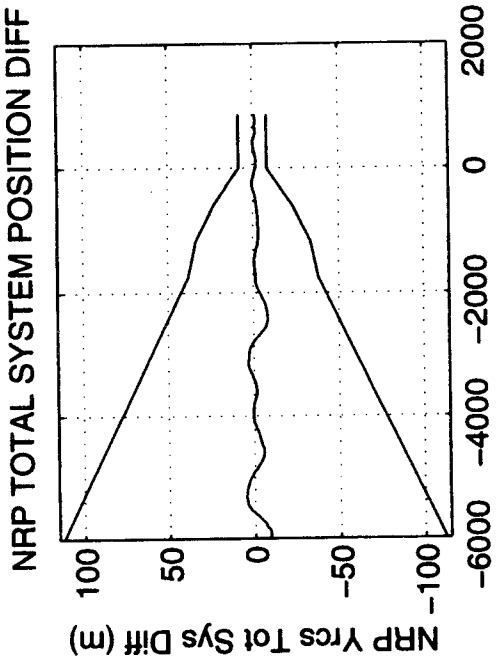
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.528  
NRP Yrcs MEAN DIFFERENCE (m): 1.263  
NRP Zrcs MEAN DIFFERENCE (m): -0.258

NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.253  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.390  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.768

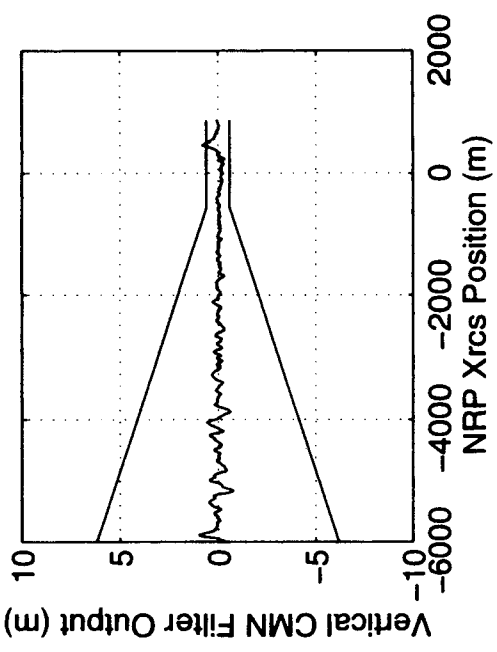
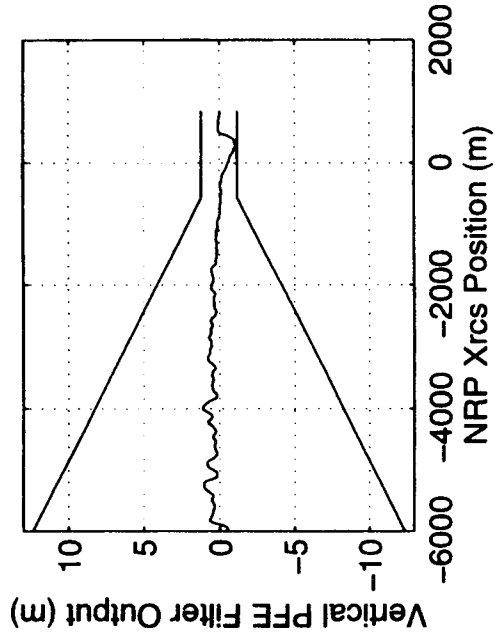
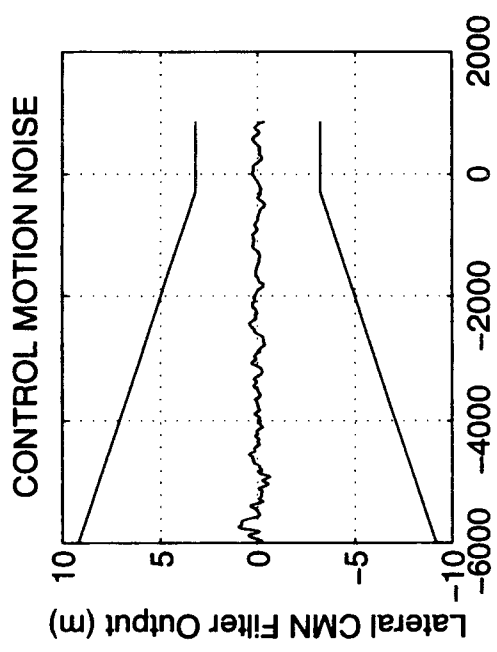
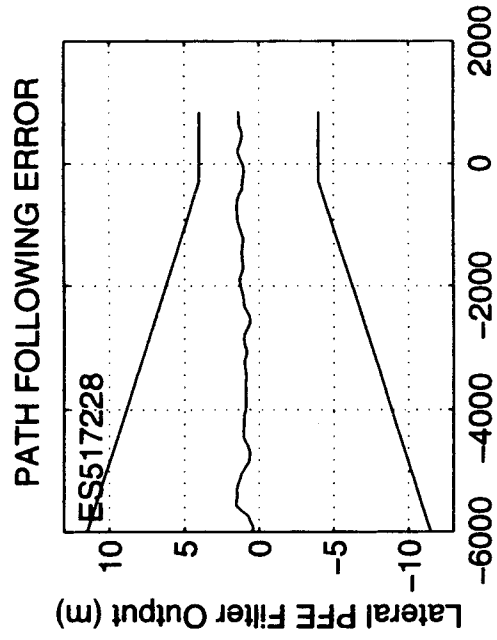
NRP Xrcs 2-RMS DIFFERENCE (m): 1.087  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.556  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.926

-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

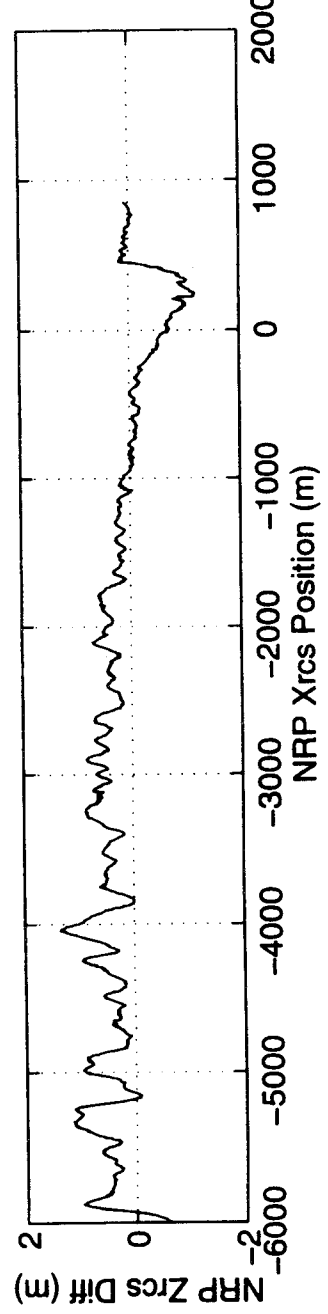
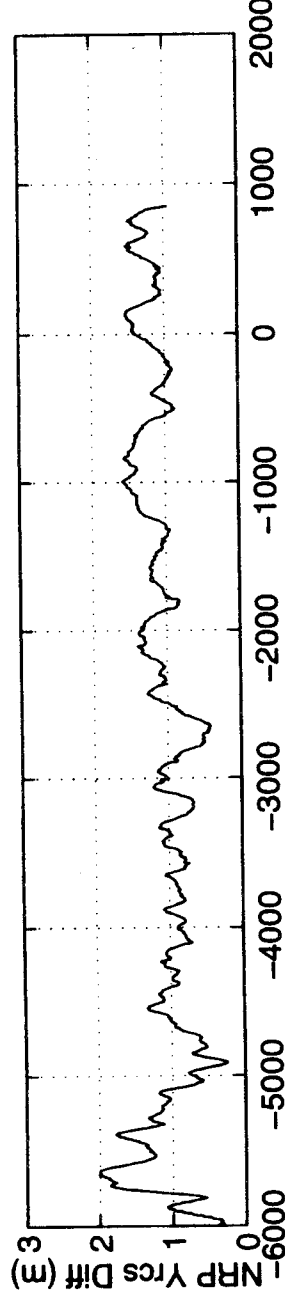
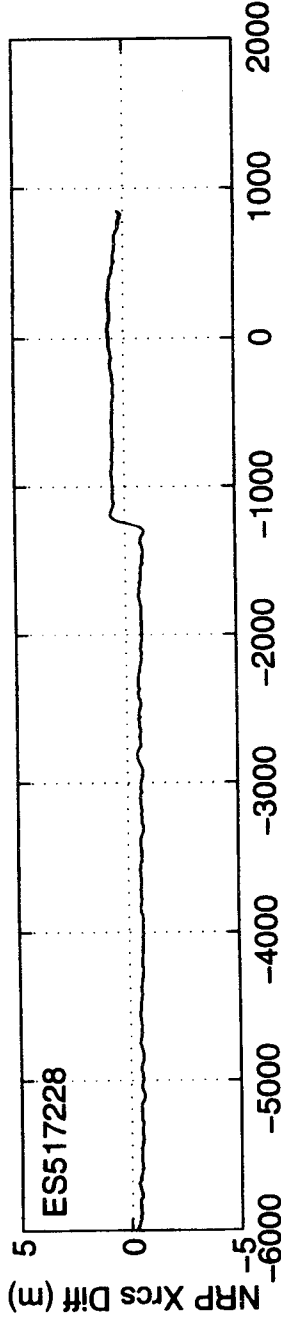
-----  
LGRP Xrcs POSITION (m): 384.123  
LGRP Yrcs POSITION (m): 0.245







NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517229  
START TIME: 346698.660  
STOP TIME: 346858.264

MINIMUM HDOP: 0.6  
MAXIMUM HDOP: 0.6  
AVERAGE HDOP: 0.6

MINIMUM VDOP: 1.4  
MAXIMUM VDOP: 1.4  
AVERAGE VDOP: 1.4

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.559  
NRP Yrcs MEAN DIFFERENCE (m): 1.228  
NRP Zrcs MEAN DIFFERENCE (m): -0.177

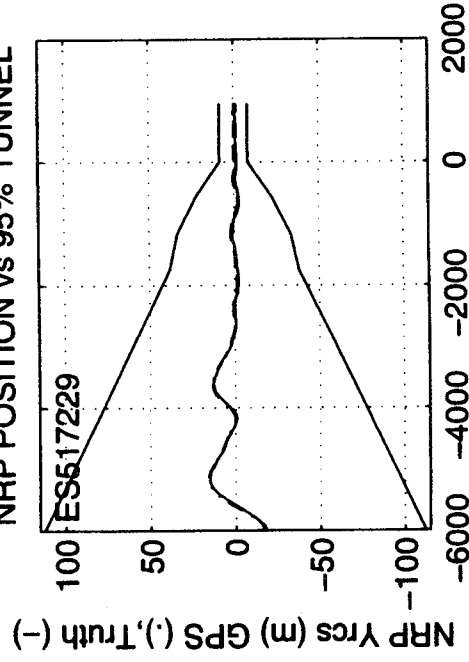
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.247  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.416  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.586

NRP Xrcs 2-RMS DIFFERENCE (m): 1.144  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.492  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.685

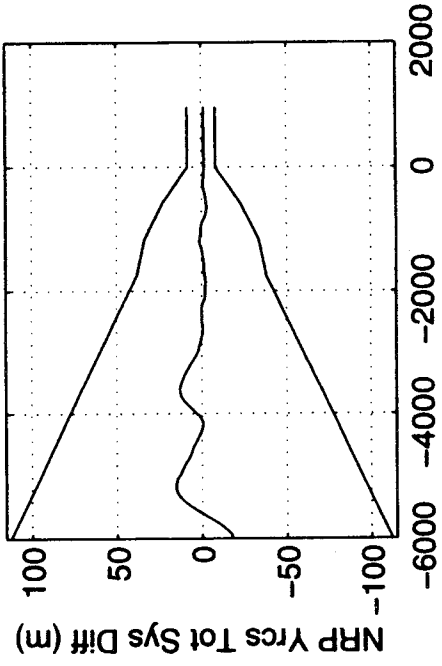
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 444.033  
LGRP Yrcs POSITION (m): -0.834

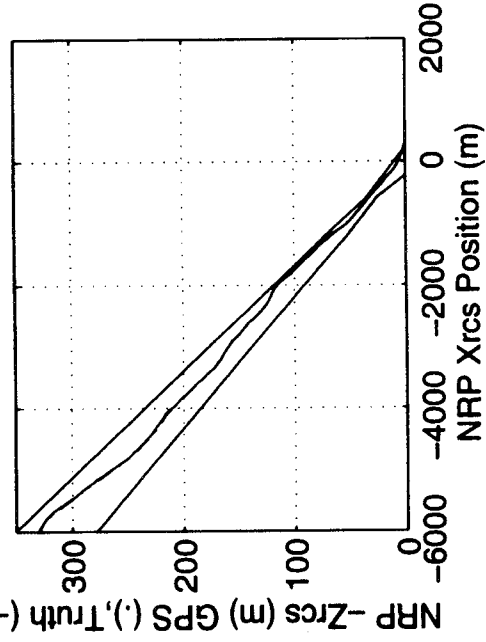
NRP POSITION vs 95% TUNNEL



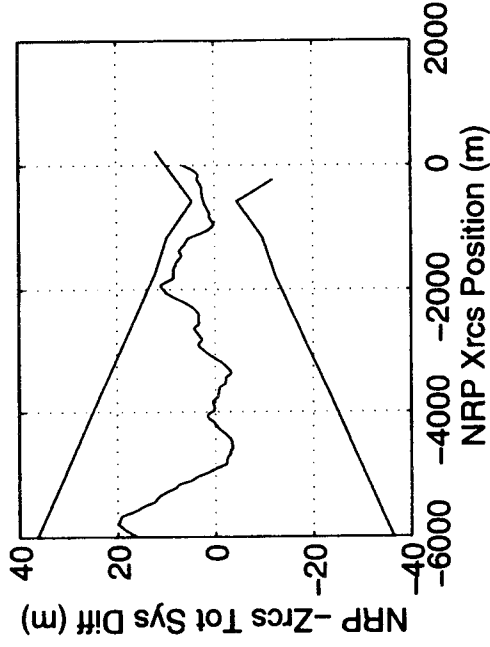
NRP TOTAL SYSTEM POSITION DIFF

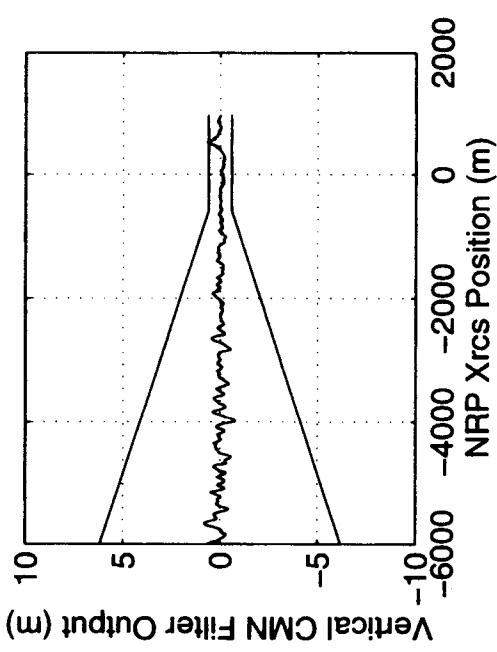
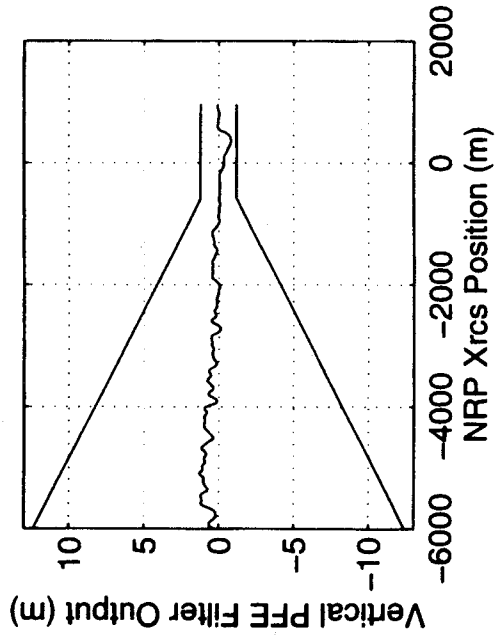
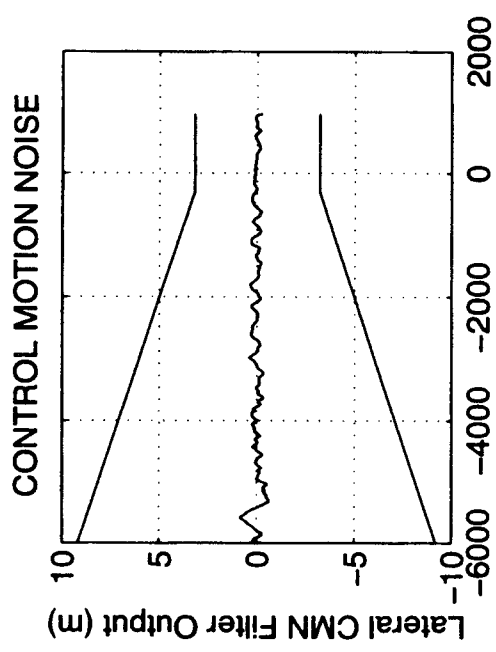
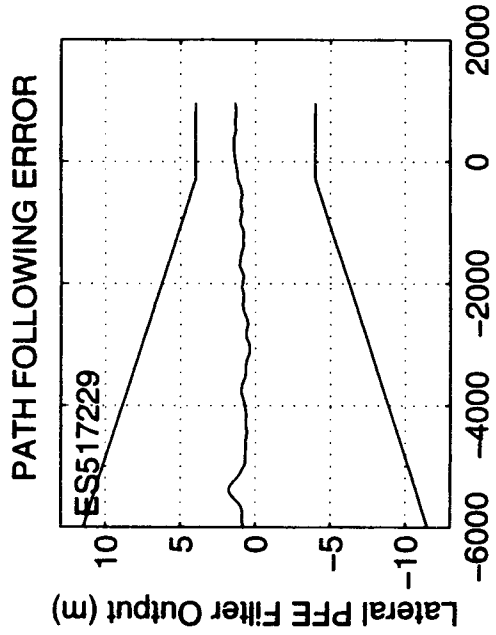


NRP -Zrcs (m) GPS (.), Truth (-)

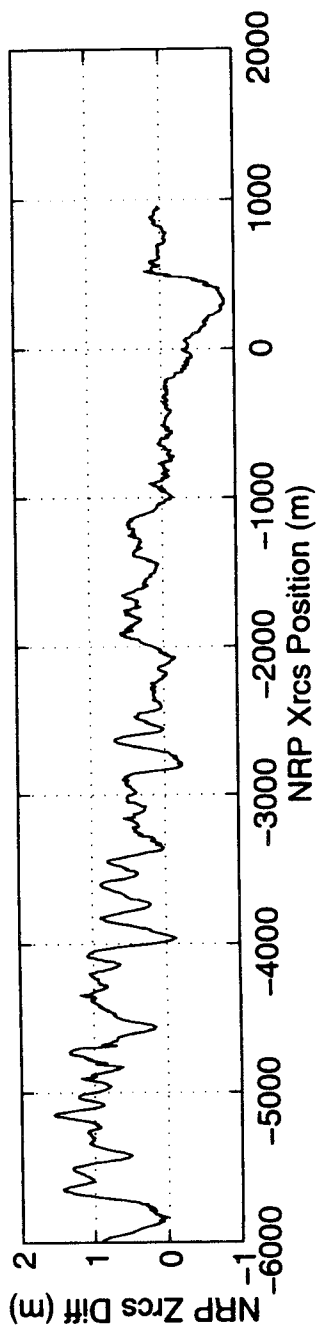
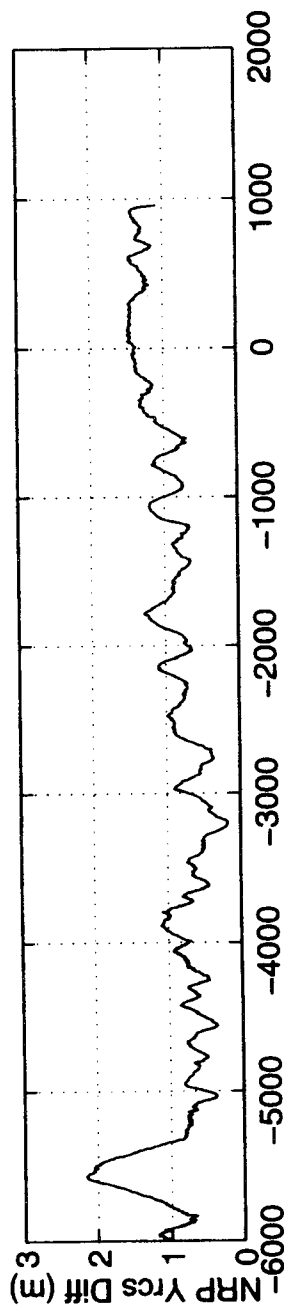
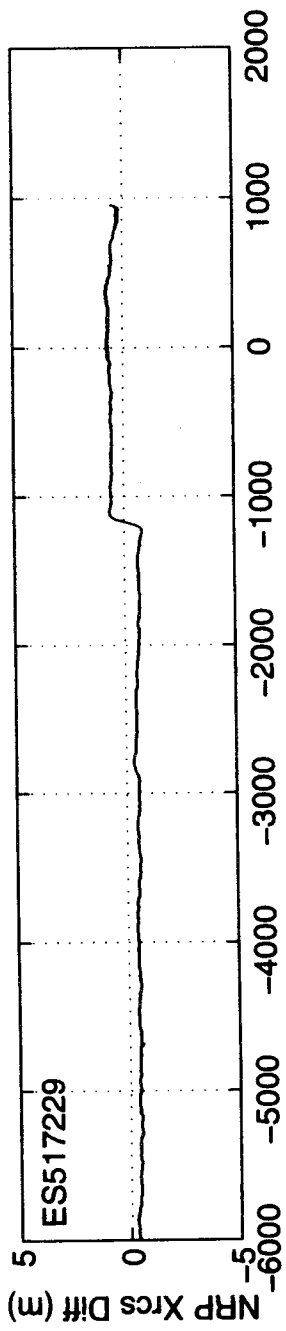


NRP -Zrcs Tot Sys Diff (m)





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517230  
START TIME: 347244.330  
STOP TIME: 347410.177

MINIMUM HDOP: 0.9  
MAXIMUM HDOP: 0.9  
AVERAGE HDOP: 0.9

MINIMUM VDOP: 2.9  
MAXIMUM VDOP: 3.2  
AVERAGE VDOP: 3.1

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

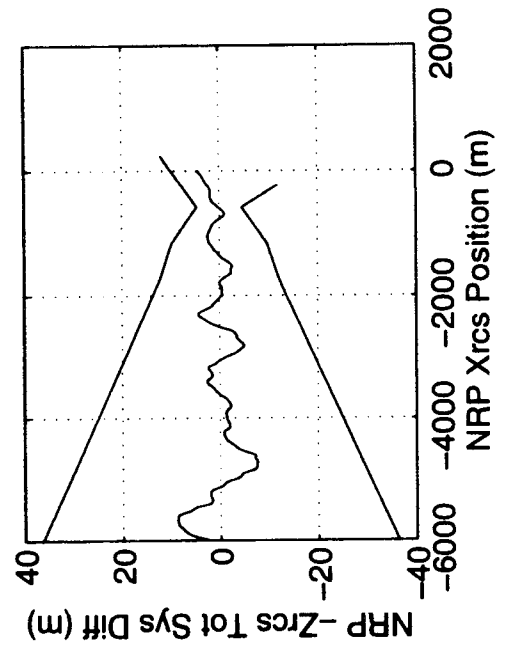
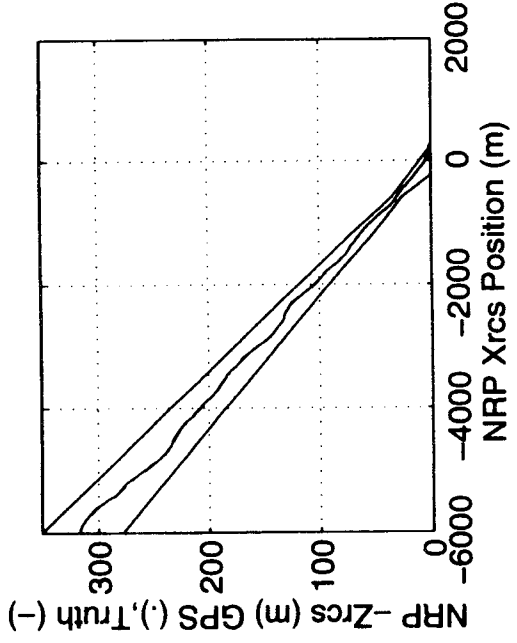
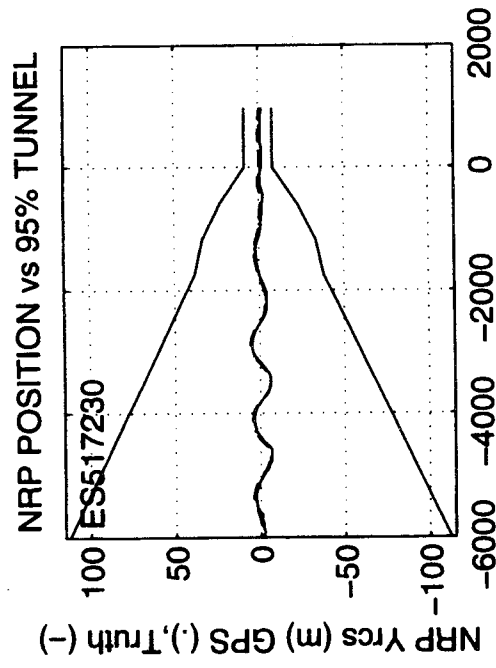
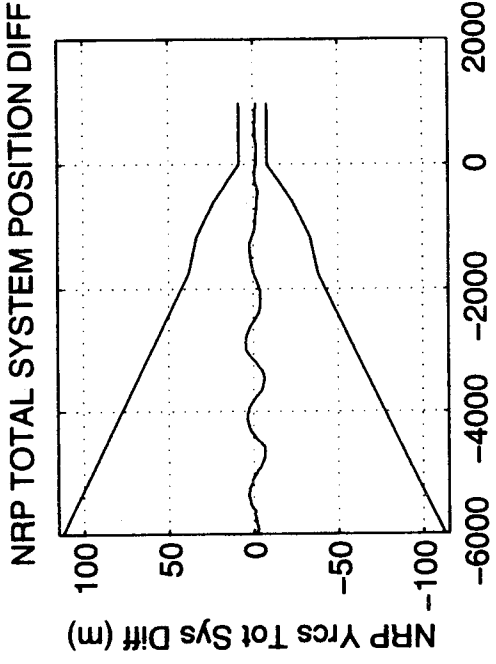
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.493  
NRP Yrcs MEAN DIFFERENCE (m): 1.327  
NRP Zrcs MEAN DIFFERENCE (m): -0.130

NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.247  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.329  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.644

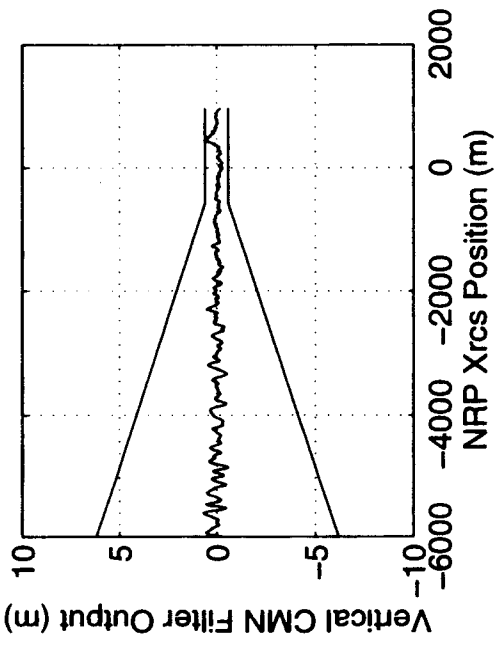
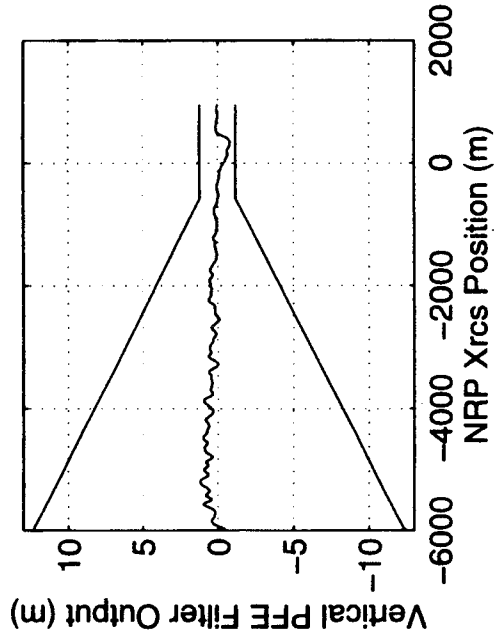
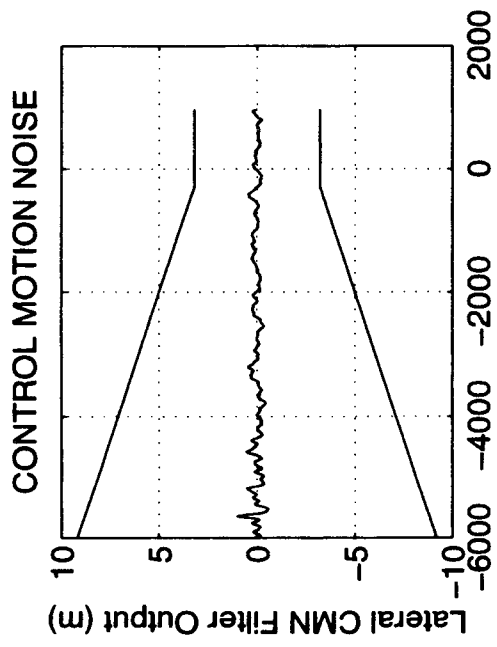
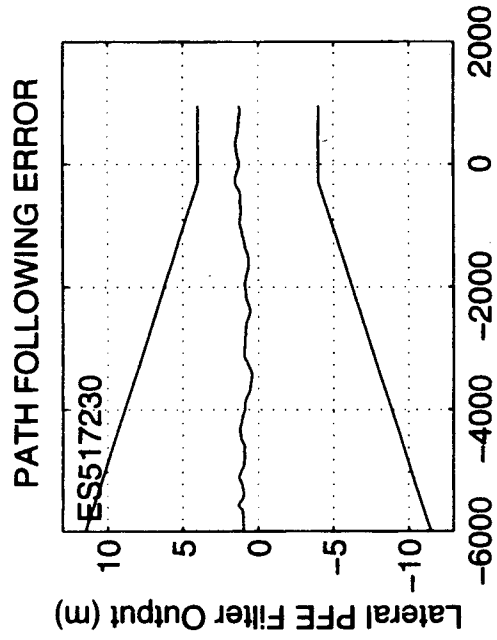
NRP Xrcs 2-RMS DIFFERENCE (m): 1.016  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.675  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.695

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LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

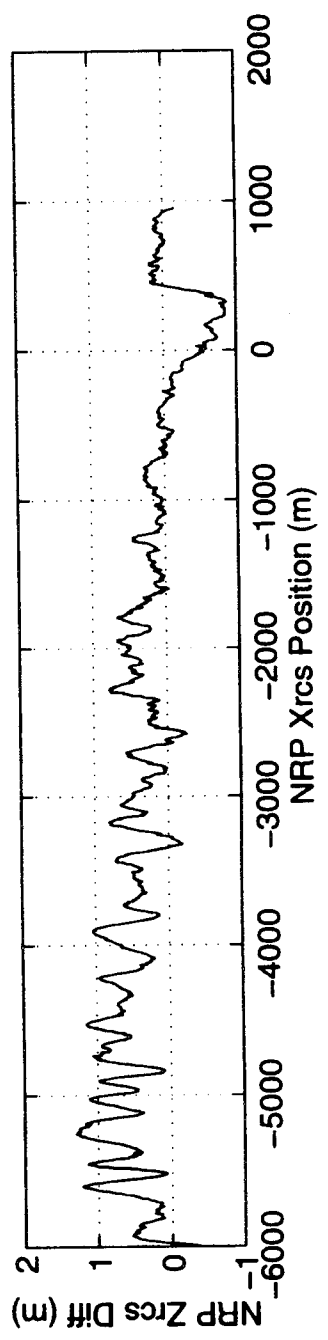
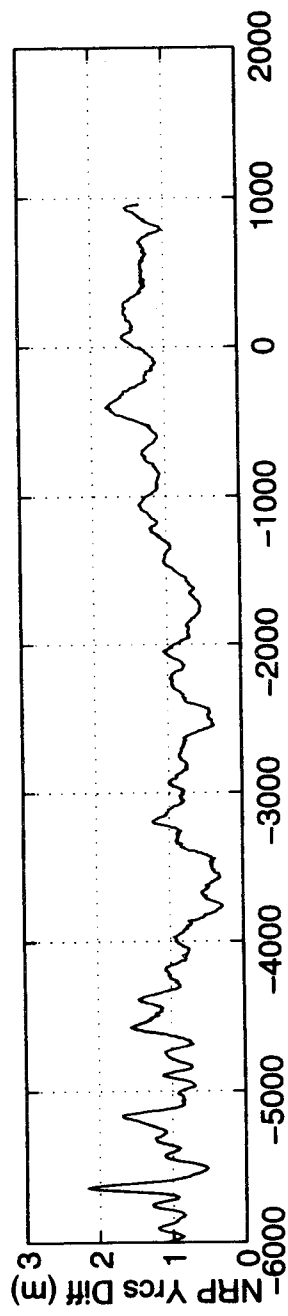
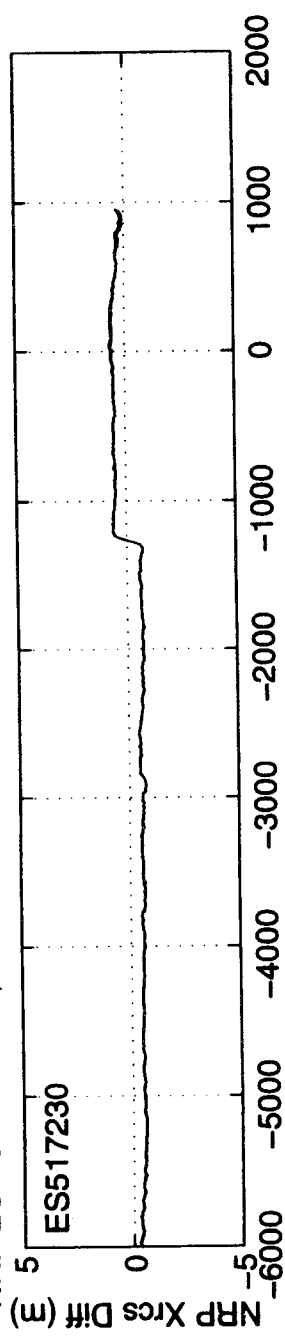
LGRP Xrcs POSITION (m): 436.617  
LGRP Yrcs POSITION (m): -0.733







NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517231  
START TIME: 347768.187  
STOP TIME: 347935.122

MINIMUM HDOP: 0.9  
MAXIMUM HDOP: 0.9  
AVERAGE HDOP: 0.9

MINIMUM VDOP: 3.4  
MAXIMUM VDOP: 3.5  
AVERAGE VDOP: 3.5

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
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\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
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TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
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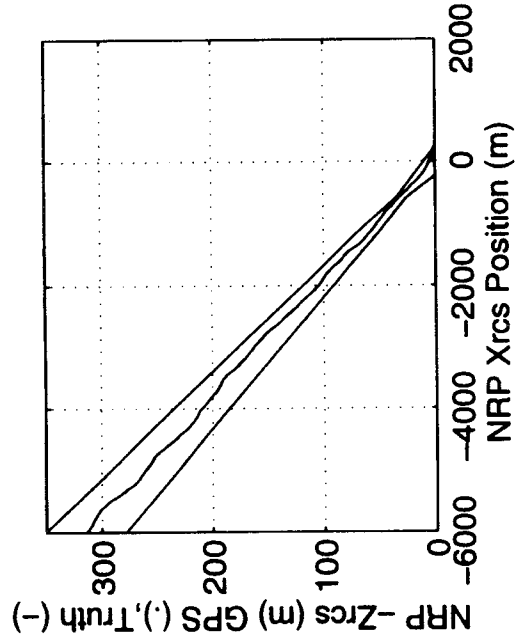
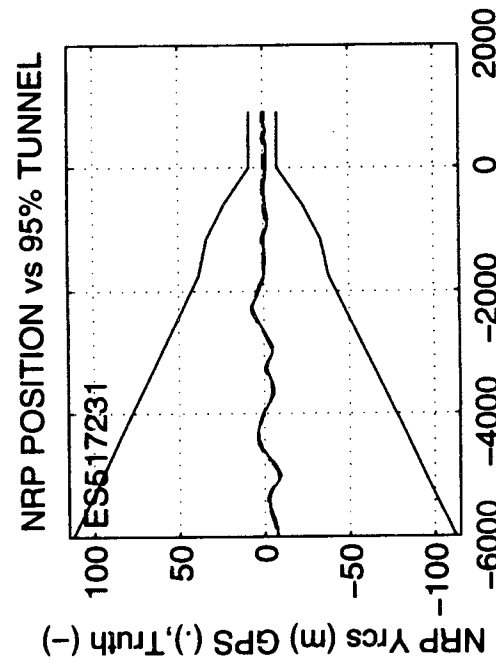
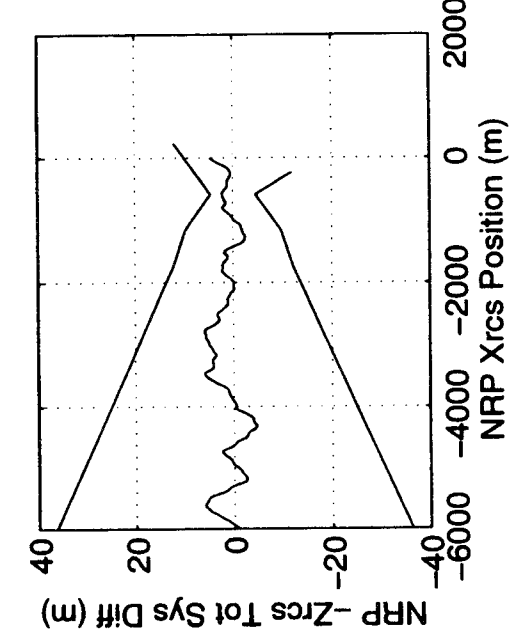
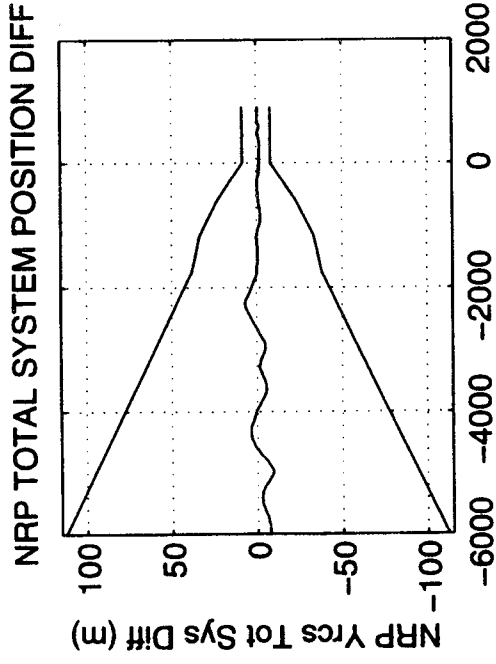
NRP Xrcs MEAN DIFFERENCE (m): 0.586  
NRP Yrcs MEAN DIFFERENCE (m): 1.291  
NRP Zrcs MEAN DIFFERENCE (m): -0.217

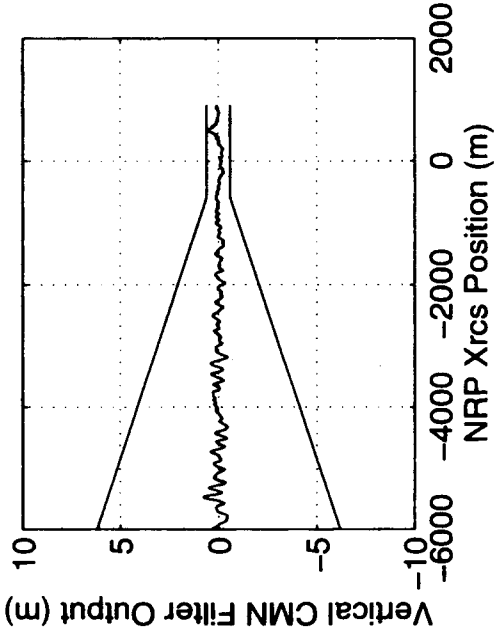
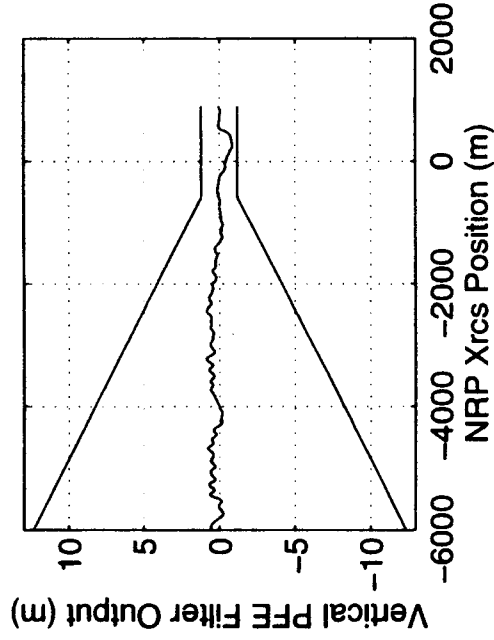
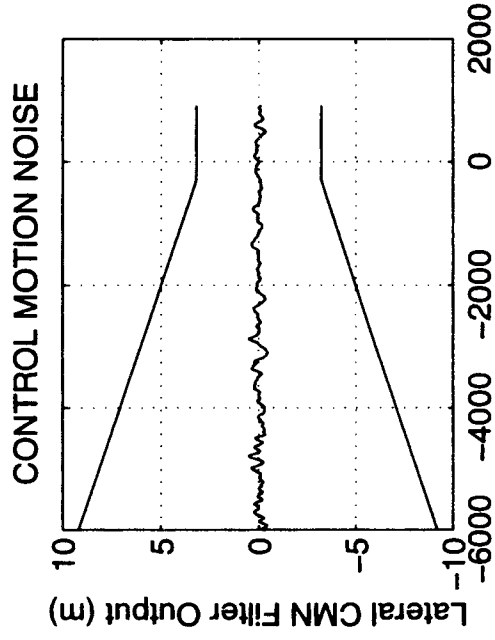
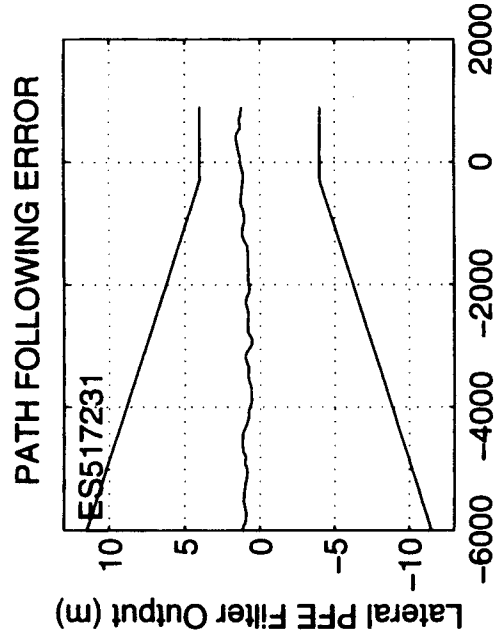
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.172  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.371  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.621

NRP Xrcs 2-RMS DIFFERENCE (m): 1.185  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.609  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.757

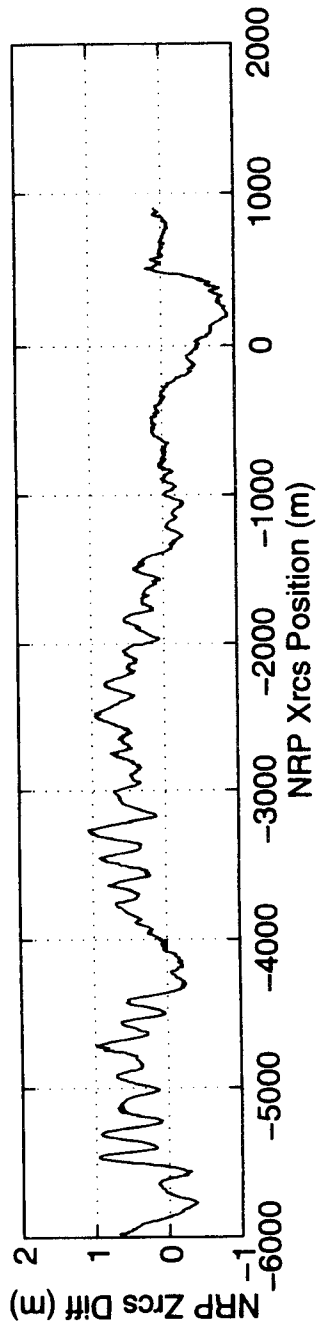
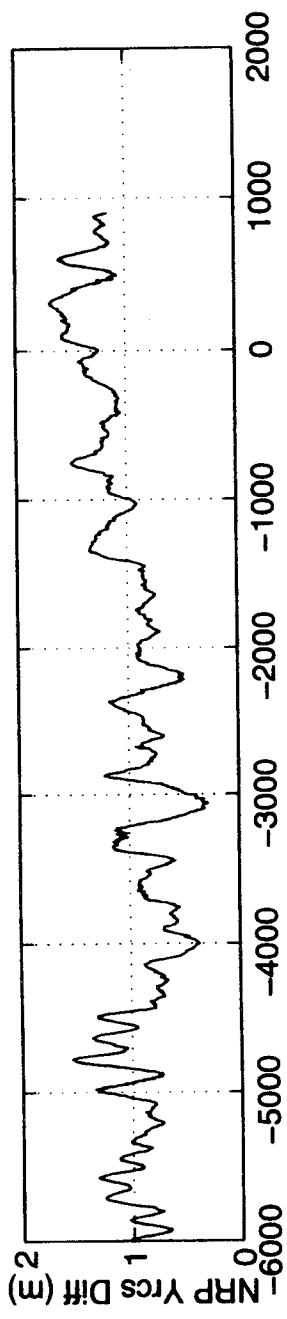
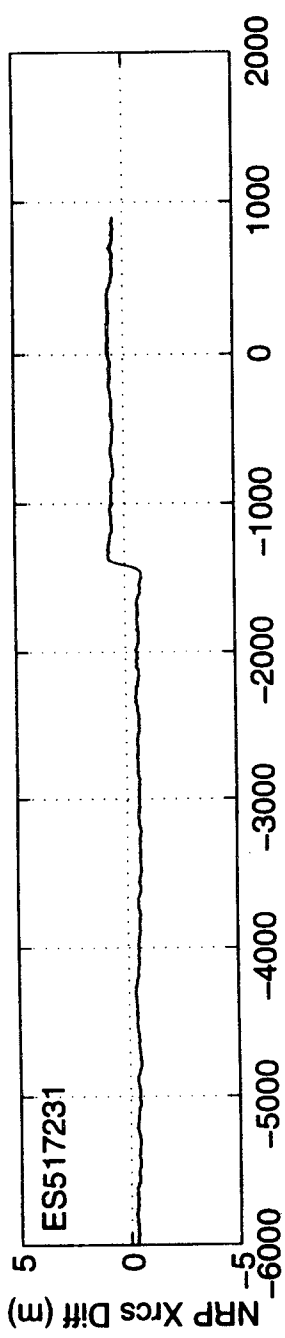
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----

LGRP Xrcs POSITION (m): 440.975  
LGRP Yrcs POSITION (m): -0.596





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517232  
START TIME: 348490.045  
STOP TIME: 348795.045

MINIMUM HDOP: 0.9  
MAXIMUM HDOP: 0.9  
AVERAGE HDOP: 0.9

MINIMUM VDOP: 3.7  
MAXIMUM VDOP: 3.8  
AVERAGE VDOP: 3.8

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID STATIC TRIAL \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL STATIC TRIAL \*  
\*\*\*\*\*

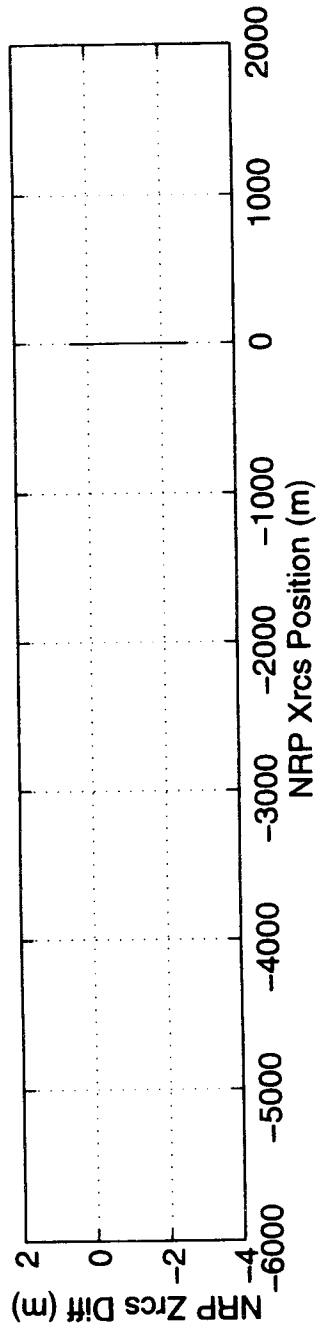
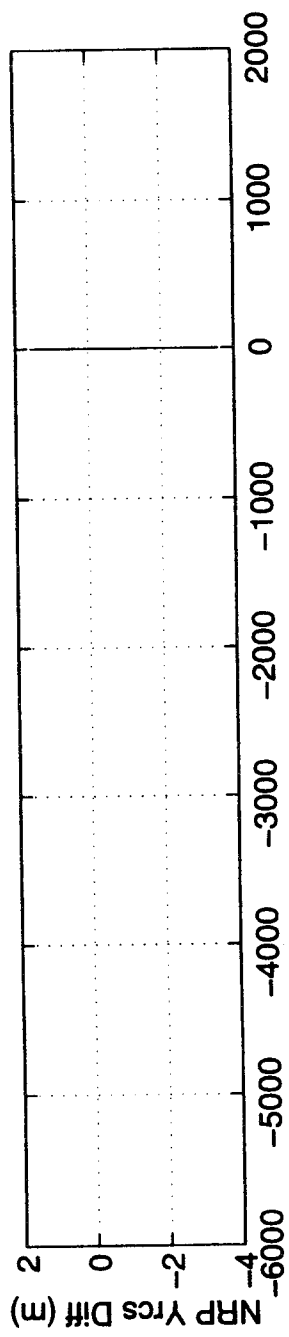
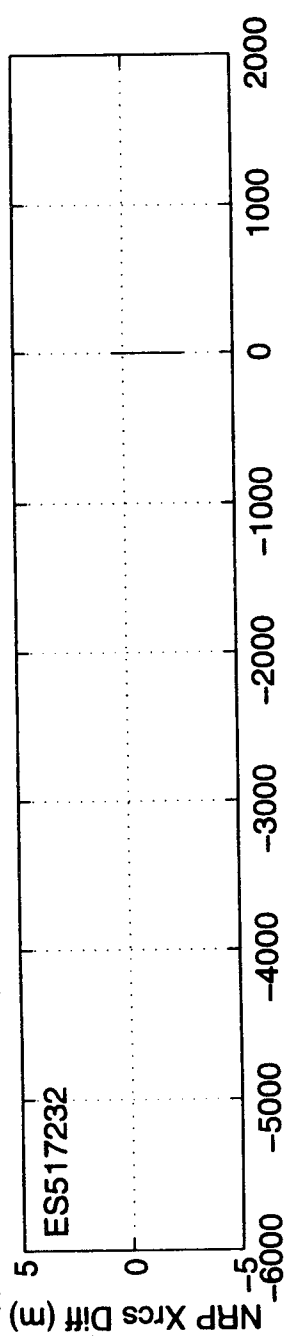
TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

-----  
NRP Xrcs MEAN DIFFERENCE (m): -0.366  
NRP Yrcs MEAN DIFFERENCE (m): 0.384  
NRP Zrcs MEAN DIFFERENCE (m): -0.662

NRP Xrcs 2-SIGMA DIFFERENCE (m): 1.809  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 3.055  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 1.591

NRP Xrcs 2-RMS DIFFERENCE (m): 1.952  
NRP Yrcs 2-RMS DIFFERENCE (m): 3.150  
NRP Zrcs 2-RMS DIFFERENCE (m): 2.070

NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES





APPROACH #: ES517401  
START TIME: 490683.726  
STOP TIME: 490830.122

MINIMUM HDOP: 0.6  
MAXIMUM HDOP: 0.6  
AVERAGE HDOP: 0.6

MINIMUM VDOP: 1.8  
MAXIMUM VDOP: 1.9  
AVERAGE VDOP: 1.8

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
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\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

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TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
-----

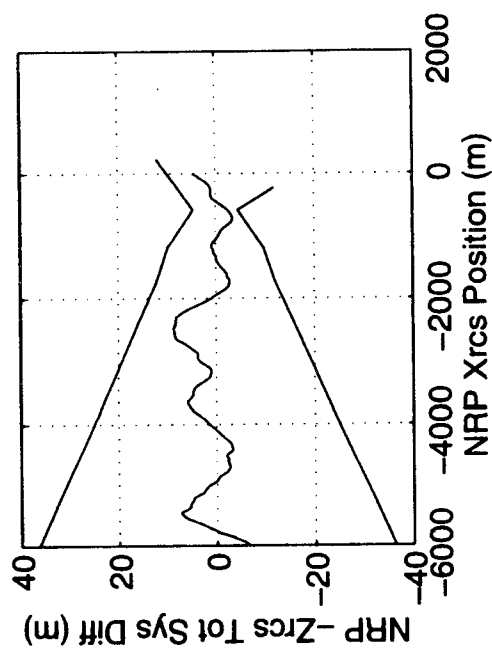
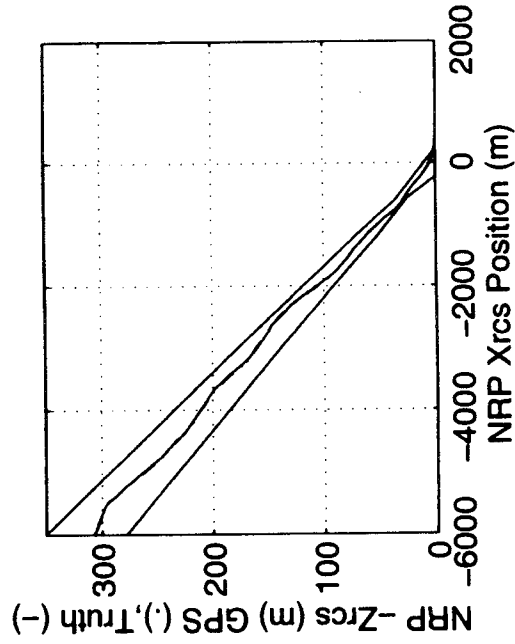
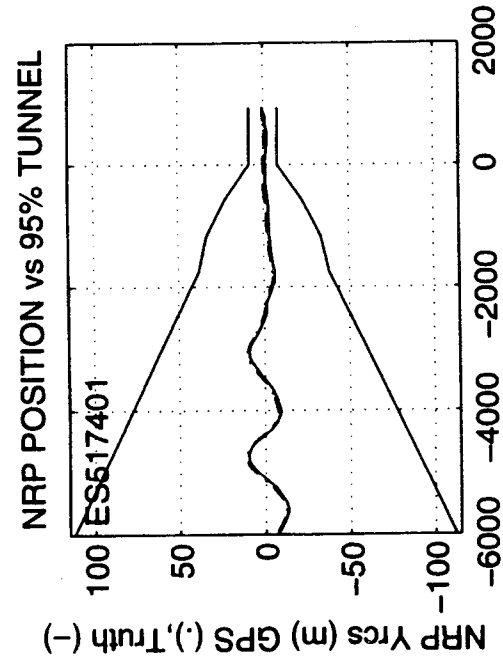
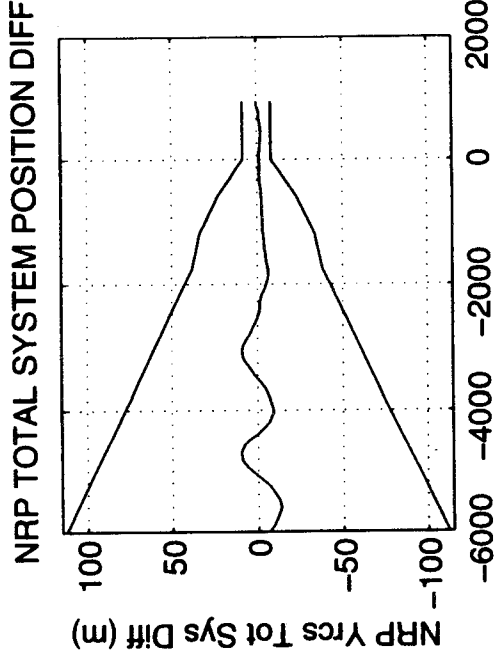
NRP Xrcs MEAN DIFFERENCE (m): 0.484  
NRP Yrcs MEAN DIFFERENCE (m): 1.380  
NRP Zrcs MEAN DIFFERENCE (m): -0.111

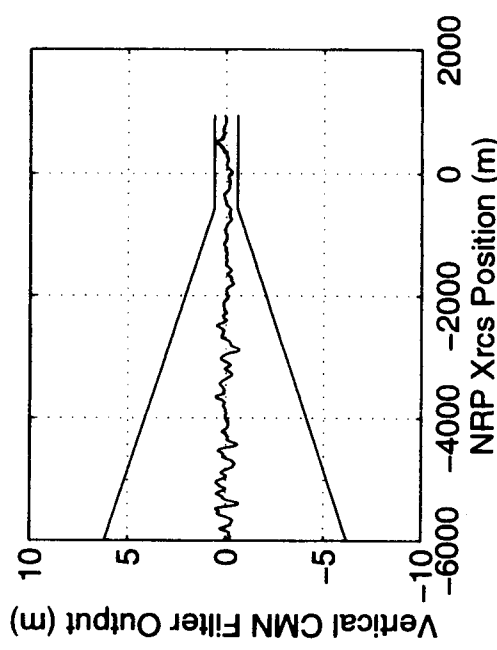
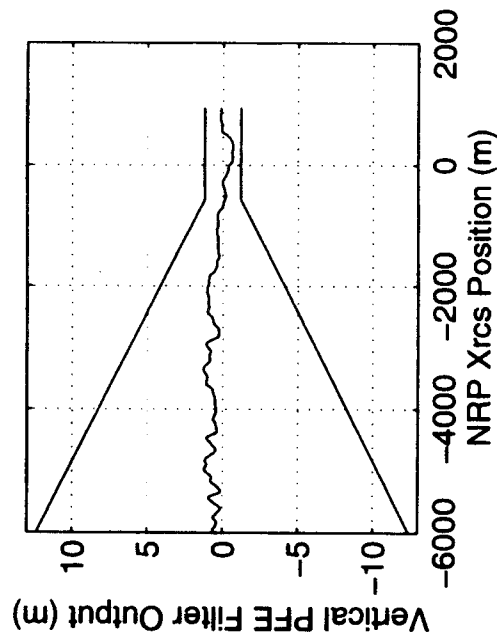
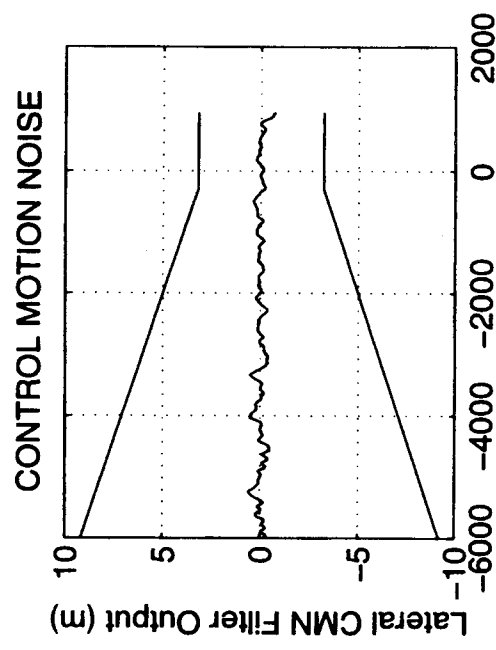
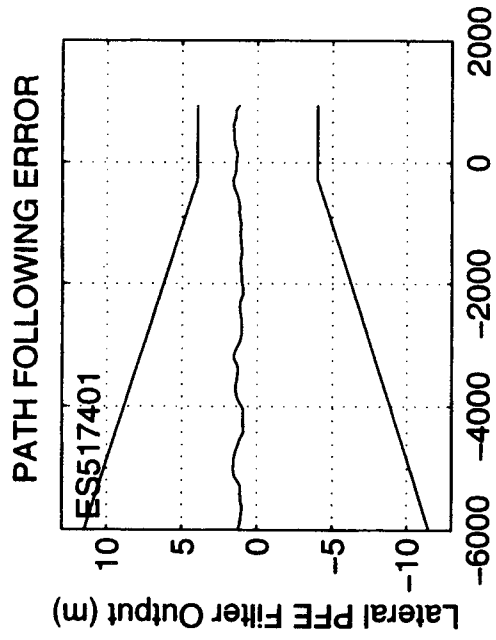
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.932  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.490  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.685

NRP Xrcs 2-RMS DIFFERENCE (m): 1.344  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.803  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.720

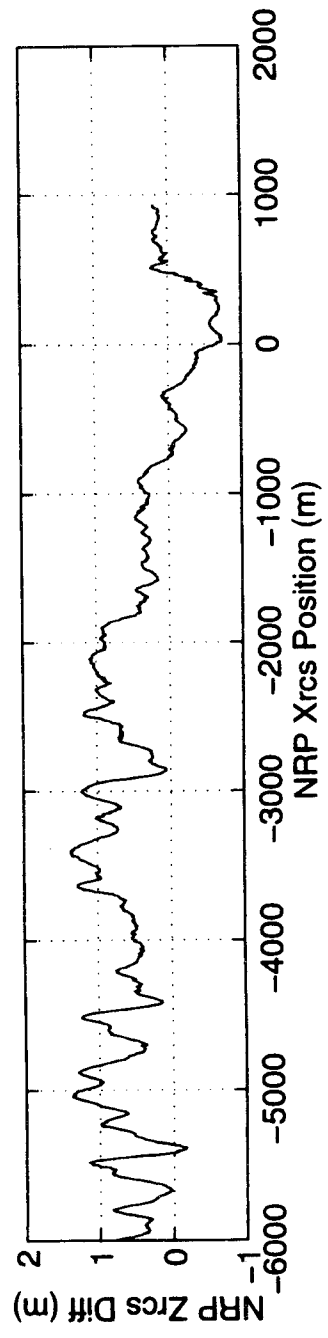
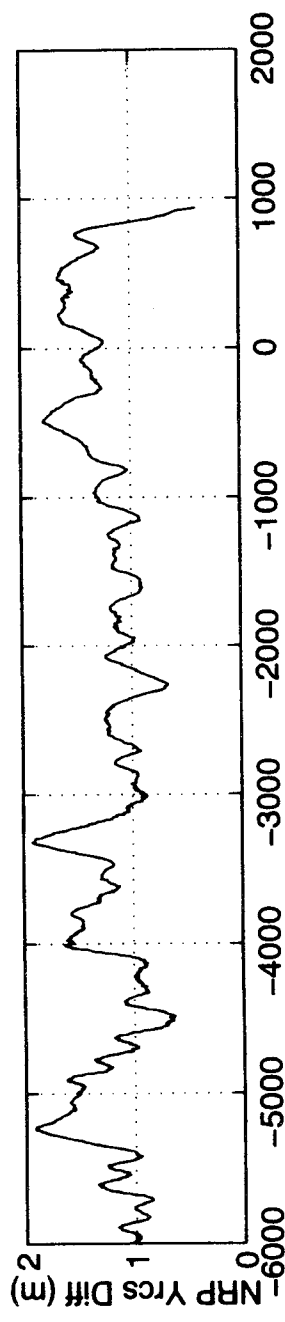
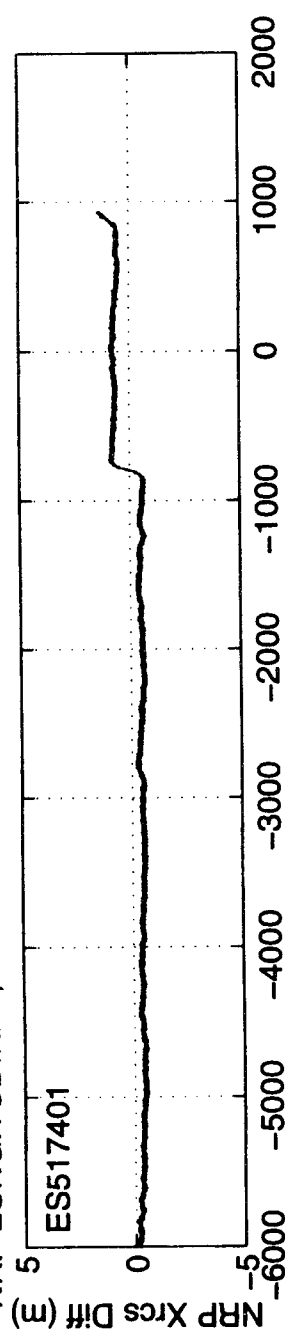
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----

LGRP Xrcs POSITION (m): 417.162  
LGRP Yrcs POSITION (m): -1.812





NRP LONGITUDINAL, LATERAL AND VERTICAL POSITION DIFFERENCES



APPROACH #: ES517402  
START TIME: 491176.528  
STOP TIME: 491320.122

MINIMUM HDOP: 0.6  
MAXIMUM HDOP: 0.6  
AVERAGE HDOP: 0.6

MINIMUM VDOP: 1.8  
MAXIMUM VDOP: 1.9  
AVERAGE VDOP: 1.9

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

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TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

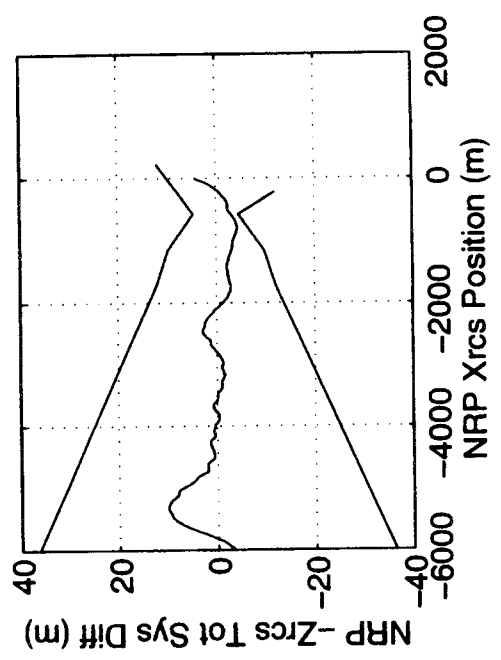
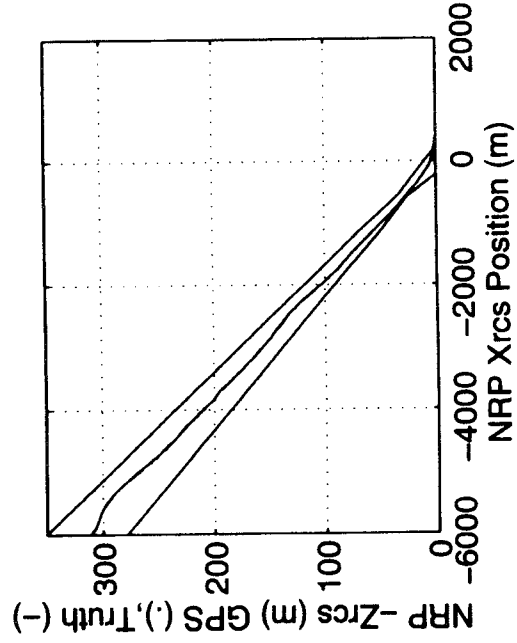
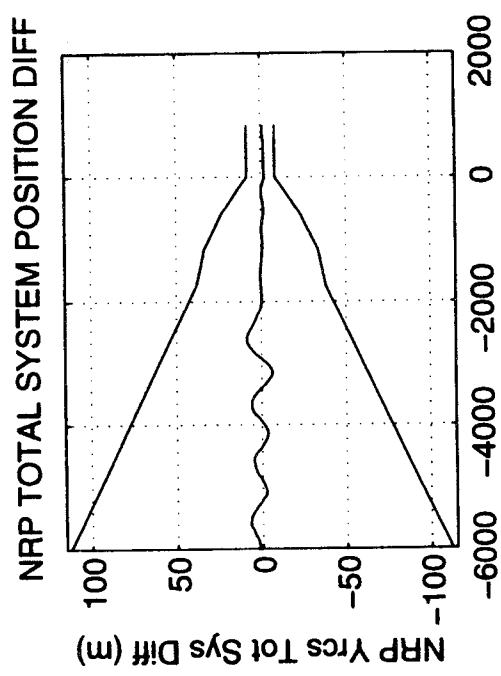
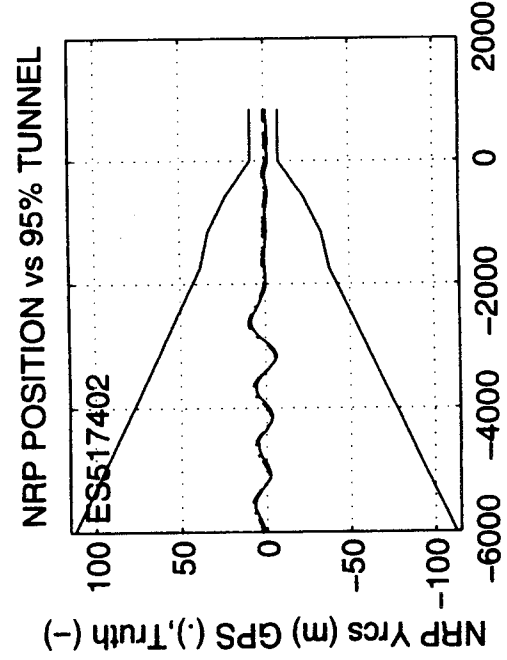
NRP Xrcs MEAN DIFFERENCE (m): 0.549  
NRP Yrcs MEAN DIFFERENCE (m): 1.474  
NRP Zrcs MEAN DIFFERENCE (m): -0.097

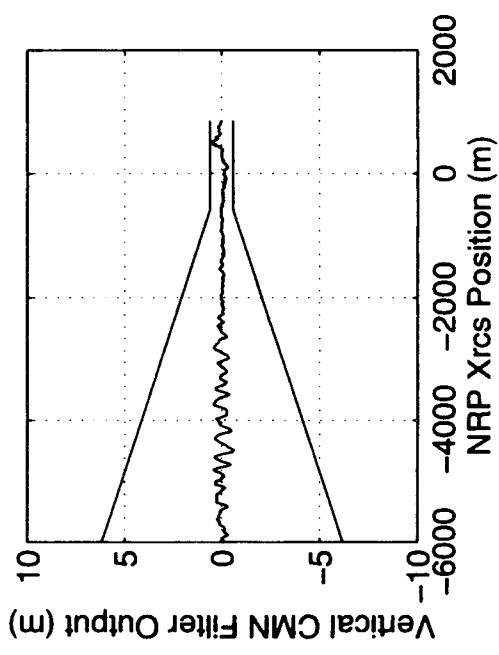
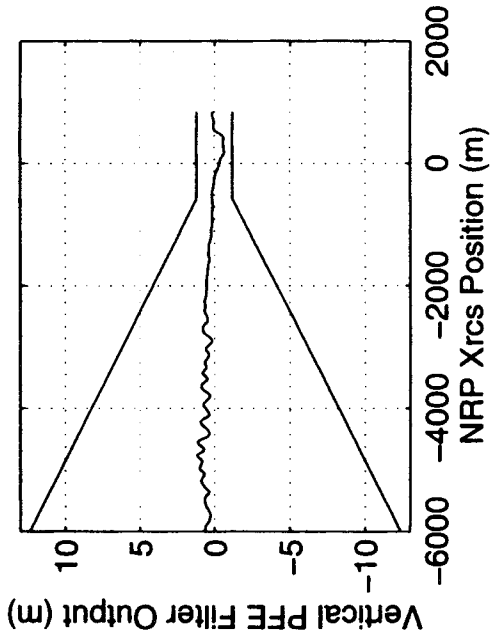
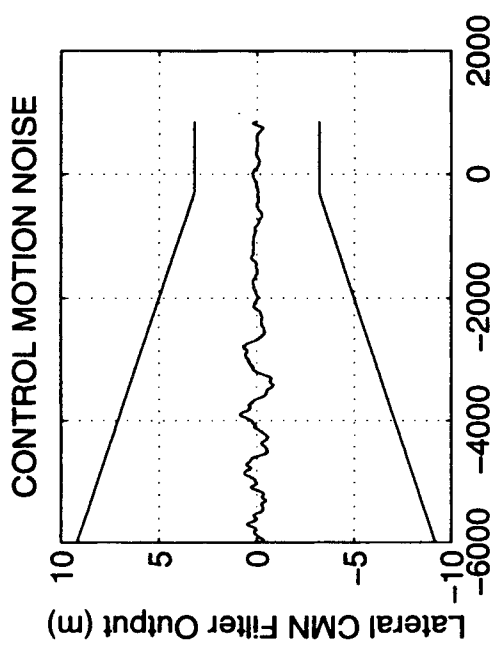
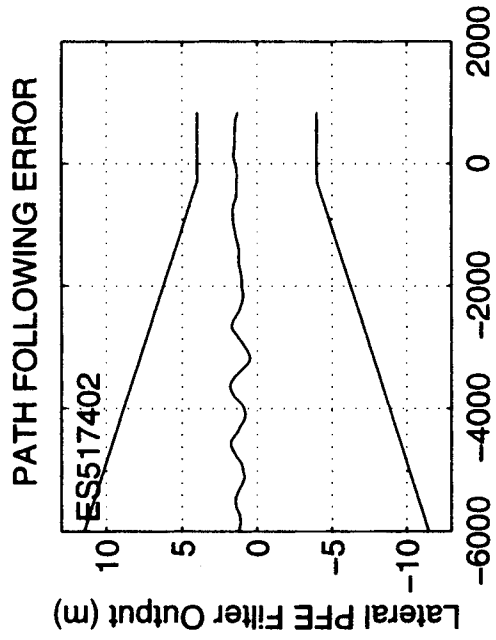
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.226  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.291  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.605

NRP Xrcs 2-RMS DIFFERENCE (m): 1.121  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.962  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.635

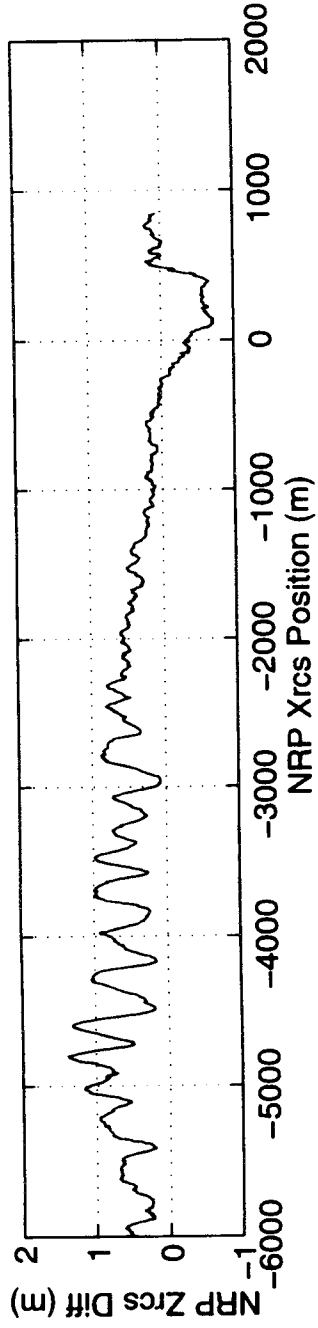
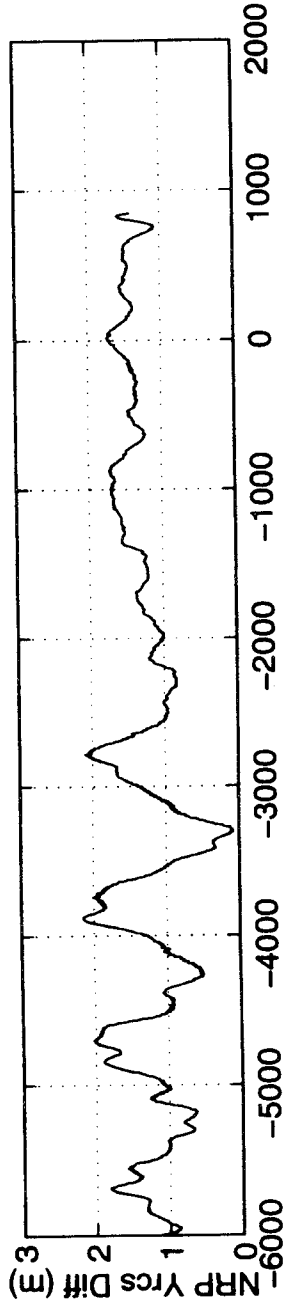
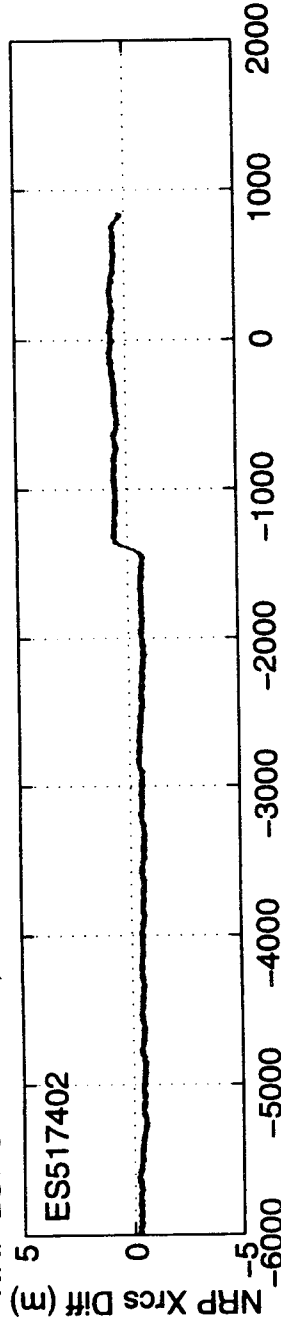
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 442.087  
LGRP Yrcs POSITION (m): -1.290





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES





APPROACH #: ES517403  
START TIME: 491676.649  
STOP TIME: 491815.111

MINIMUM HDOP: 0.4  
MAXIMUM HDOP: 0.6  
AVERAGE HDOP: 0.5

MINIMUM VDOP: 1.2  
MAXIMUM VDOP: 1.8  
AVERAGE VDOP: 1.5

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 10  
AVERAGE NUMBER OF SVs: 9

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
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\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

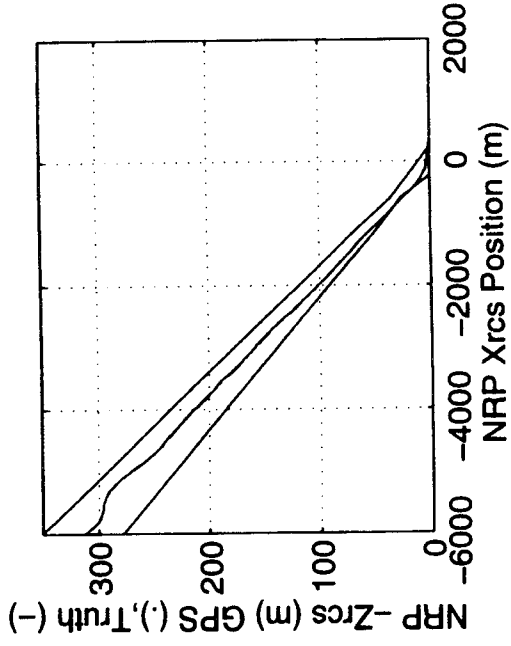
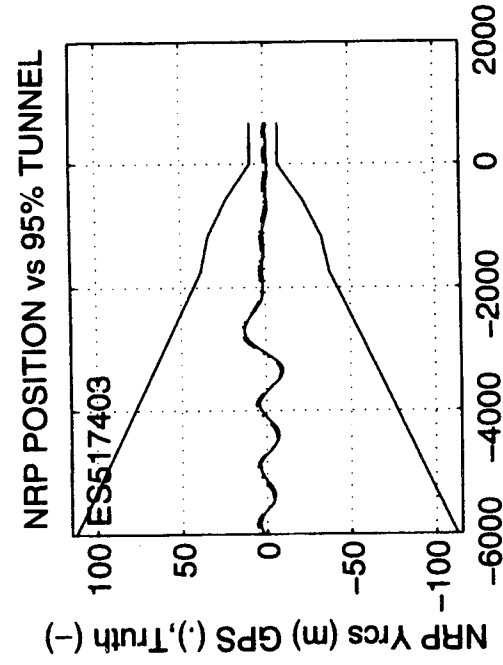
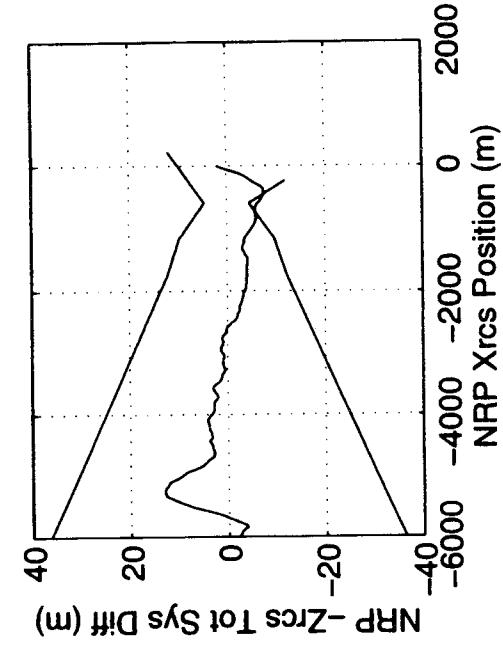
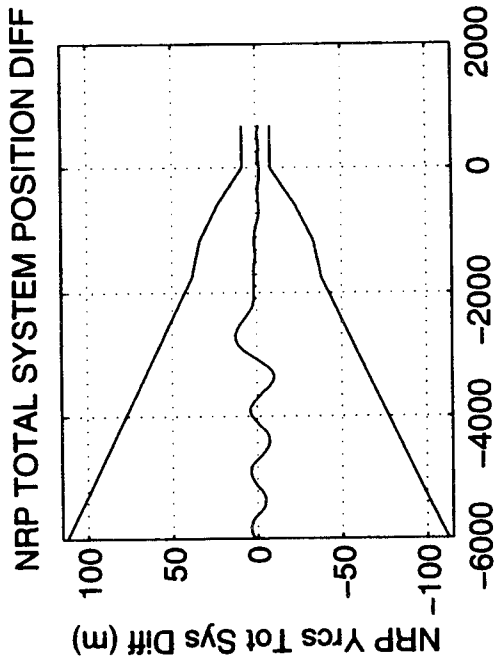
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.549  
NRP Yrcs MEAN DIFFERENCE (m): 1.550  
NRP Zrcs MEAN DIFFERENCE (m): -0.062

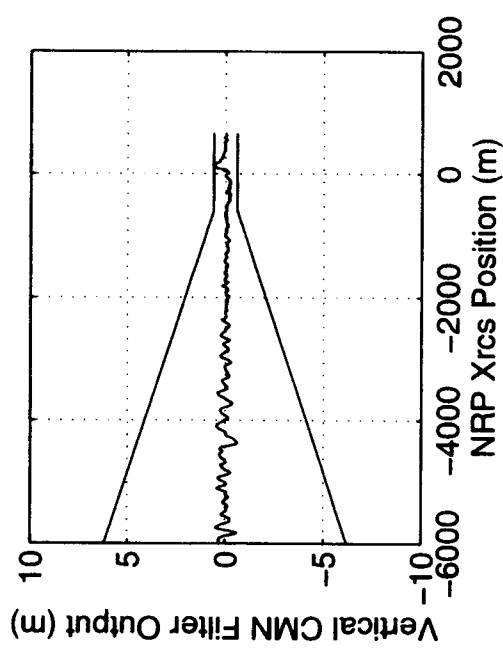
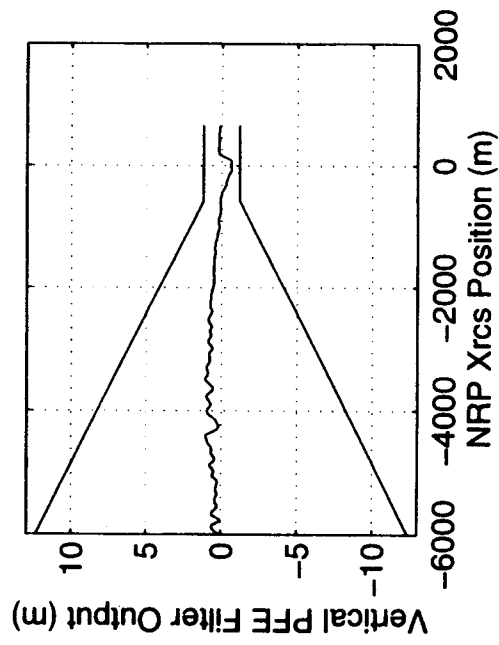
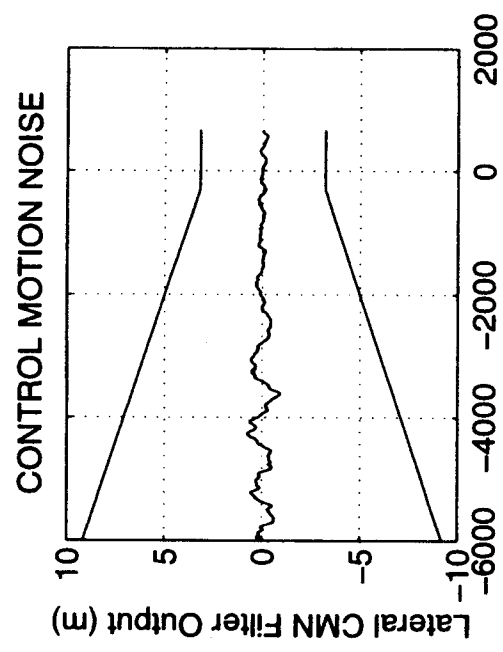
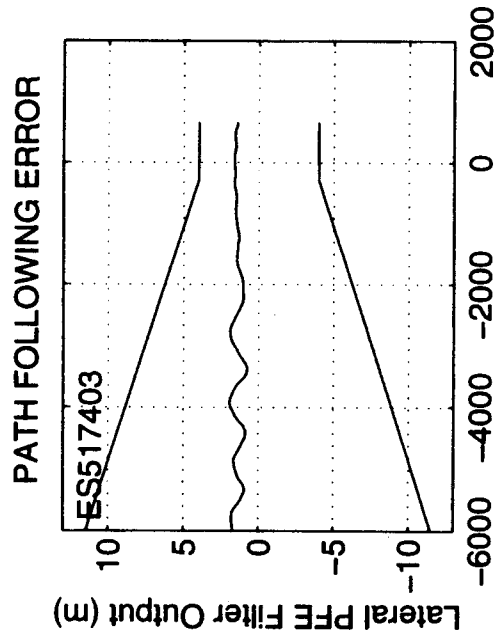
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.261  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.230  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.614

NRP Xrcs 2-RMS DIFFERENCE (m): 1.128  
NRP Yrcs 2-RMS DIFFERENCE (m): 3.108  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.626

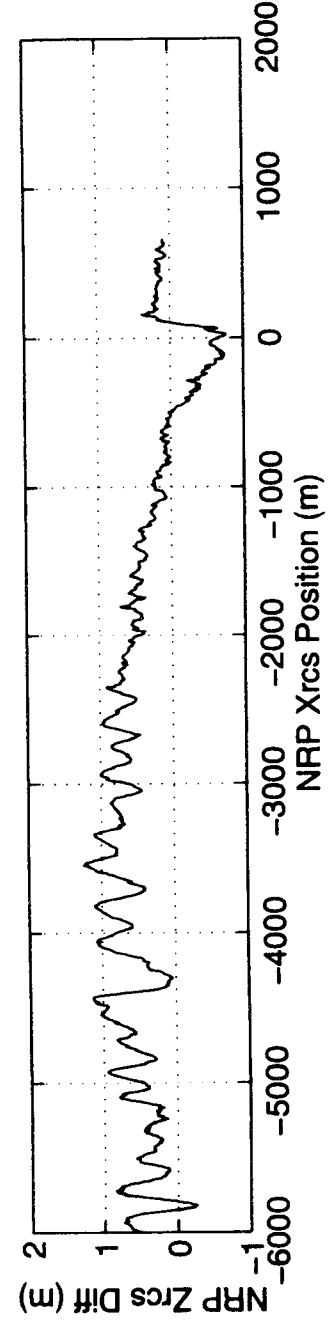
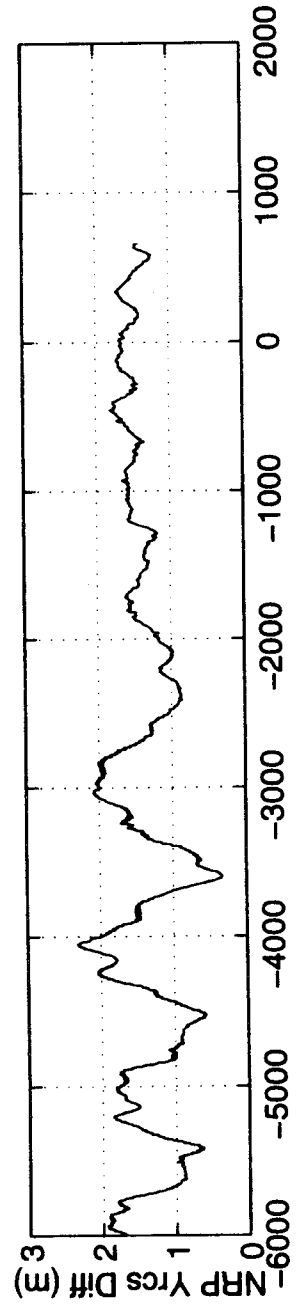
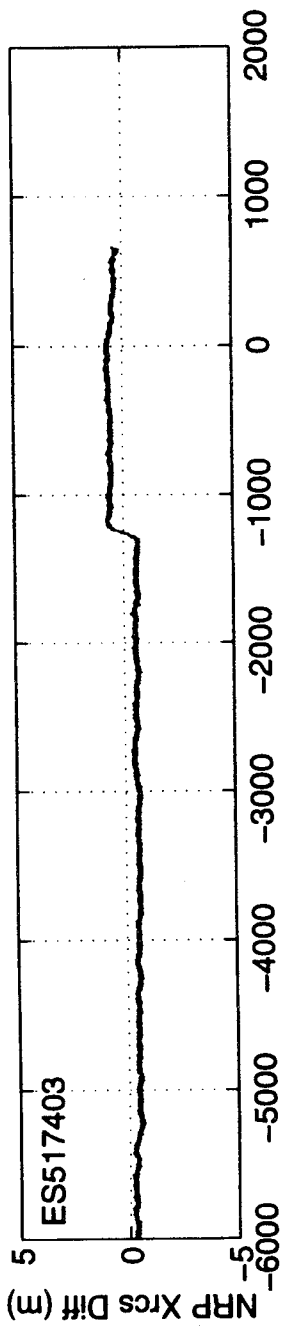
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 30.090  
LGRP Yrcs POSITION (m): -1.284





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517404  
START TIME: 492175.187  
STOP TIME: 492322.924

MINIMUM HDOP: 1.0  
MAXIMUM HDOP: 1.0  
AVERAGE HDOP: 1.0

MINIMUM VDOP: 3.3  
MAXIMUM VDOP: 3.5  
AVERAGE VDOP: 3.4

MINIMUM NUMBER OF SVs: 9  
MAXIMUM NUMBER OF SVs: 9  
AVERAGE NUMBER OF SVs: 9

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
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\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

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TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
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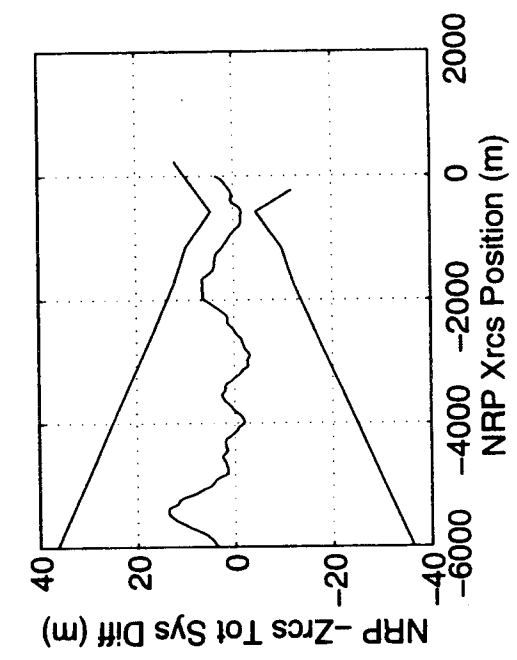
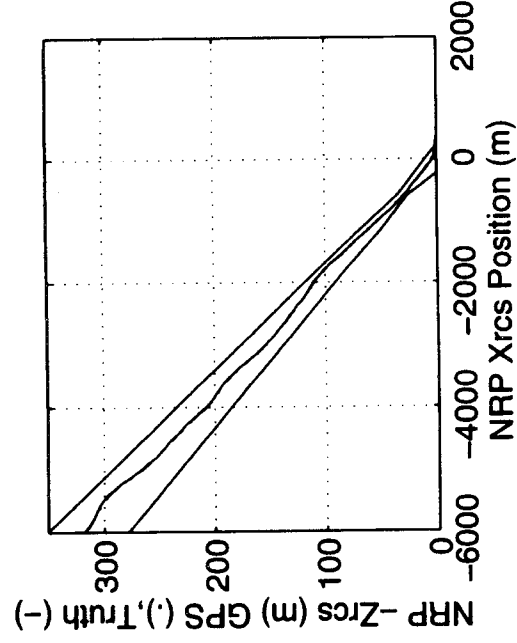
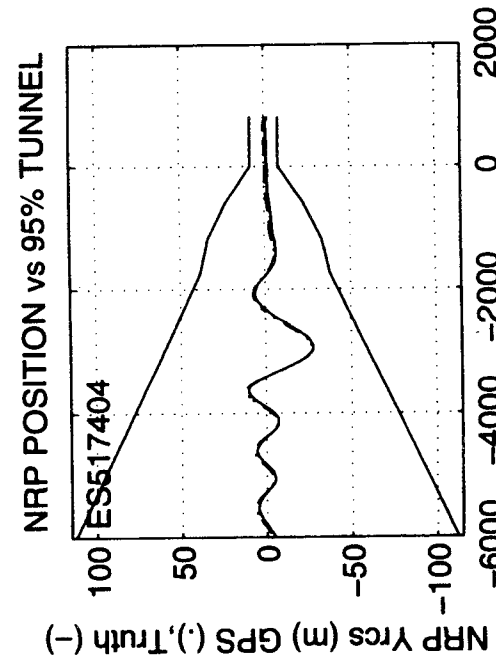
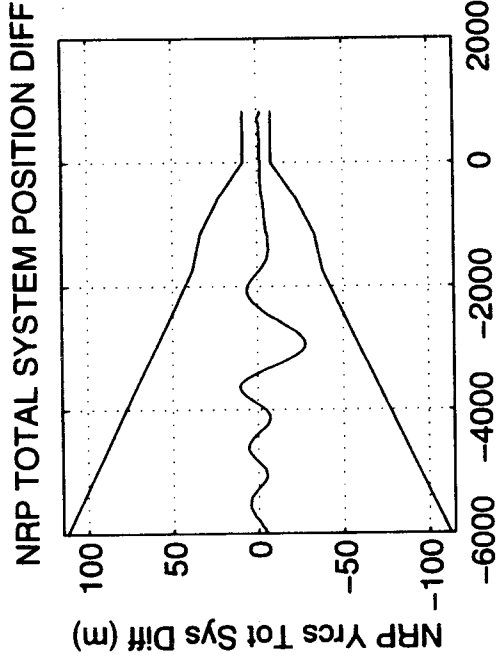
NRP Xrcs MEAN DIFFERENCE (m): 0.570  
NRP Yrcs MEAN DIFFERENCE (m): 1.533  
NRP Zrcs MEAN DIFFERENCE (m): -0.182

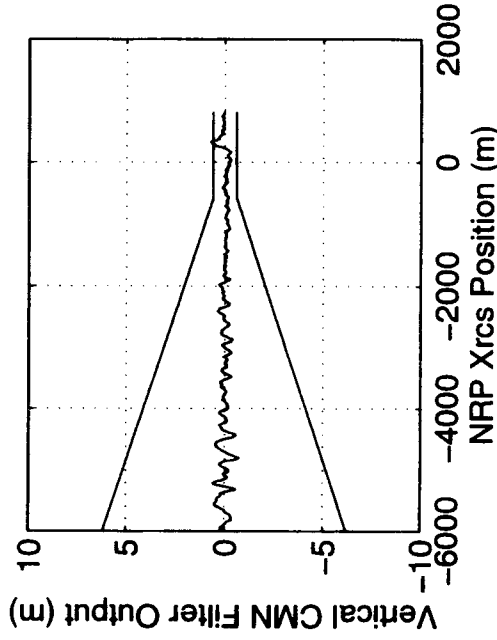
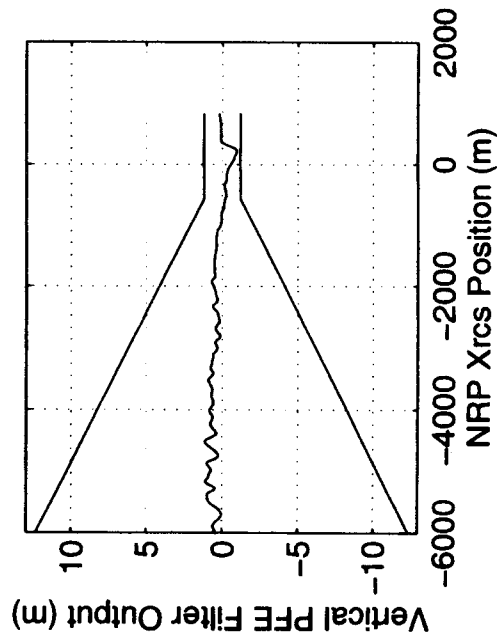
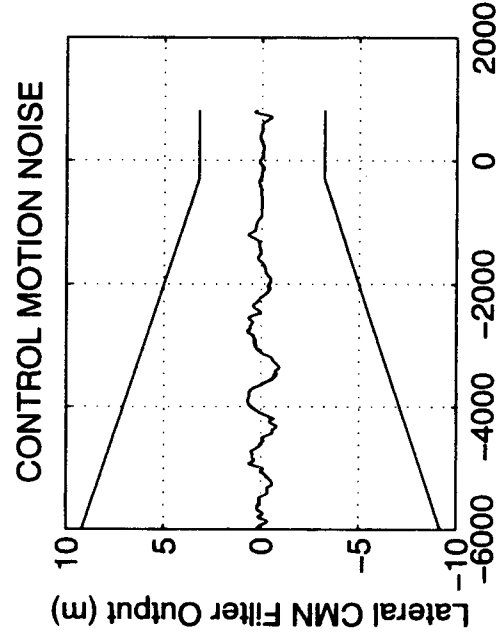
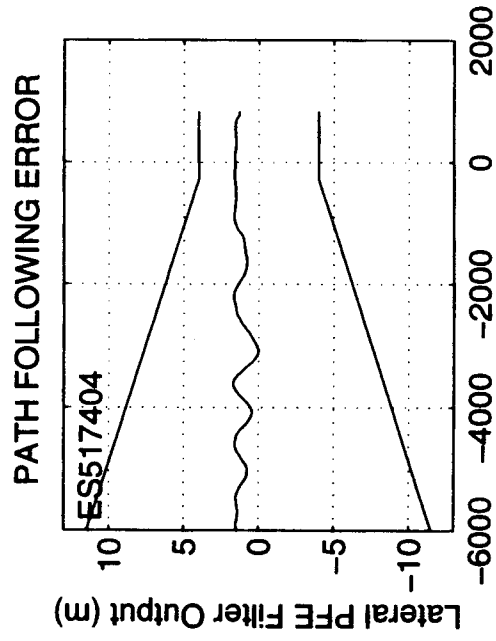
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.245  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.300  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.685

NRP Xrcs 2-RMS DIFFERENCE (m): 1.167  
NRP Yrcs 2-RMS DIFFERENCE (m): 3.080  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.776

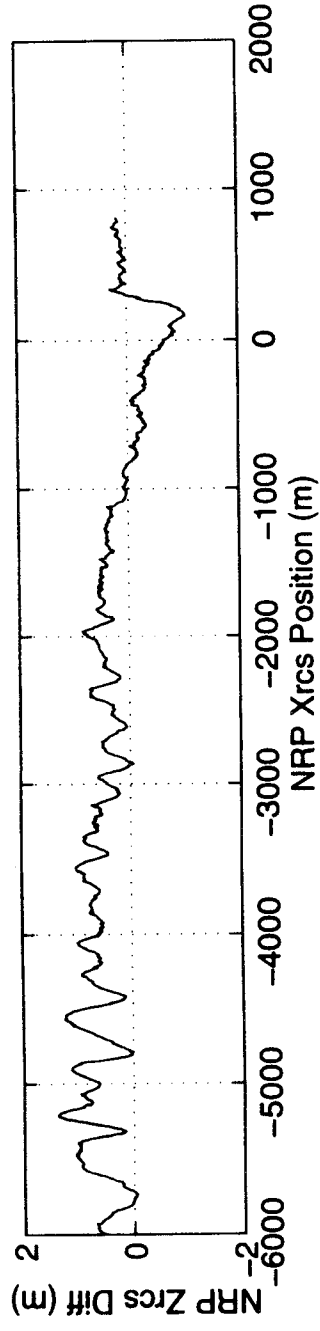
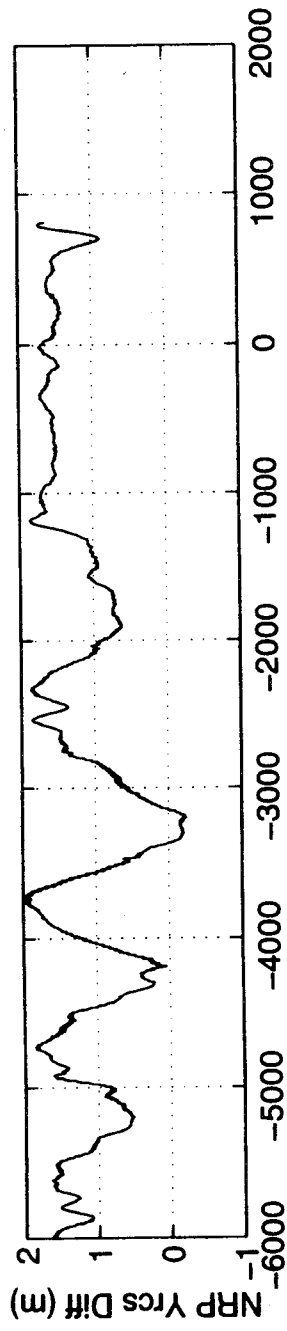
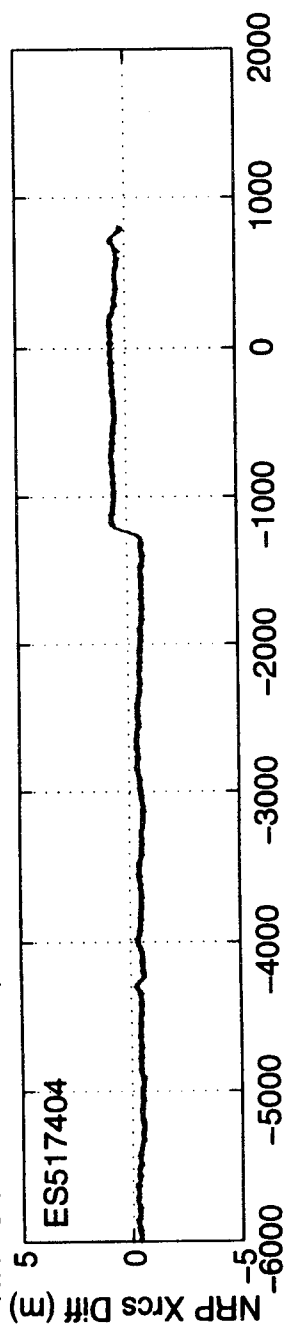
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----

LGRP Xrcs POSITION (m): 301.513  
LGRP Yrcs POSITION (m): -1.206





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES





APPROACH #: ES517405  
START TIME: 492668.330  
STOP TIME: 492815.264

MINIMUM HDOP: 1.0  
MAXIMUM HDOP: 1.0  
AVERAGE HDOP: 1.0

MINIMUM VDOP: 3.3  
MAXIMUM VDOP: 3.6  
AVERAGE VDOP: 3.4

MINIMUM NUMBER OF SVs: 9  
MAXIMUM NUMBER OF SVs: 9  
AVERAGE NUMBER OF SVs: 9

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

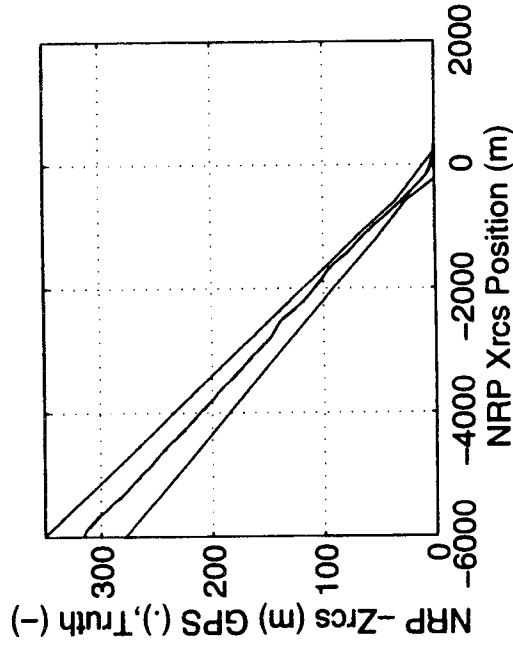
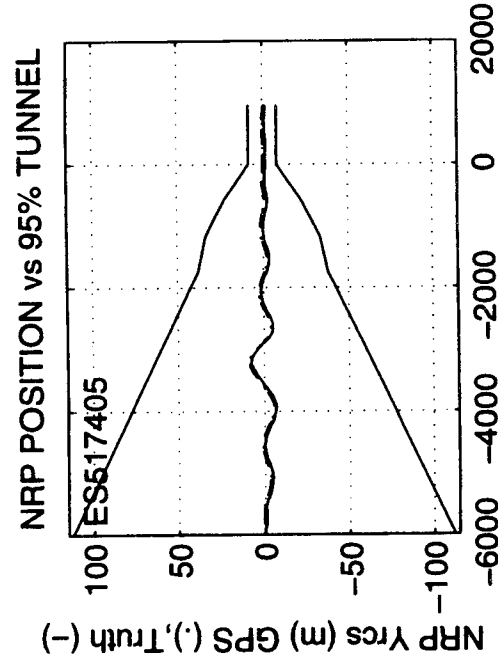
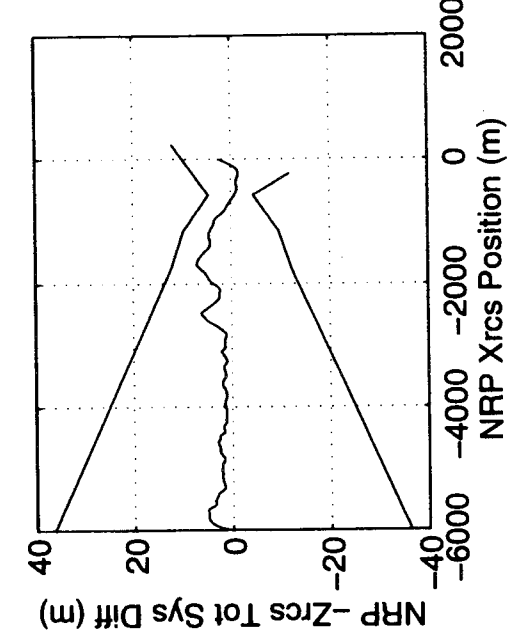
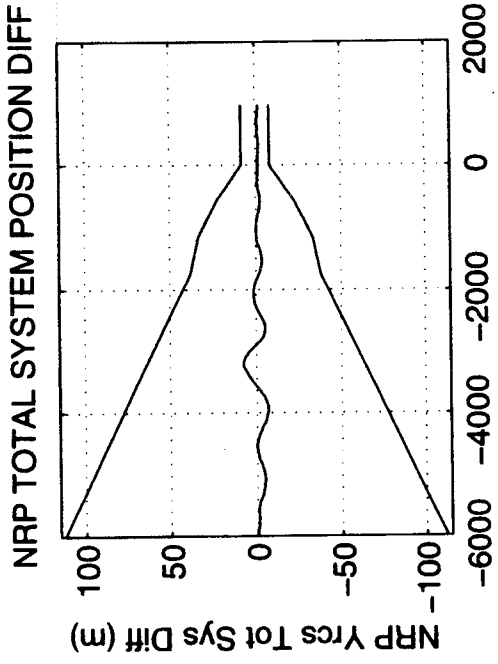
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.601  
NRP Yrcs MEAN DIFFERENCE (m): 1.547  
NRP Zrcs MEAN DIFFERENCE (m): -0.164

NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.303  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.243  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.682

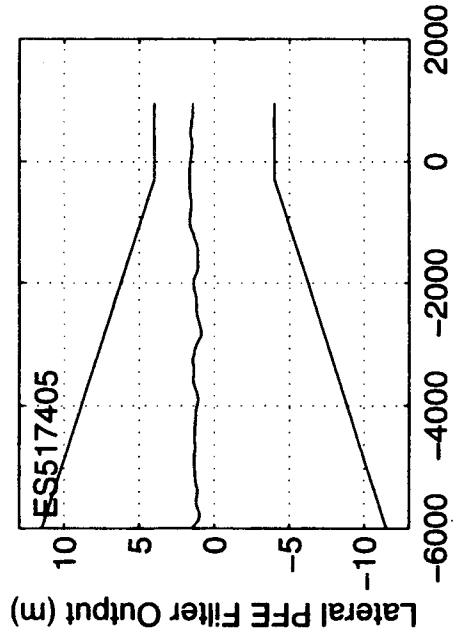
NRP Xrcs 2-RMS DIFFERENCE (m): 1.240  
NRP Yrcs 2-RMS DIFFERENCE (m): 3.104  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.756

-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

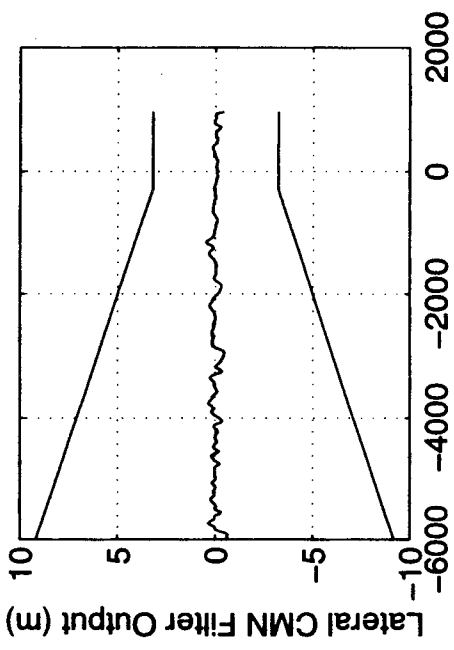
LGRP Xrcs POSITION (m): 283.313  
LGRP Yrcs POSITION (m): -1.441



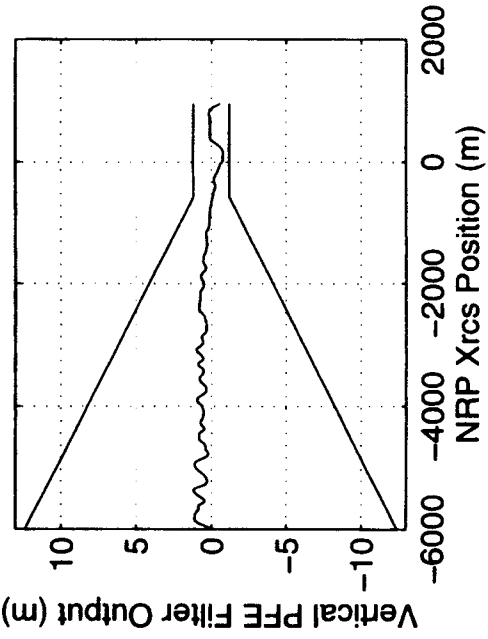
PATH FOLLOWING ERROR



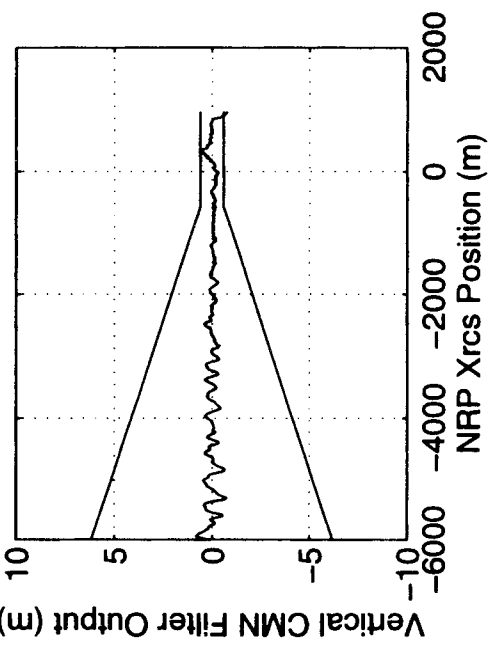
CONTROL MOTION NOISE



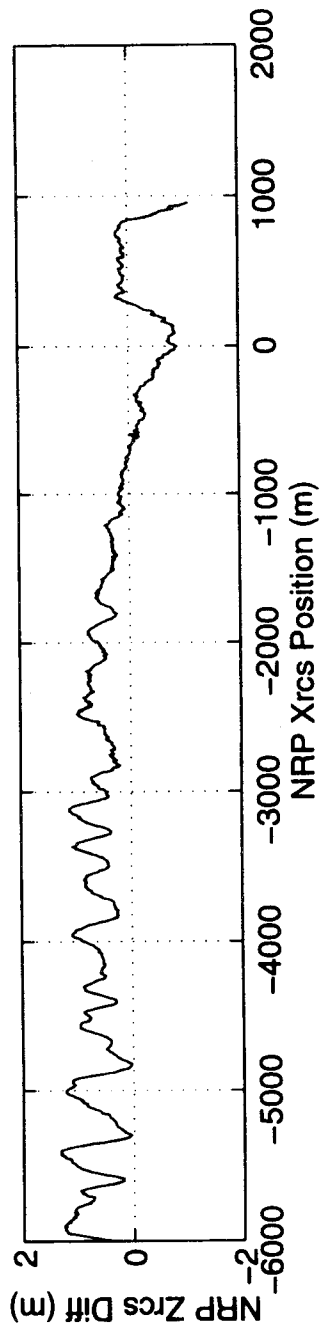
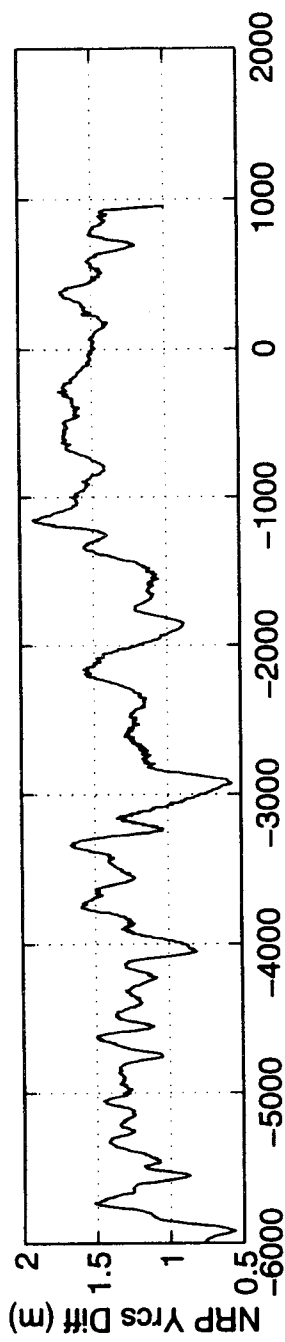
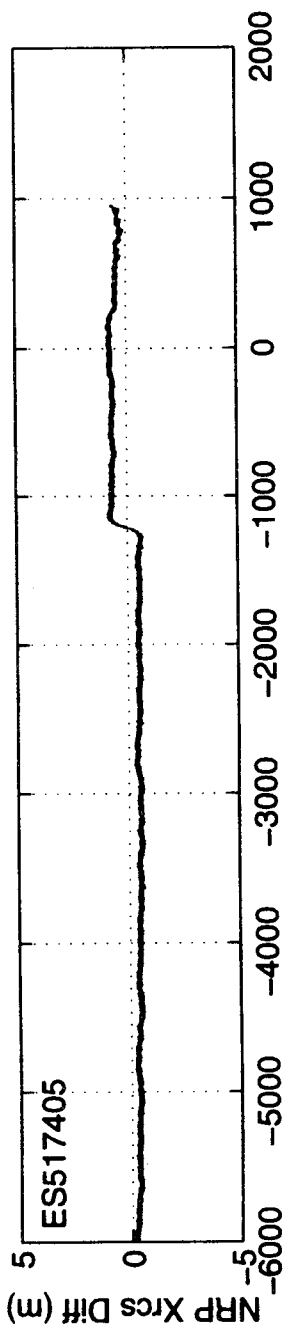
Vertical PFE Filter Output (m)



Vertical CMN Filter Output (m)



NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517406  
START TIME: 493158.649  
STOP TIME: 493305.187

MINIMUM HDOP: 0.9  
MAXIMUM HDOP: 0.9  
AVERAGE HDOP: 0.9

MINIMUM VDOP: 3.1  
MAXIMUM VDOP: 3.2  
AVERAGE VDOP: 3.2

MINIMUM NUMBER OF SVs: 9  
MAXIMUM NUMBER OF SVs: 9  
AVERAGE NUMBER OF SVs: 9

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

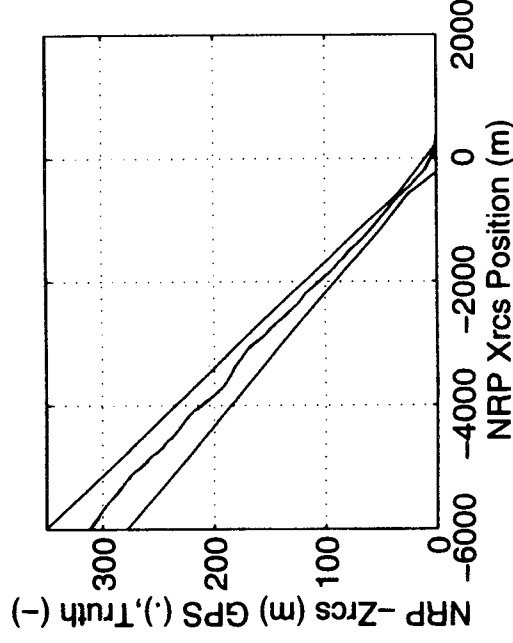
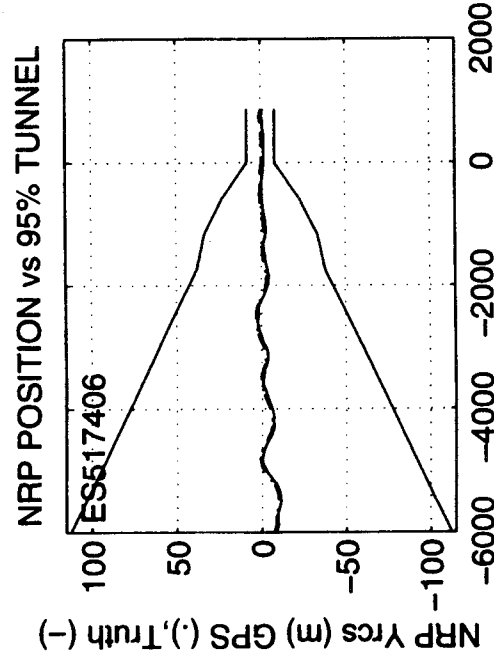
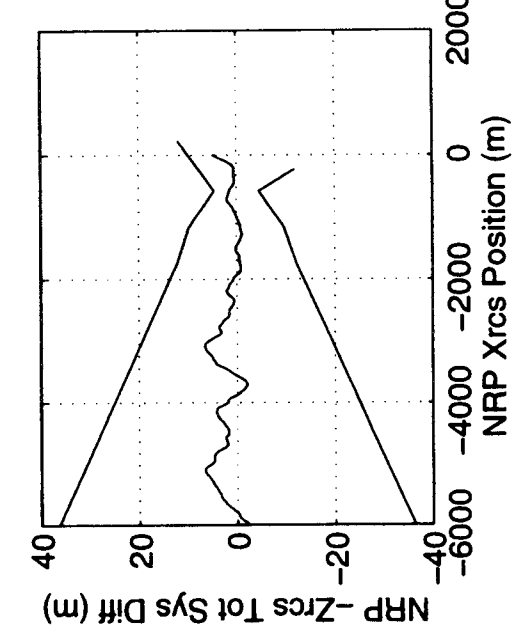
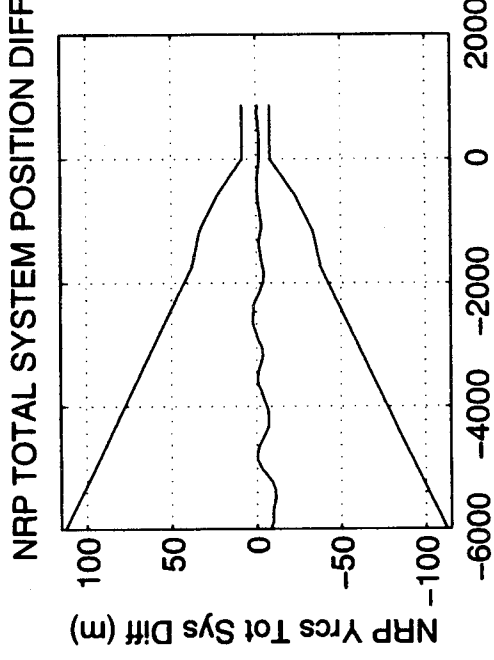
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.312  
NRP Yrcs MEAN DIFFERENCE (m): 1.488  
NRP Zrcs MEAN DIFFERENCE (m): -0.059

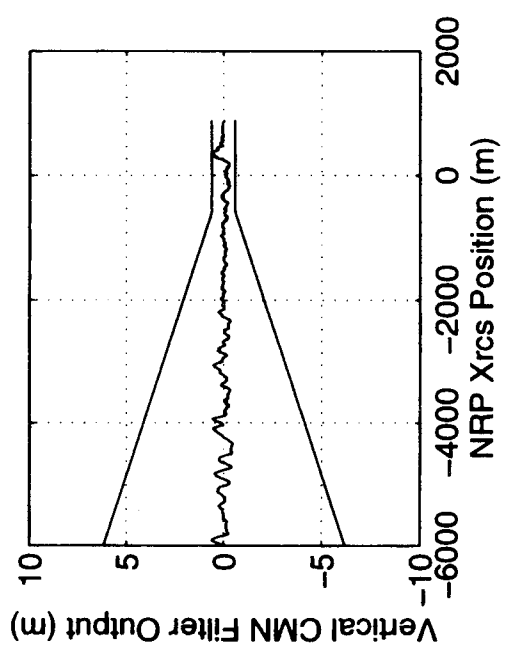
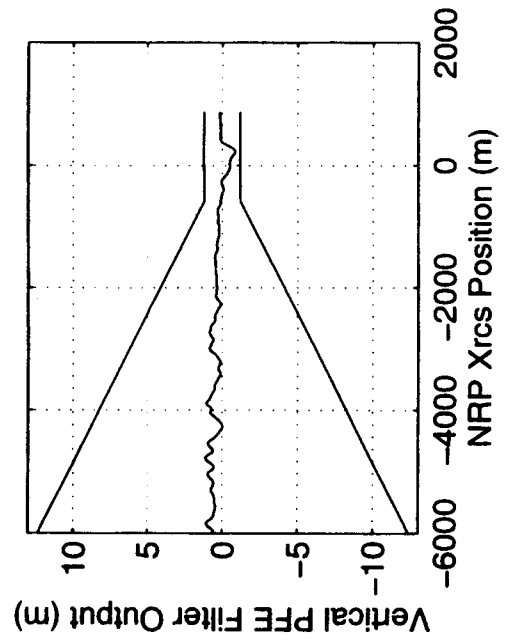
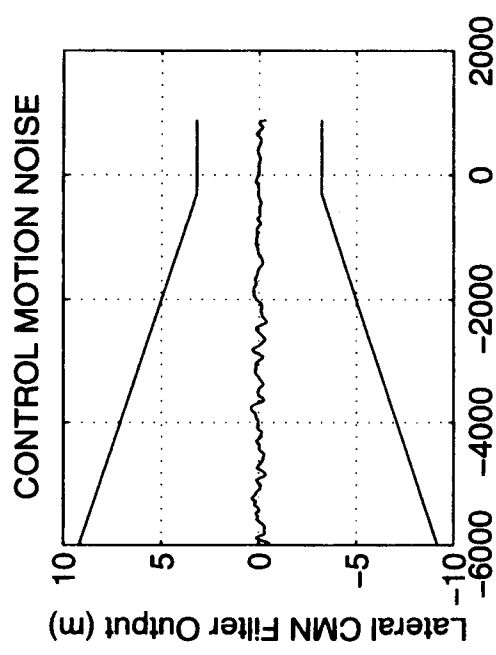
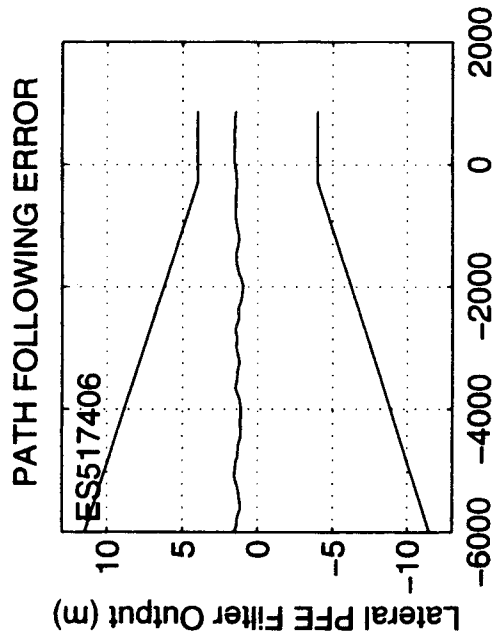
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.977  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.169  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.675

NRP Xrcs 2-RMS DIFFERENCE (m): 1.160  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.982  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.685

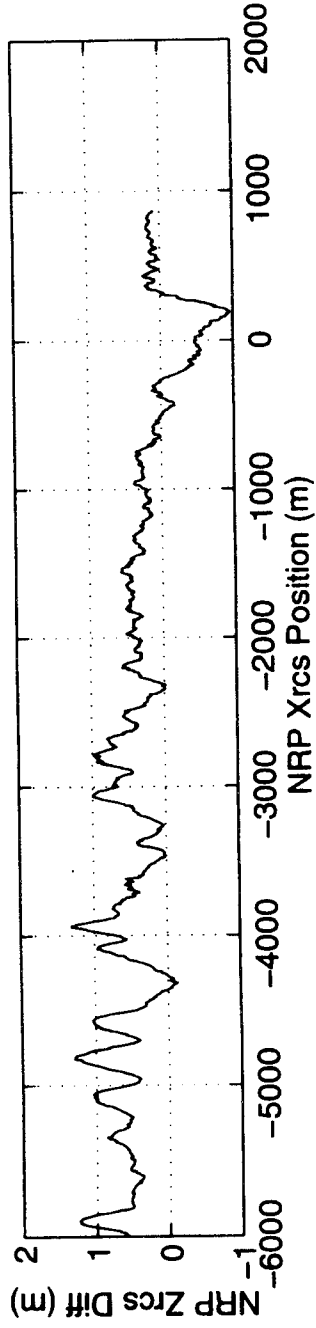
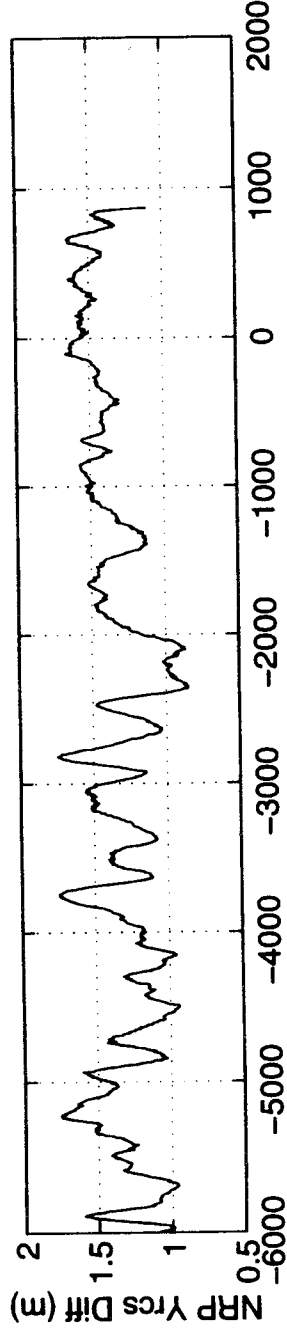
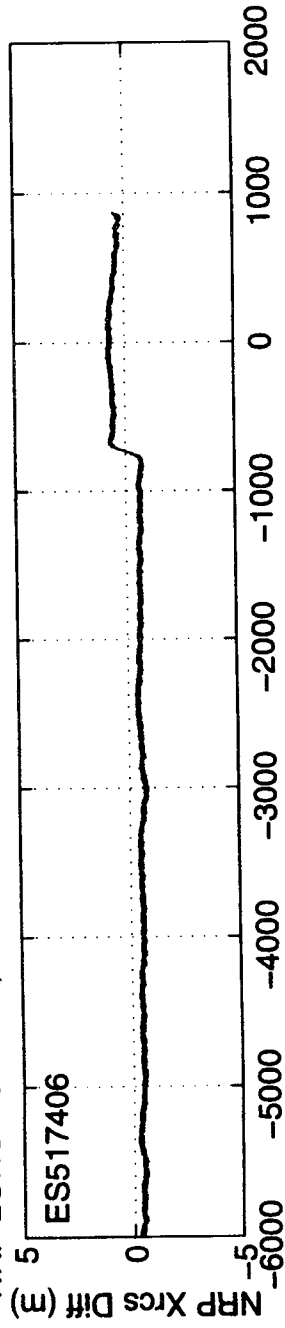
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

-----  
LGRP Xrcs POSITION (m): 259.157  
LGRP Yrcs POSITION (m): -1.347





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES





APPROACH #: ES517407  
START TIME: 493661.330  
STOP TIME: 493805.858

MINIMUM HDOP: 0.8  
MAXIMUM HDOP: 0.9  
AVERAGE HDOP: 0.8

MINIMUM VDOP: 2.7  
MAXIMUM VDOP: 4.6  
AVERAGE VDOP: 3.3

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 9  
AVERAGE NUMBER OF SVs: 9

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
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\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

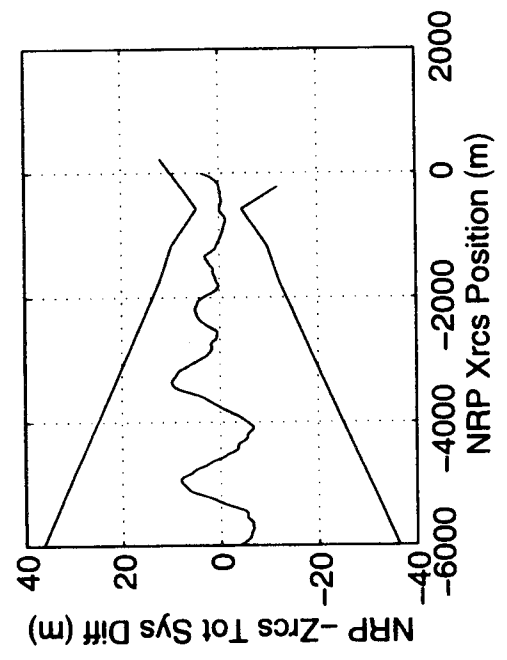
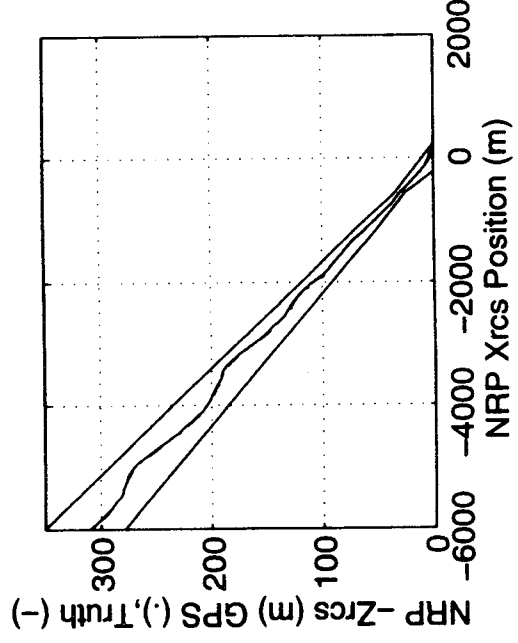
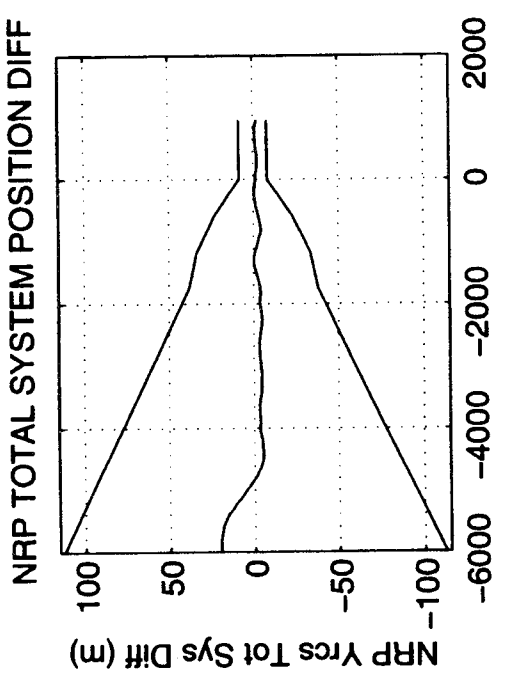
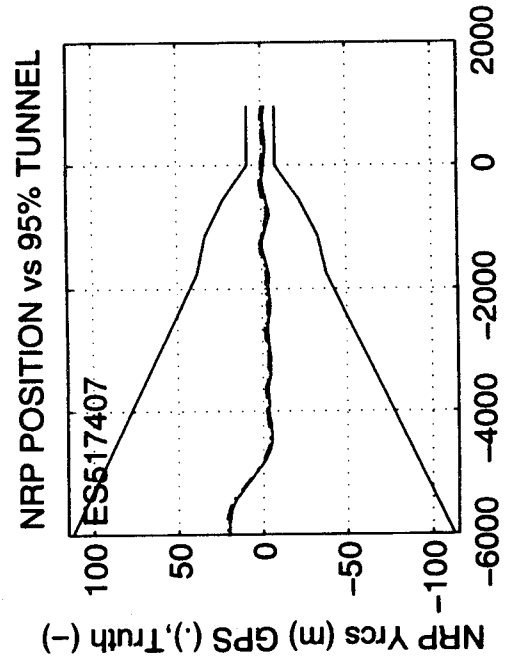
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.430  
NRP Yrcs MEAN DIFFERENCE (m): 1.488  
NRP Zrcs MEAN DIFFERENCE (m): -0.115

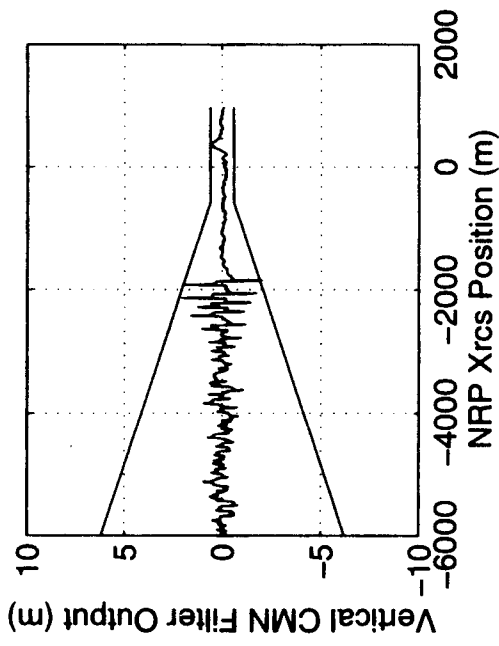
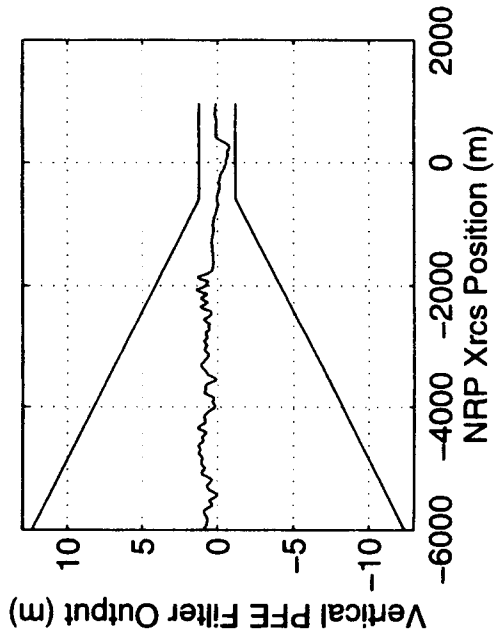
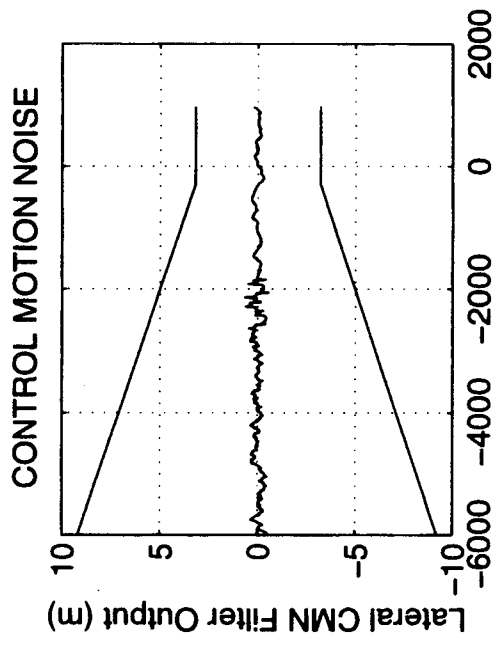
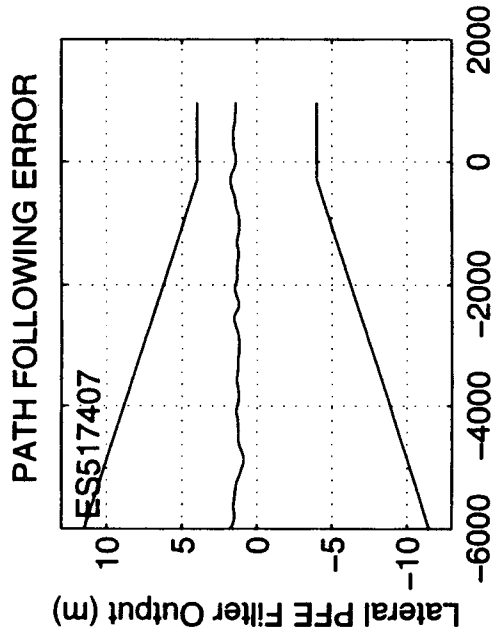
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.810  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.353  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.643

NRP Xrcs 2-RMS DIFFERENCE (m): 1.182  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.997  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.682

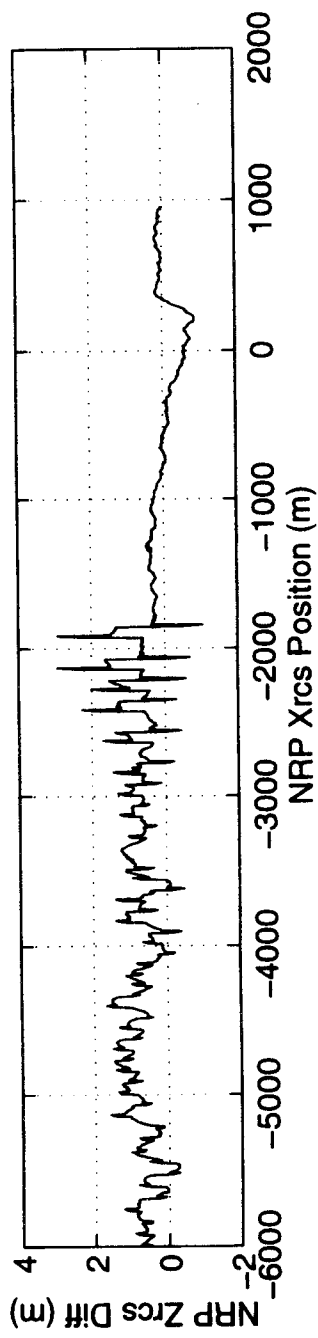
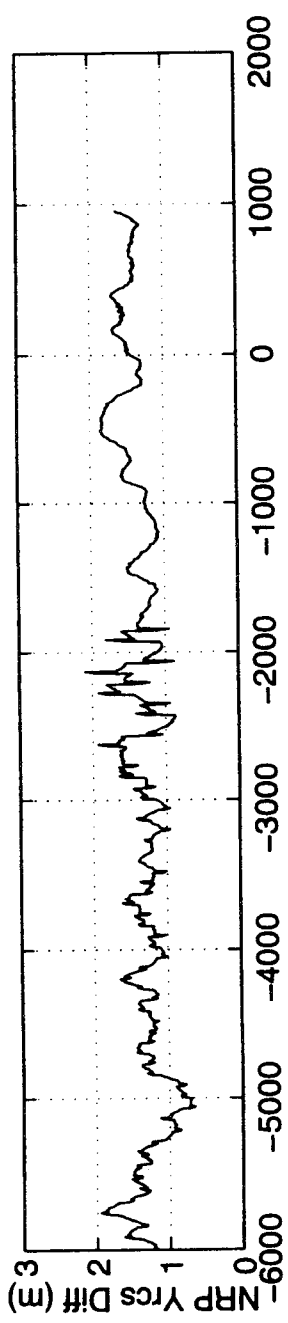
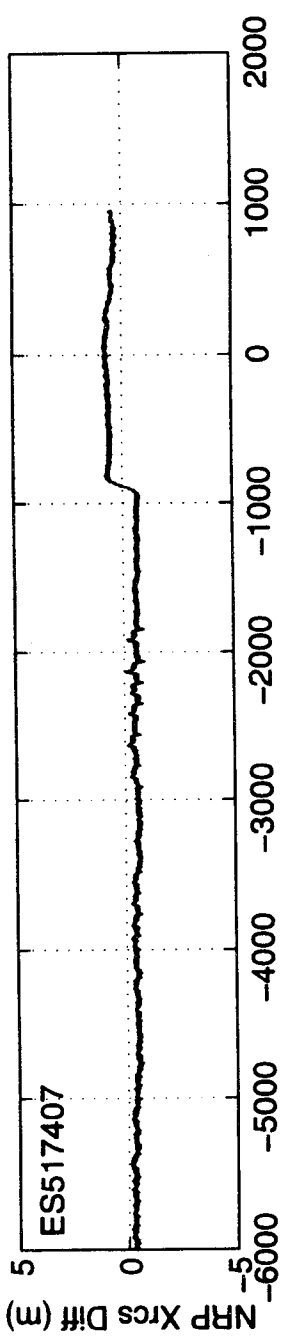
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 343.814  
LGRP Yrcs POSITION (m): -1.994





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517408  
START TIME: 494136.385  
STOP TIME: 494287.781

MINIMUM HDOP: 0.9  
MAXIMUM HDOP: 0.9  
AVERAGE HDOP: 0.9

MINIMUM VDOP: 4.1  
MAXIMUM VDOP: 4.2  
AVERAGE VDOP: 4.2

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

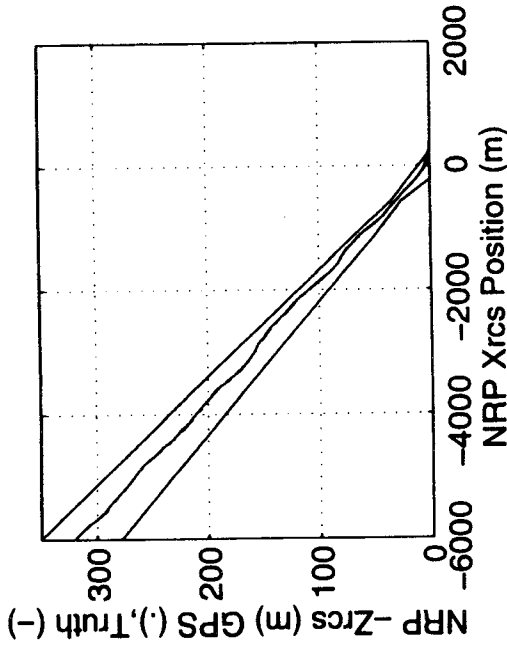
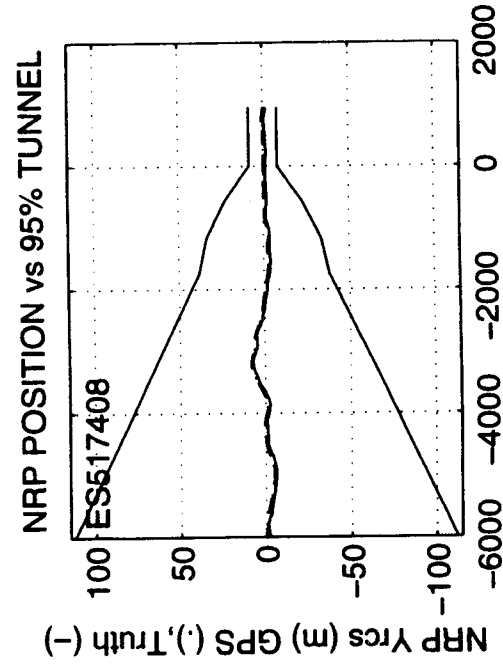
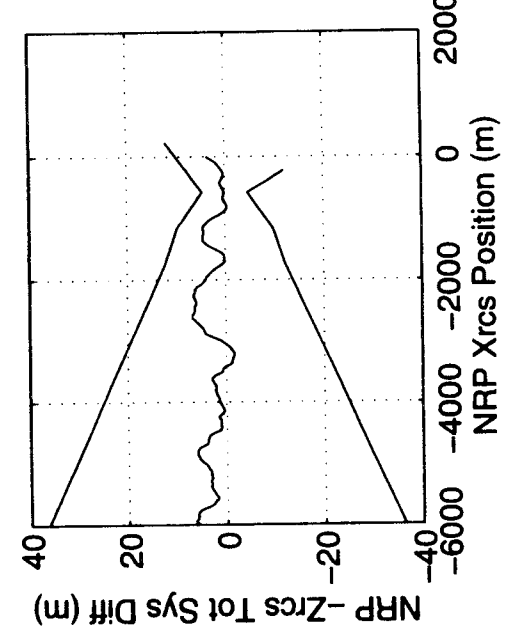
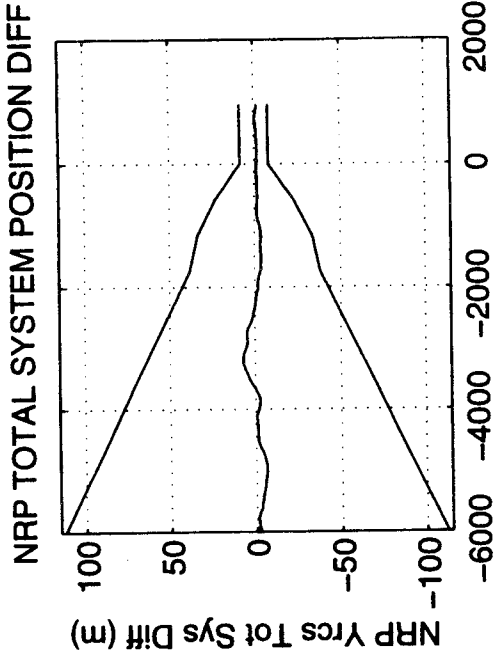
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.216  
NRP Yrcs MEAN DIFFERENCE (m): 1.352  
NRP Zrcs MEAN DIFFERENCE (m): -0.087

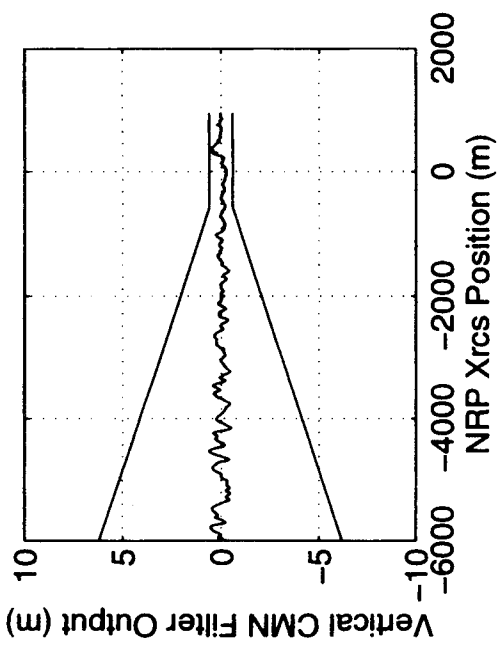
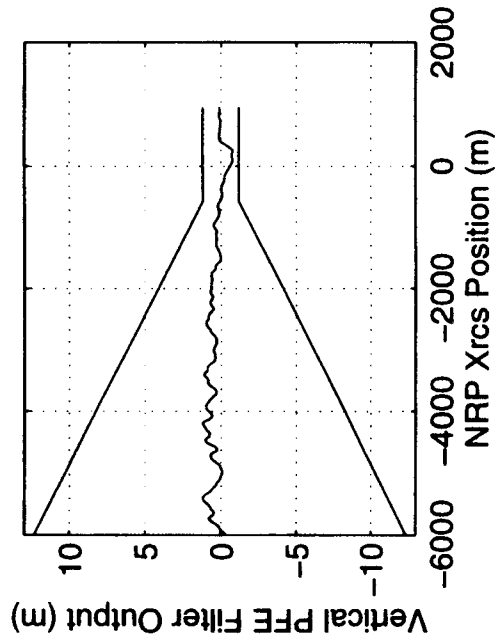
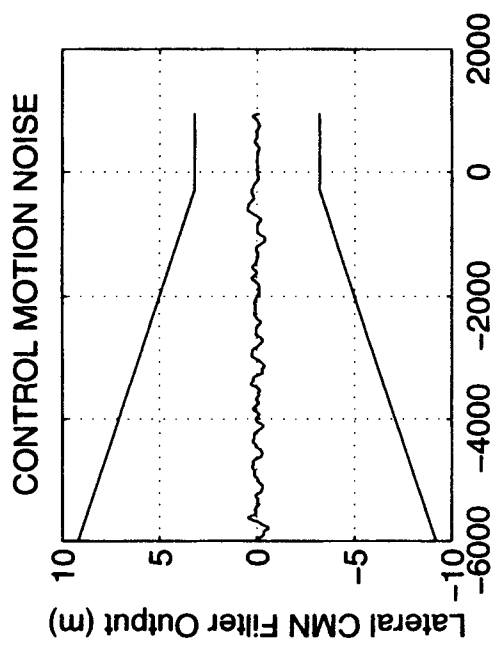
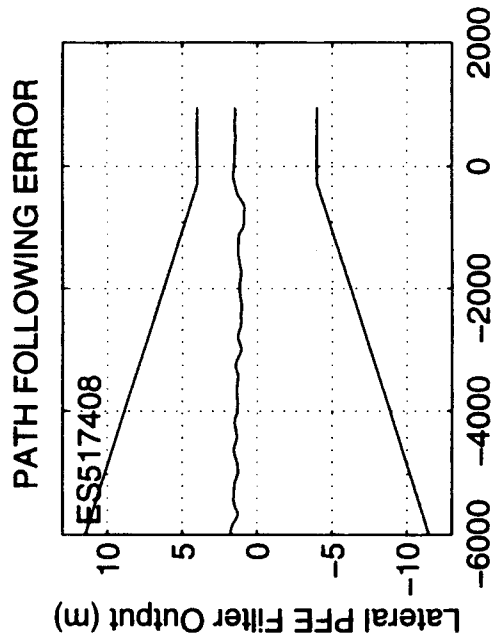
NRP Xrcs 2-SIGMA DIFFERENCE (m): 1.048  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.574  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.713

NRP Xrcs 2-RMS DIFFERENCE (m): 1.134  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.764  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.734

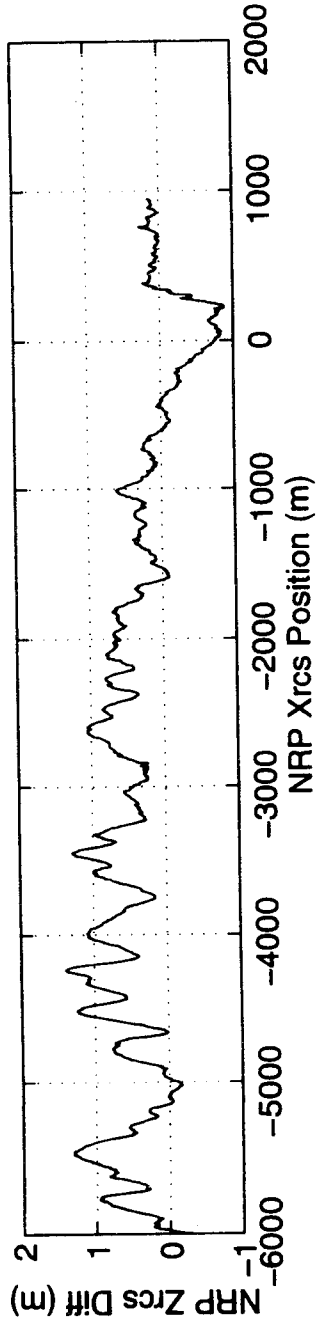
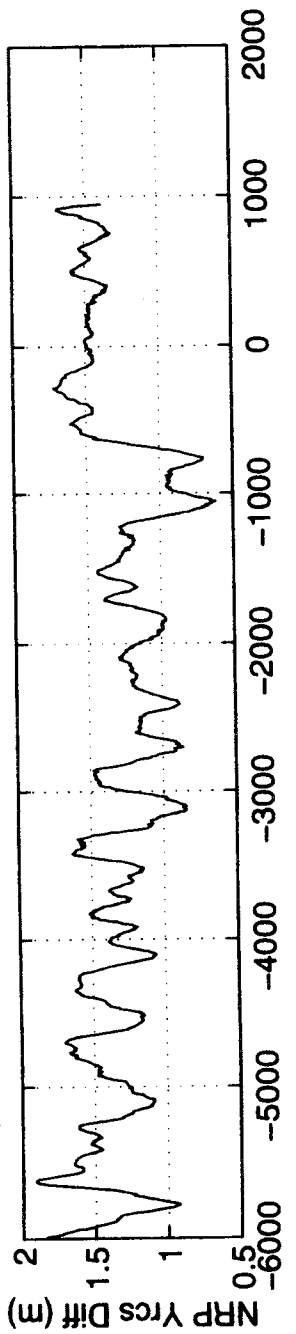
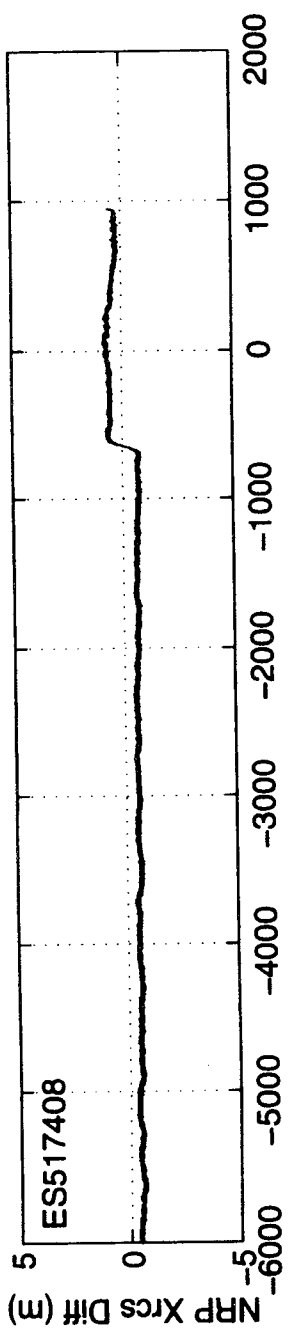
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

-----  
LGRP Xrcs POSITION (m): 262.831  
LGRP Yrcs POSITION (m): -1.343





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES





APPROACH #: ES517409  
START TIME: 494636.451  
STOP TIME: 494785.121

MINIMUM HDOP: 0.8  
MAXIMUM HDOP: 0.8  
AVERAGE HDOP: 0.8

MINIMUM VDOP: 3.5  
MAXIMUM VDOP: 3.8  
AVERAGE VDOP: 3.6

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

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TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
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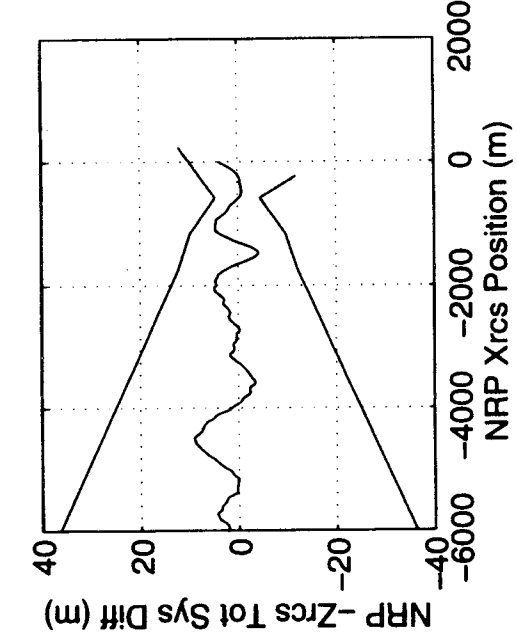
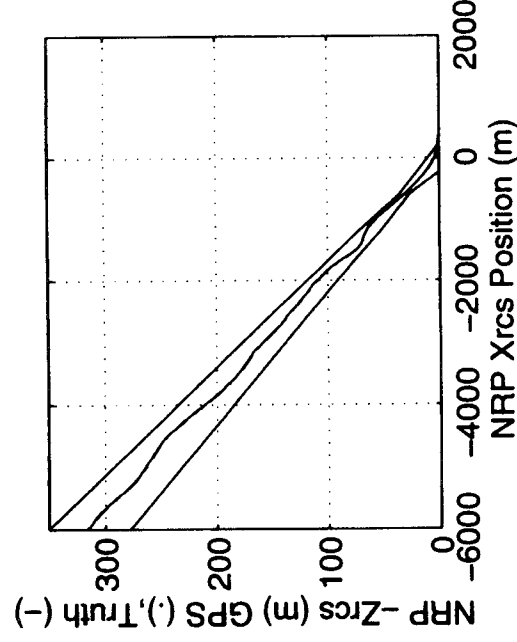
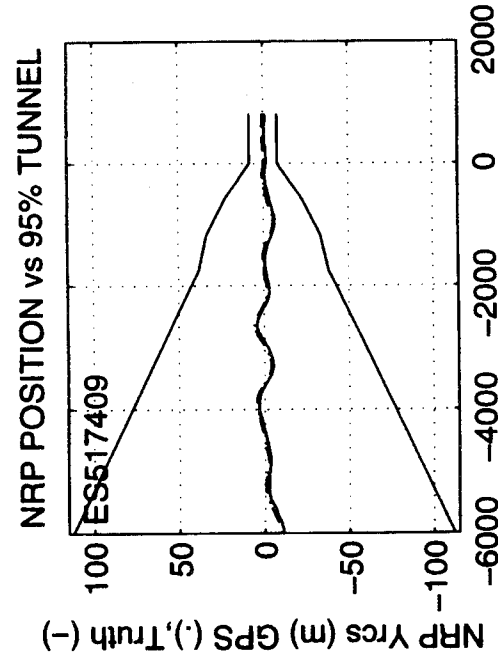
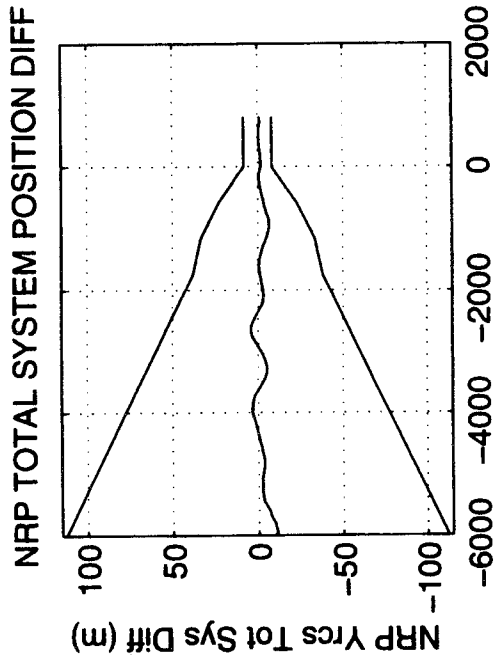
NRP Xrcs MEAN DIFFERENCE (m): 0.319  
NRP Yrcs MEAN DIFFERENCE (m): 1.443  
NRP Zrcs MEAN DIFFERENCE (m): -0.154

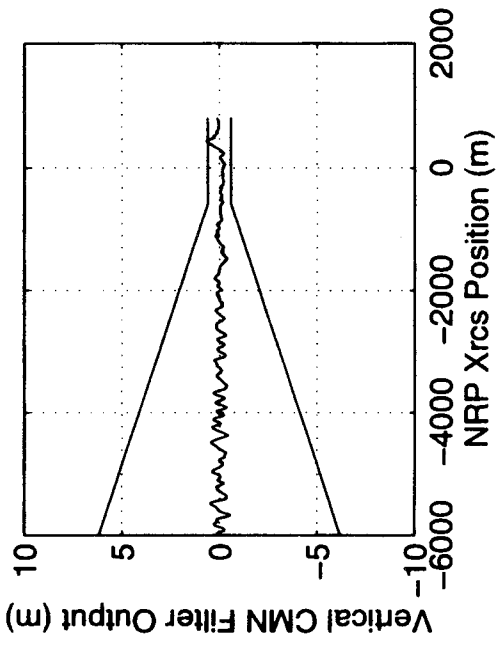
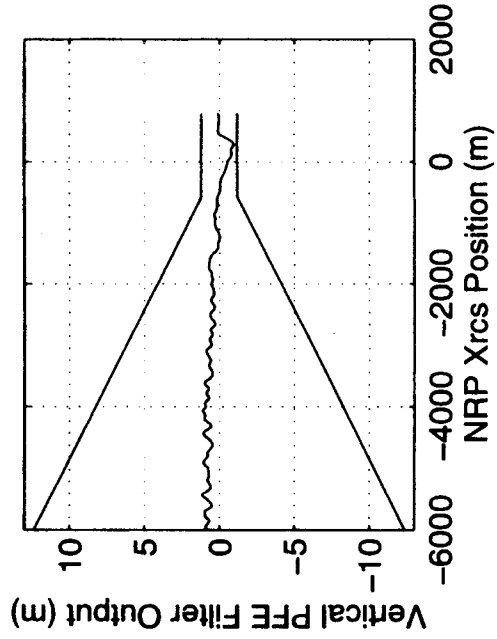
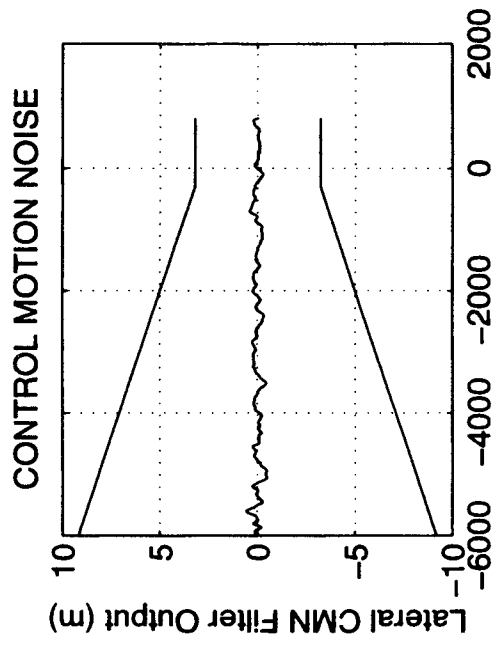
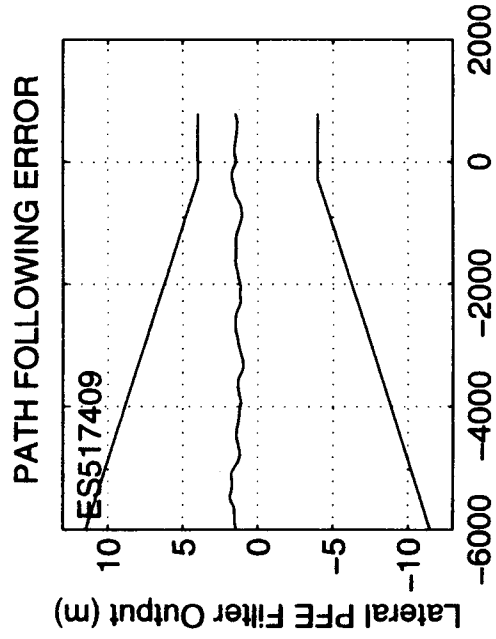
NRP Xrcs 2-SIGMA DIFFERENCE (m): 1.031  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.451  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.803

NRP Xrcs 2-RMS DIFFERENCE (m): 1.212  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.921  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.860

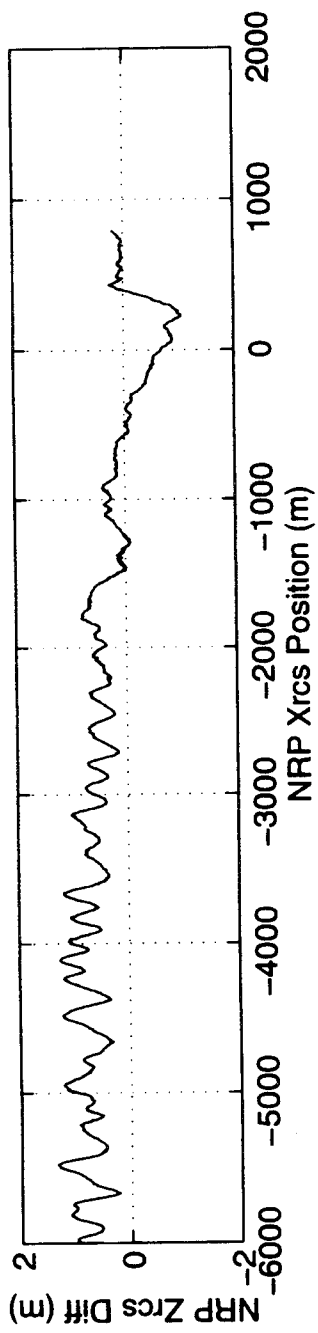
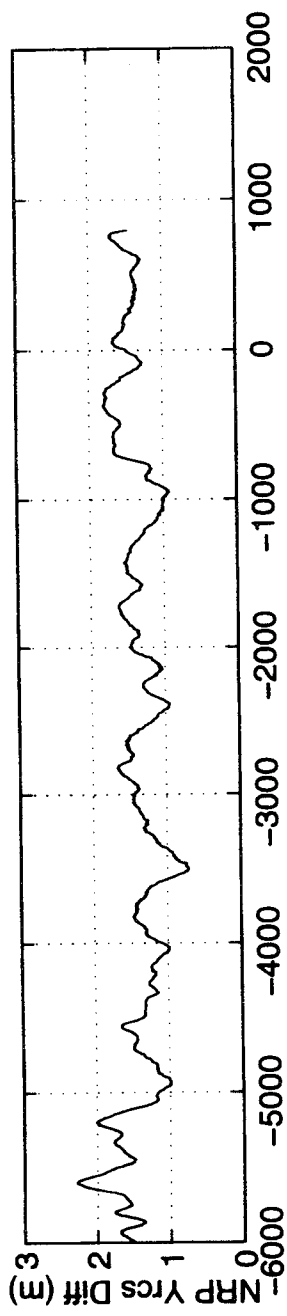
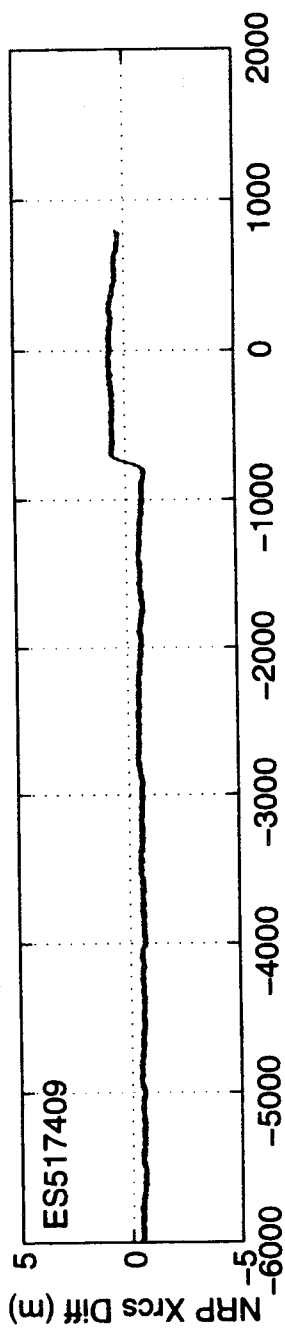
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----

LGPR Xrcs POSITION (m): 419.403  
LGRP Yrcs POSITION (m): -0.120





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517410  
START TIME: 495147.396  
STOP TIME: 495299.462

MINIMUM HDOP: 0.8  
MAXIMUM HDOP: 0.8  
AVERAGE HDOP: 0.8

MINIMUM VDOP: 2.9  
MAXIMUM VDOP: 3.2  
AVERAGE VDOP: 3.1

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
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\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

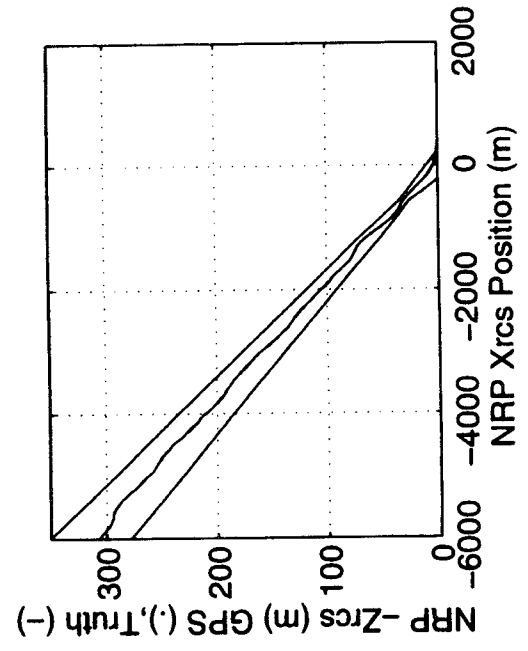
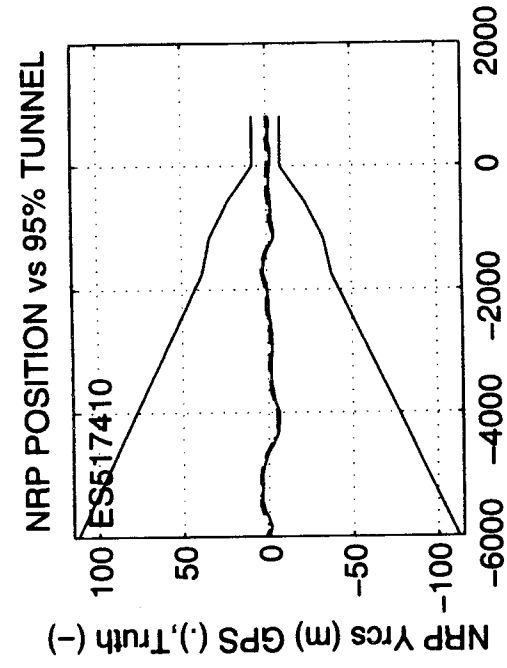
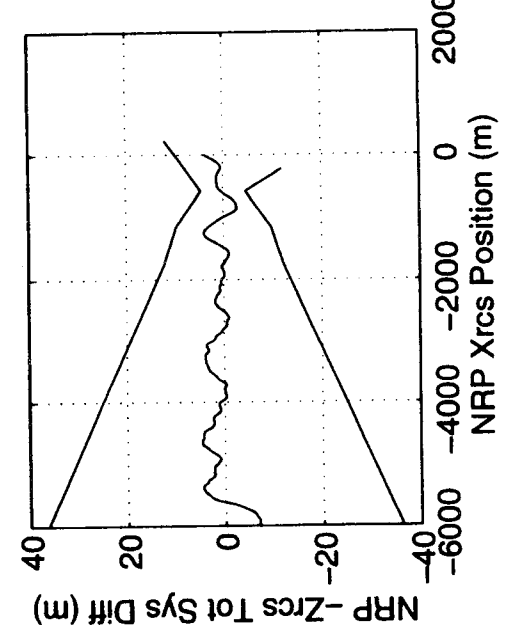
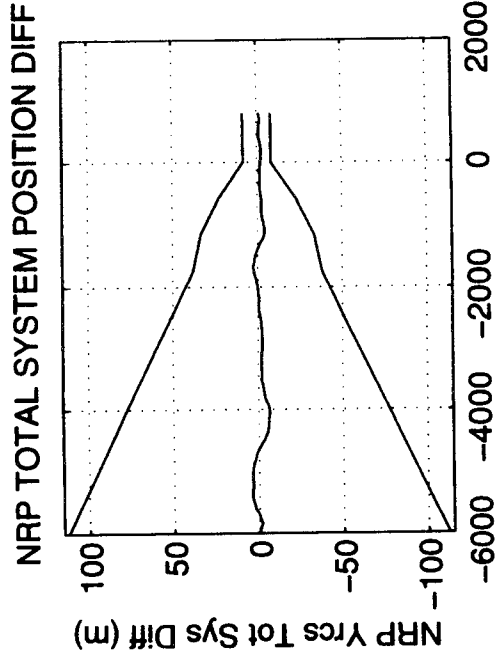
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NRP Xrcs MEAN DIFFERENCE (m): 0.303  
NRP Yrcs MEAN DIFFERENCE (m): 1.546  
NRP Zrcs MEAN DIFFERENCE (m): -0.149

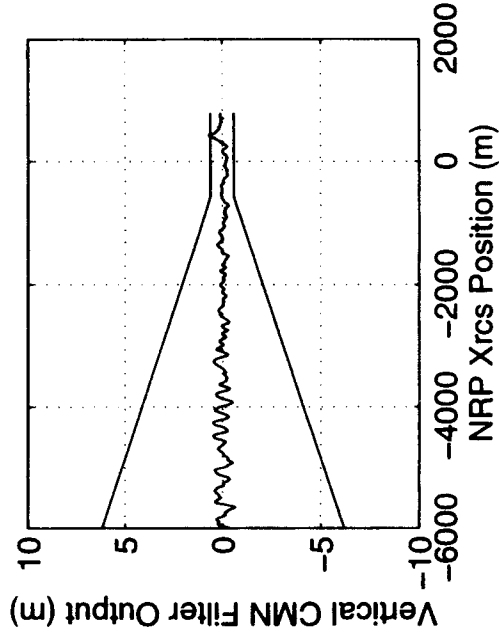
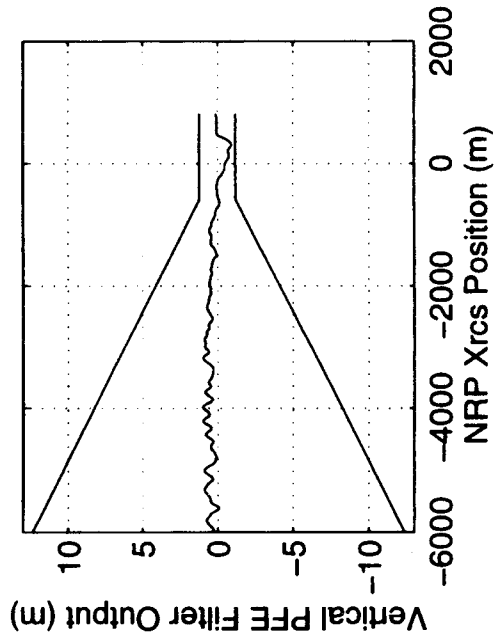
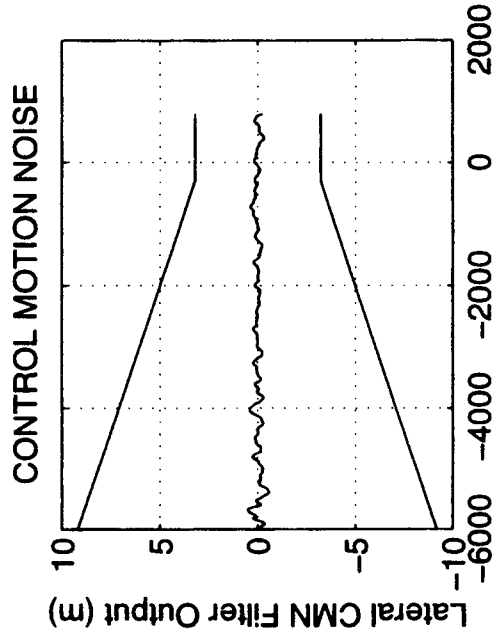
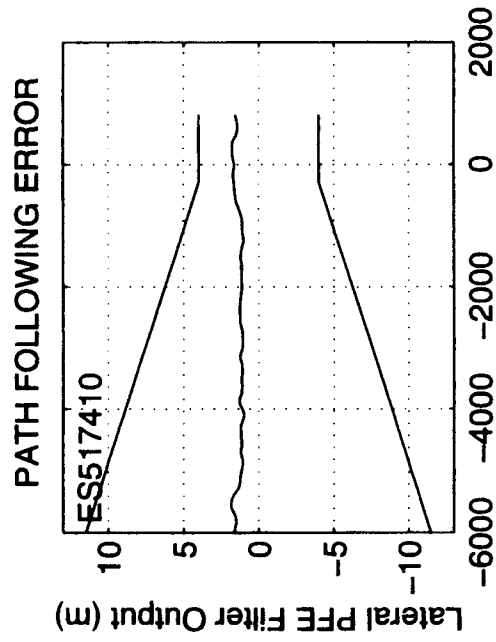
NRP Xrcs 2-SIGMA DIFFERENCE (m): 1.015  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.425  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.798

NRP Xrcs 2-RMS DIFFERENCE (m): 1.182  
NRP Yrcs 2-RMS DIFFERENCE (m): 3.122  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.853

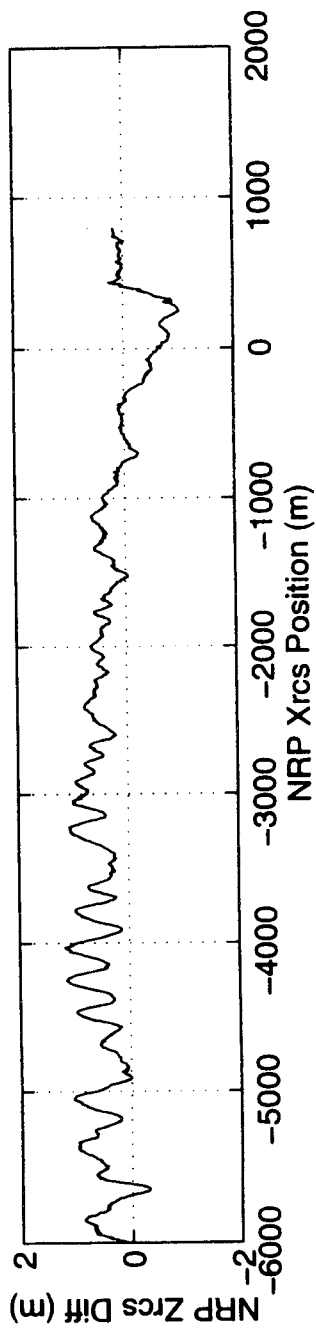
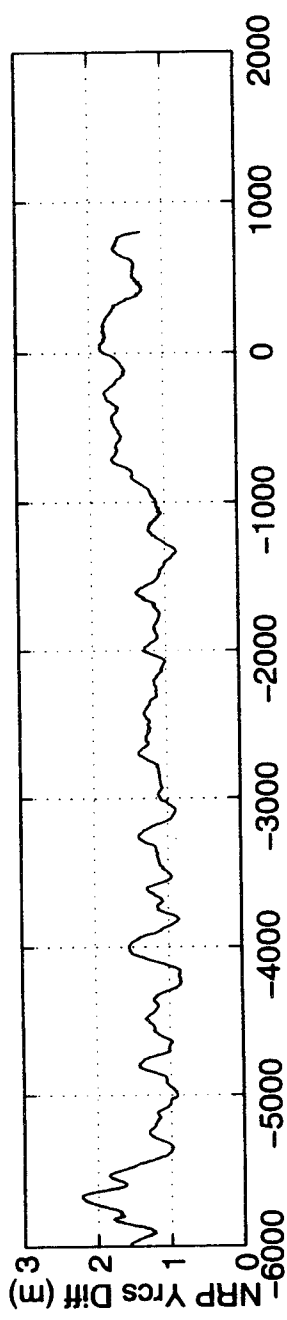
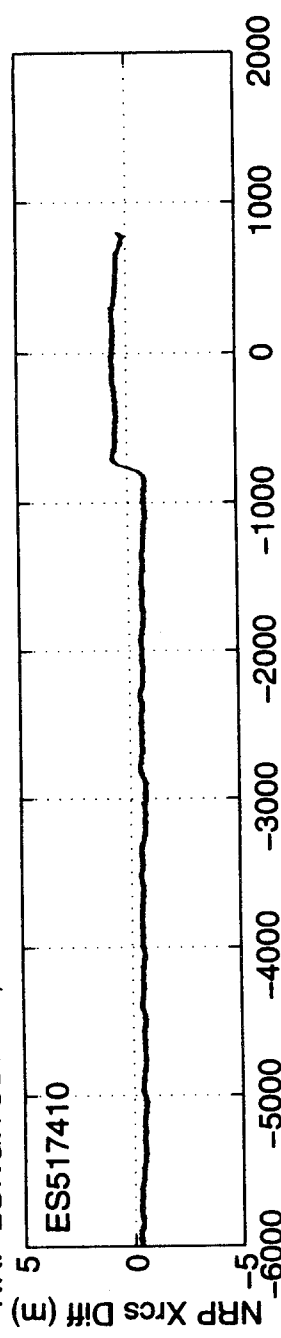
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 416.364  
LGRP Yrcs POSITION (m): -0.606





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES





APPROACH #: ES517411  
START TIME: 495656.330  
STOP TIME: 495810.649

MINIMUM HDOP: 0.7  
MAXIMUM HDOP: 0.8  
AVERAGE HDOP: 0.7

MINIMUM VDOP: 2.5  
MAXIMUM VDOP: 2.7  
AVERAGE VDOP: 2.5

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
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\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

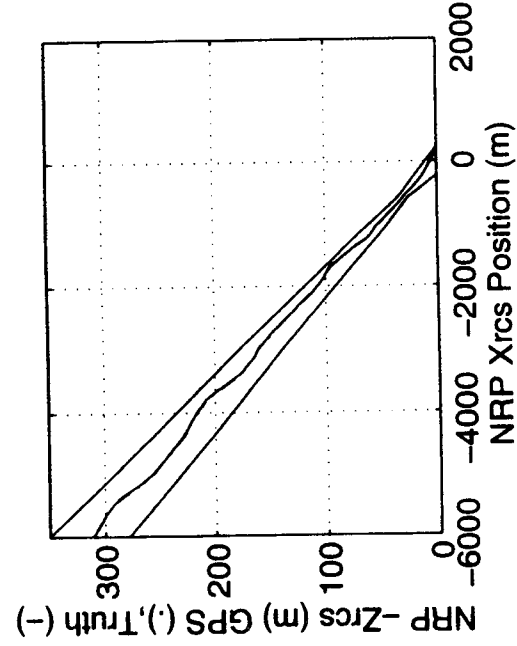
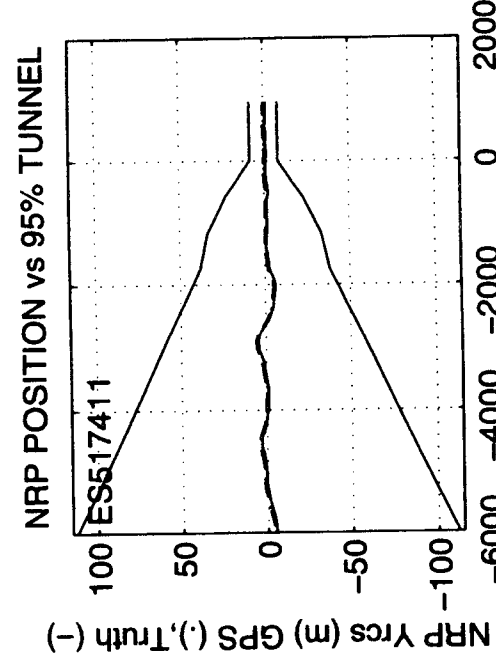
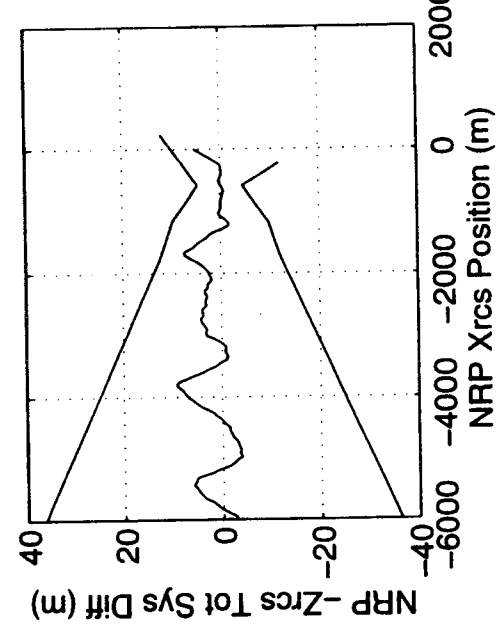
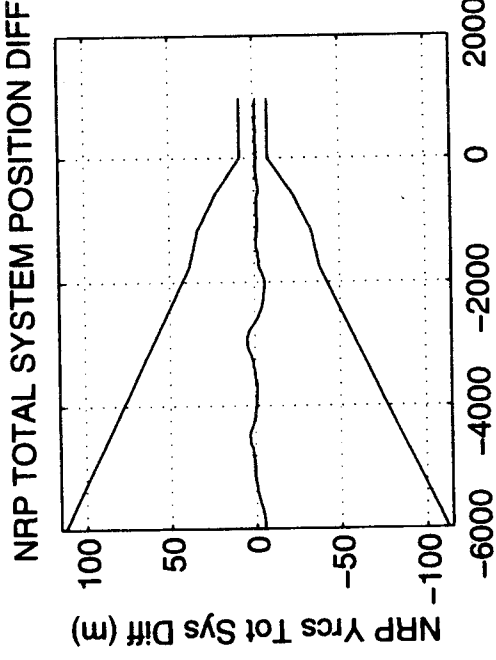
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NRP Xrcs MEAN DIFFERENCE (m): 0.249  
NRP Yrcs MEAN DIFFERENCE (m): 1.282  
NRP Zrcs MEAN DIFFERENCE (m): -0.124

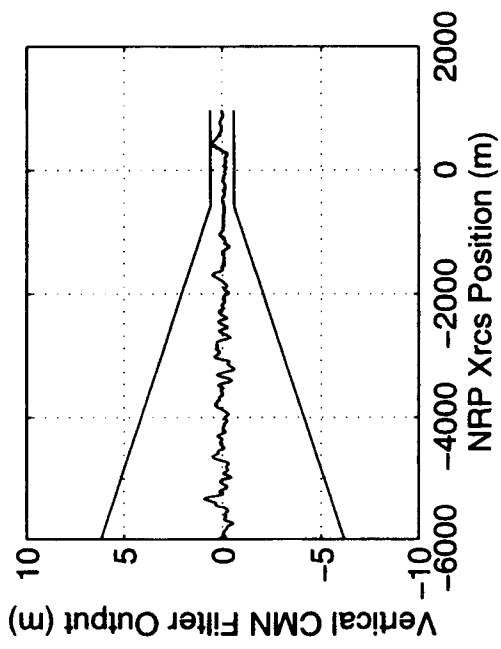
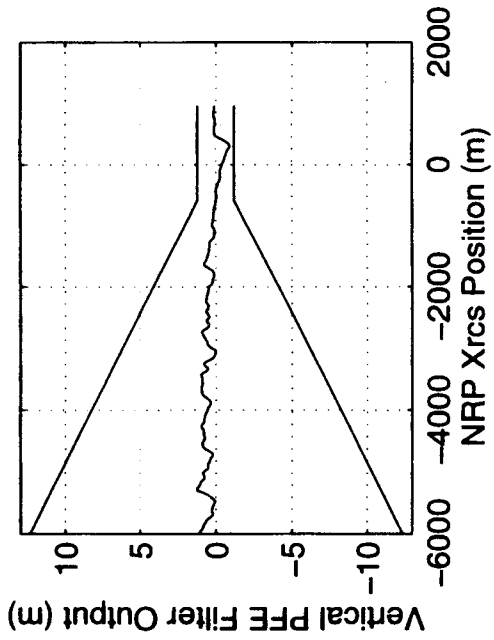
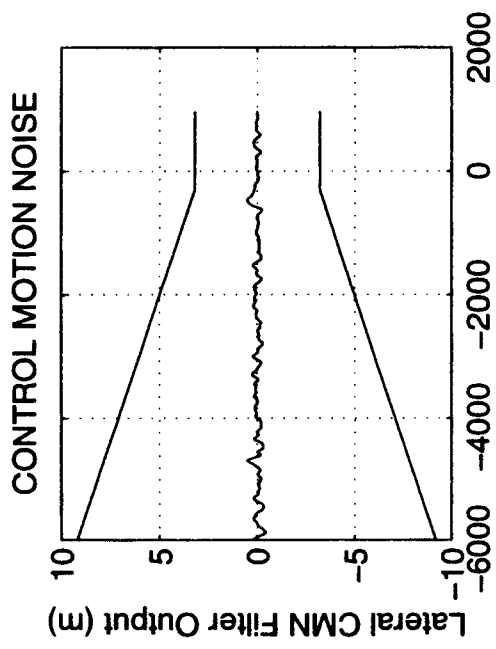
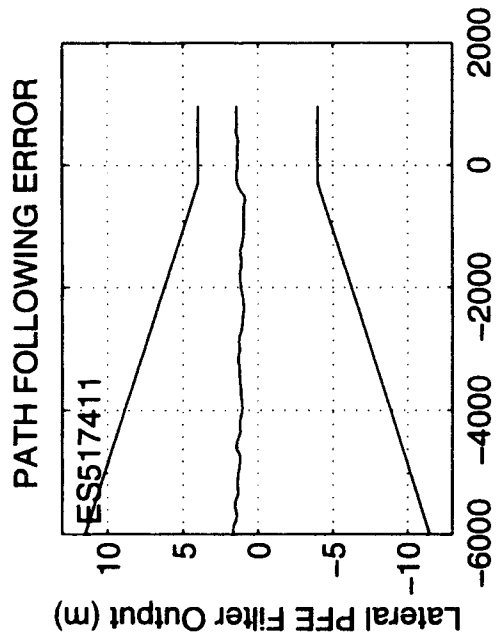
NRP Xrcs 2-SIGMA DIFFERENCE (m): 1.064  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.488  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.658

NRP Xrcs 2-RMS DIFFERENCE (m): 1.175  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.611  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.703

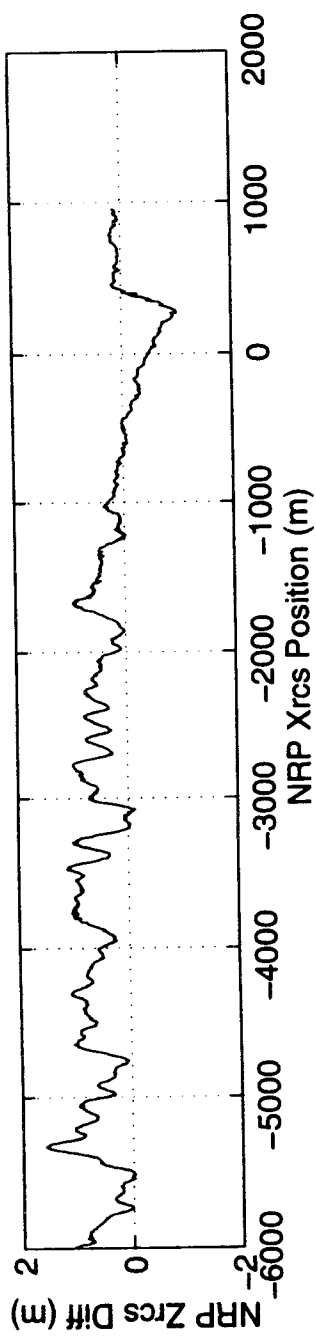
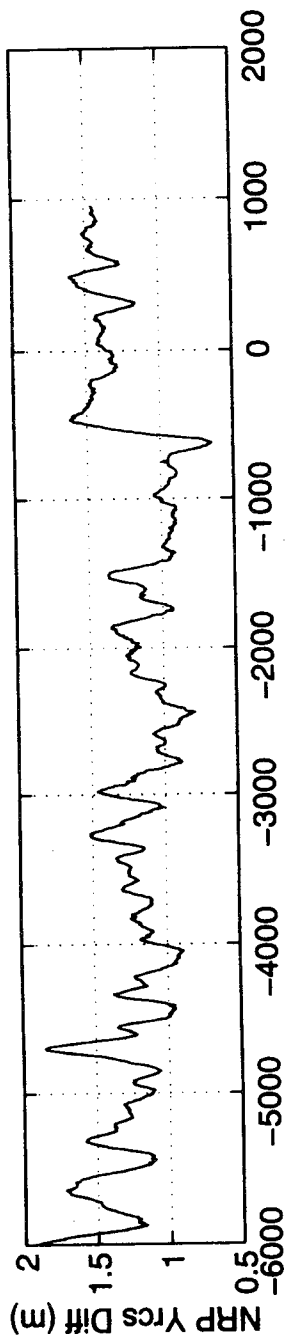
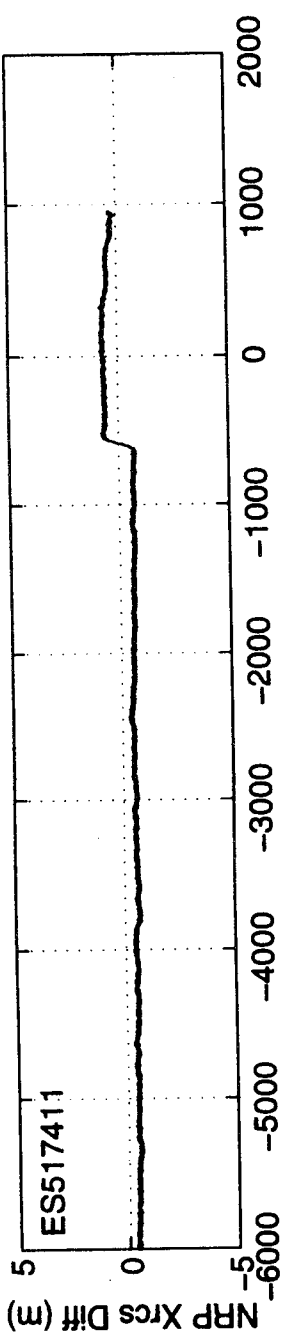
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 368.557  
LGRP Yrcs POSITION (m): -0.809





NRP LONGITUDINAL, LATERAL AND VERTICAL POSITION DIFFERENCES



APPROACH #: ES517412  
START TIME: 496165.528  
STOP TIME: 496320.188

MINIMUM HDOP: 0.7  
MAXIMUM HDOP: 1.1  
AVERAGE HDOP: 0.8

MINIMUM VDOP: 2.1  
MAXIMUM VDOP: 4.0  
AVERAGE VDOP: 2.8

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

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TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

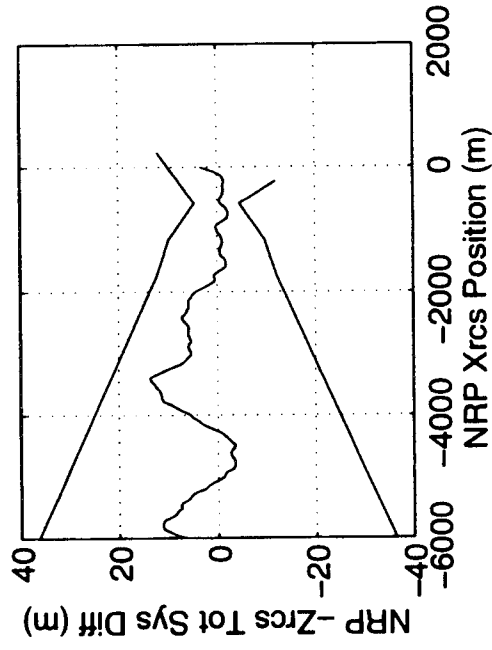
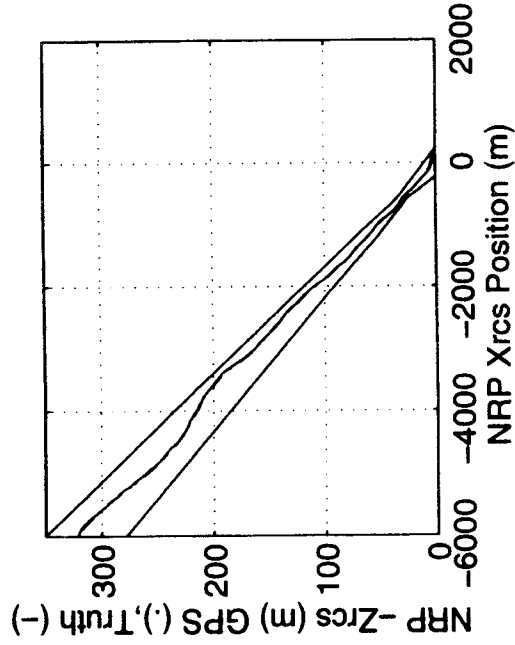
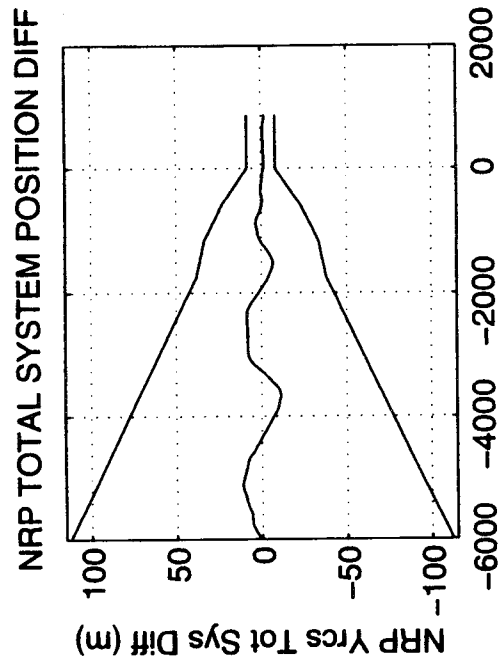
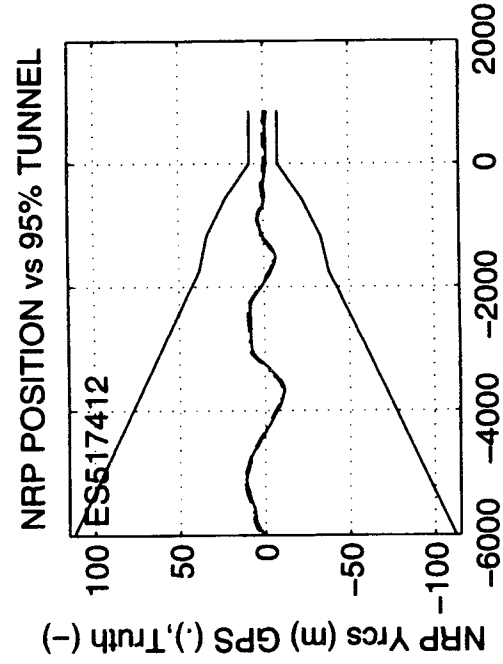
NRP Xrcs MEAN DIFFERENCE (m): 0.240  
NRP Yrcs MEAN DIFFERENCE (m): 1.188  
NRP Zrcs MEAN DIFFERENCE (m): -0.097

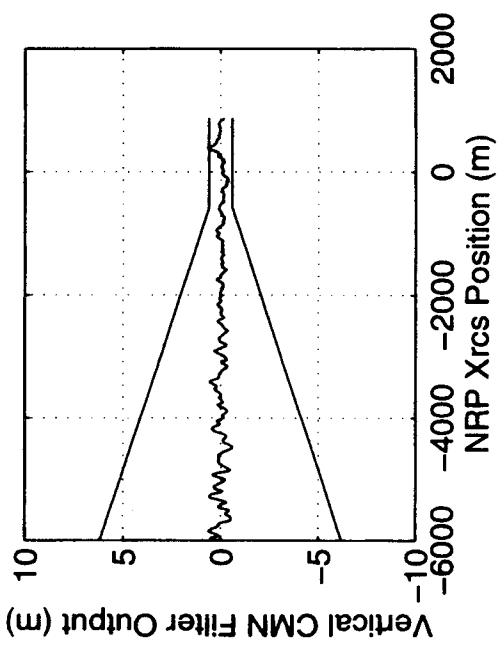
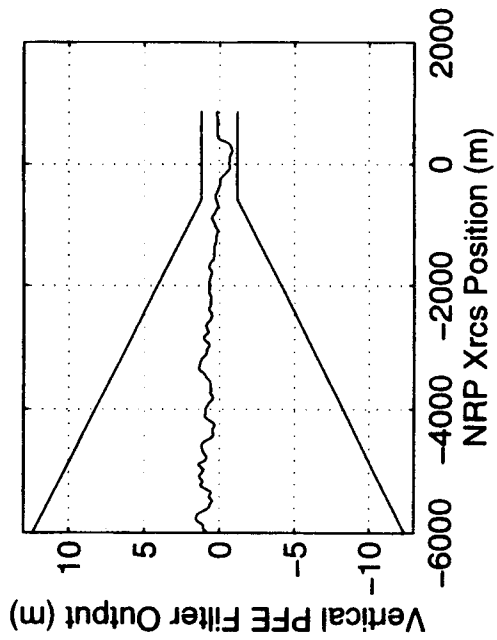
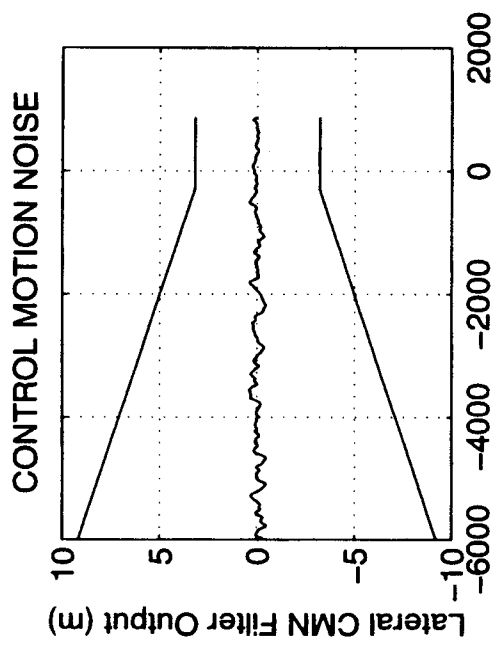
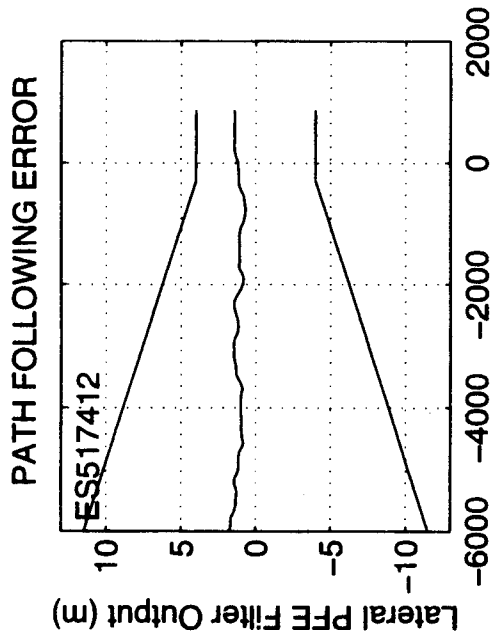
NRP Xrcs 2-SIGMA DIFFERENCE (m): 1.131  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.582  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.827

NRP Xrcs 2-RMS DIFFERENCE (m): 1.228  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.445  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.850

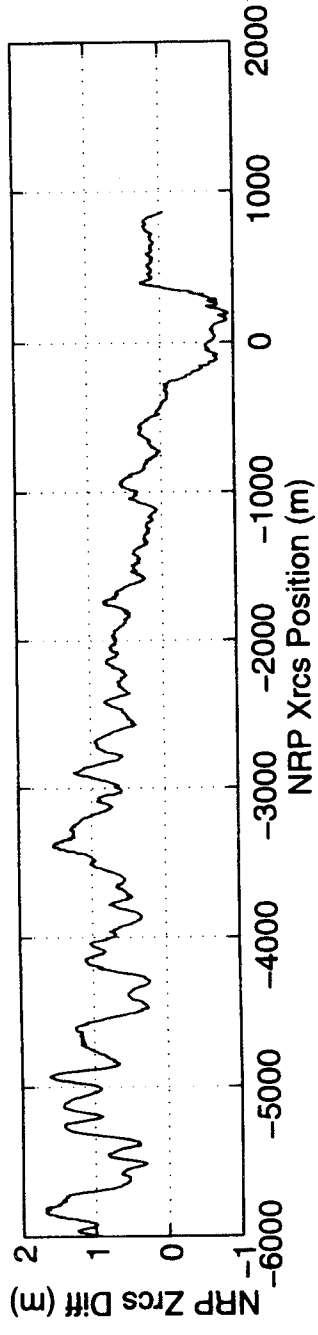
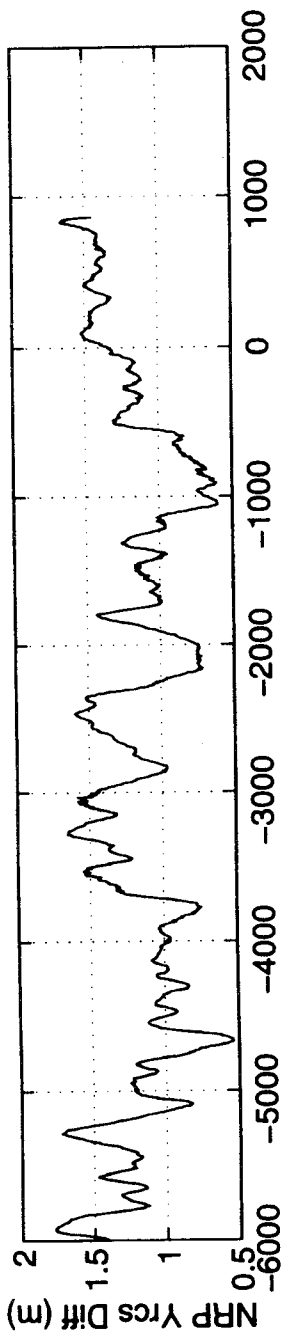
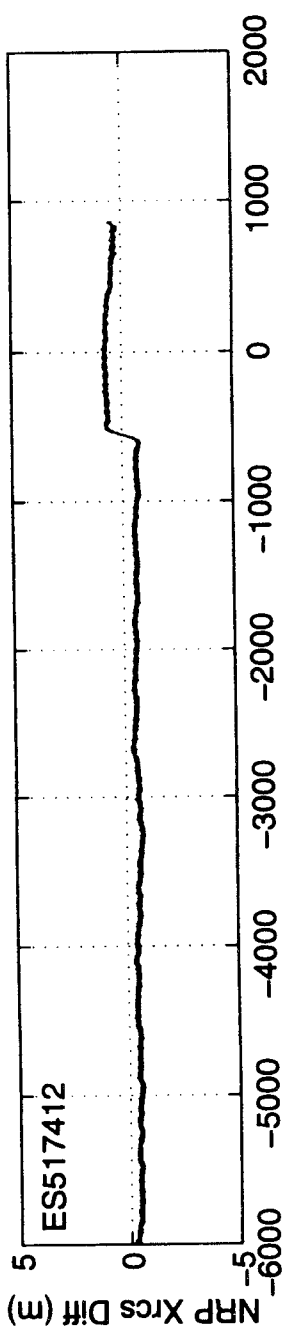
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGPR Xrcs POSITION (m): 312.520  
LGPR Yrcs POSITION (m): -0.768





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES





APPROACH #: ES517413  
START TIME: 496666.792  
STOP TIME: 496824.462

MINIMUM HDOP: 0.7  
MAXIMUM HDOP: 1.2  
AVERAGE HDOP: 0.9  
  
MINIMUM VDOP: 1.8  
MAXIMUM VDOP: 4.1  
AVERAGE VDOP: 2.7

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
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\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

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TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
-----

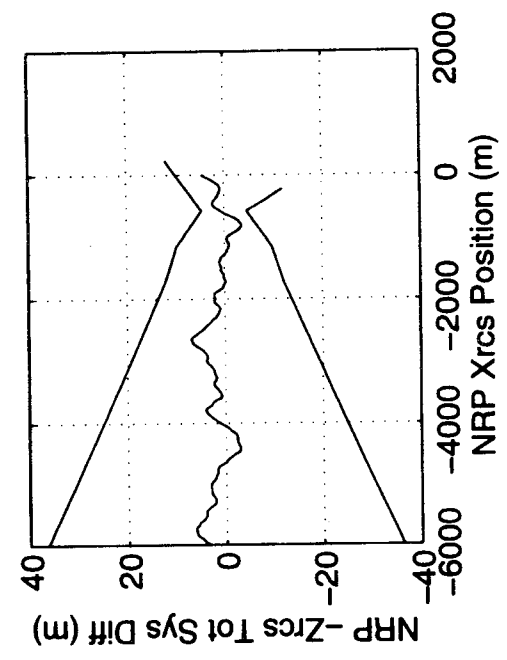
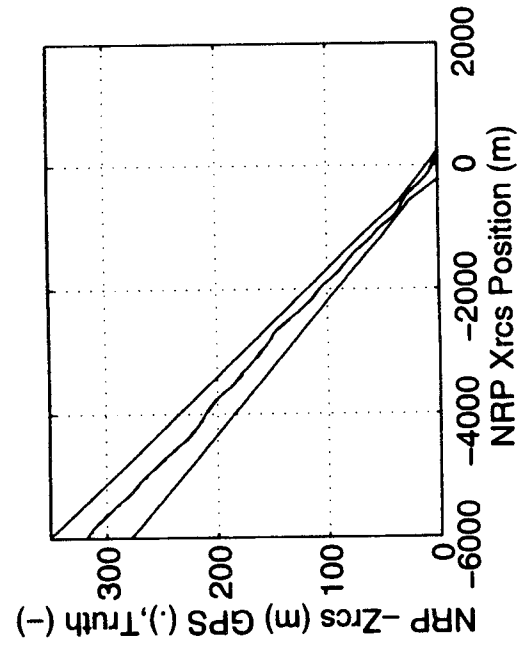
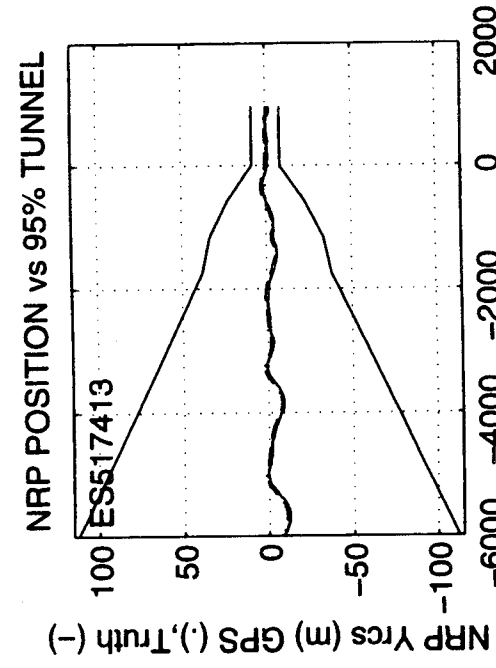
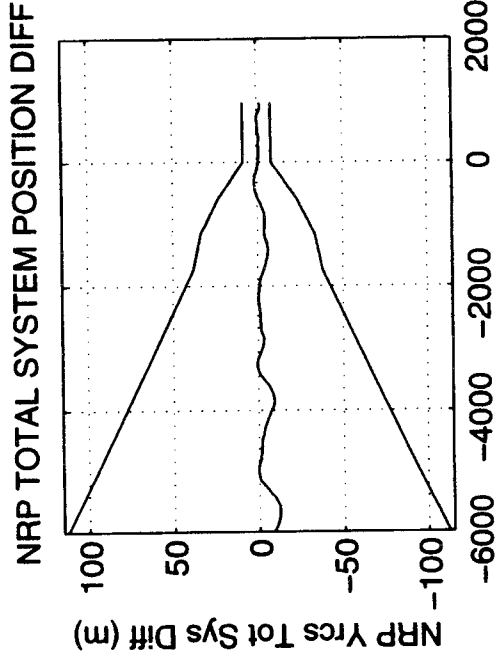
NRP Xrcs MEAN DIFFERENCE (m): 0.204  
NRP Yrcs MEAN DIFFERENCE (m): 1.260  
NRP Zrcs MEAN DIFFERENCE (m): -0.094

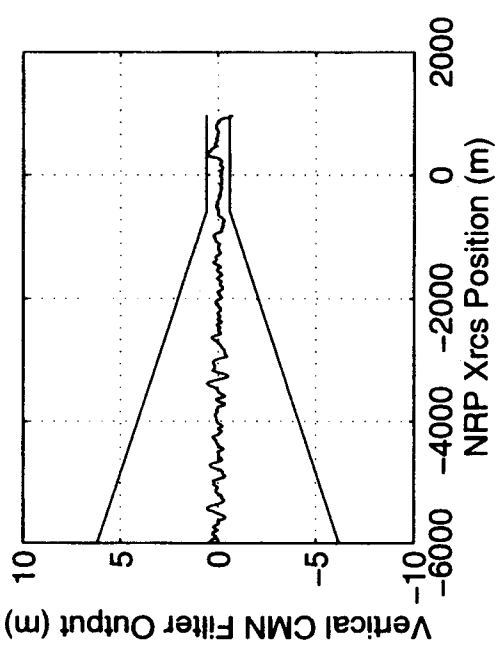
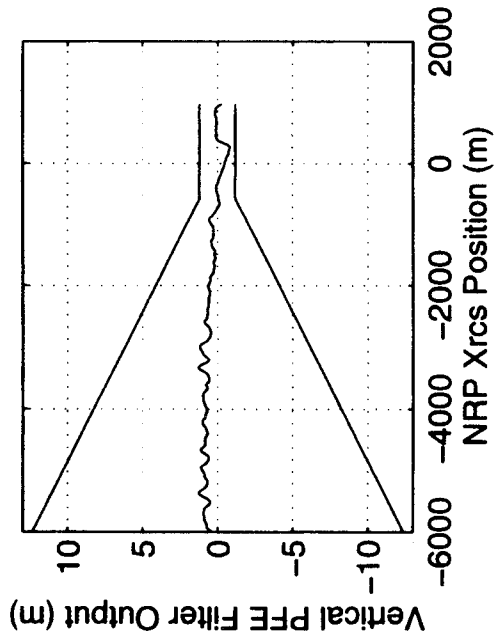
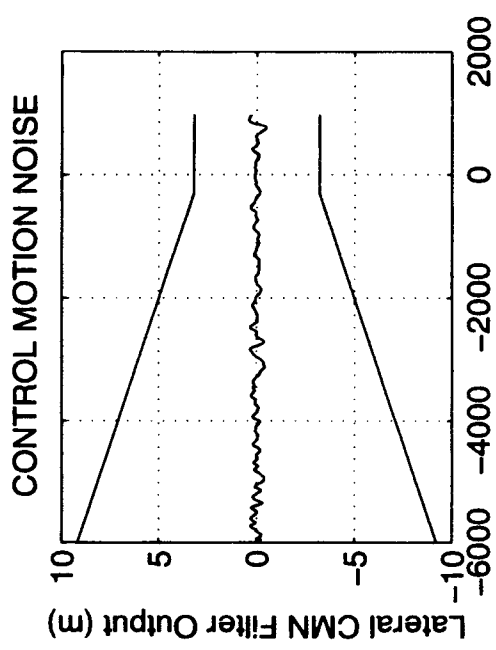
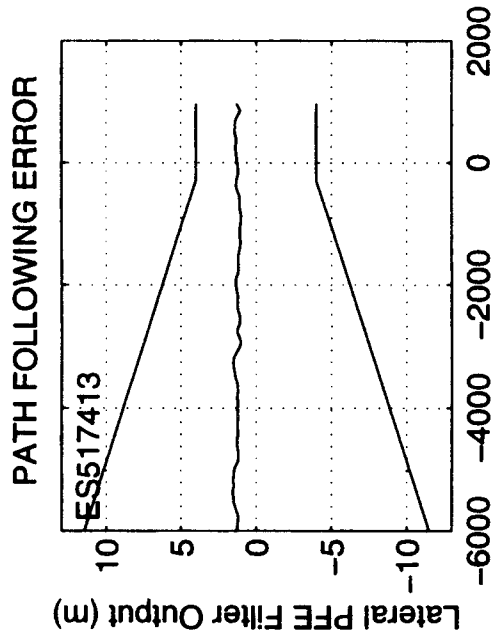
NRP Xrcs 2-SIGMA DIFFERENCE (m): 1.114  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.398  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.709

NRP Xrcs 2-RMS DIFFERENCE (m): 1.187  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.551  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.734

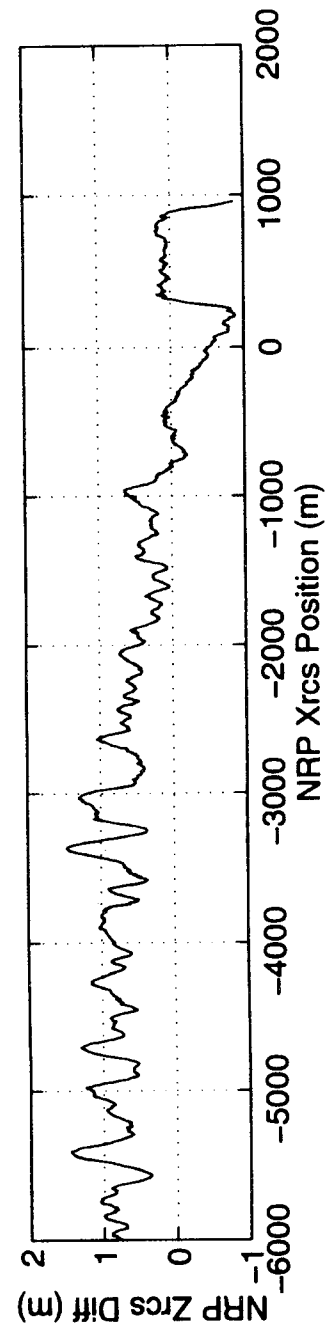
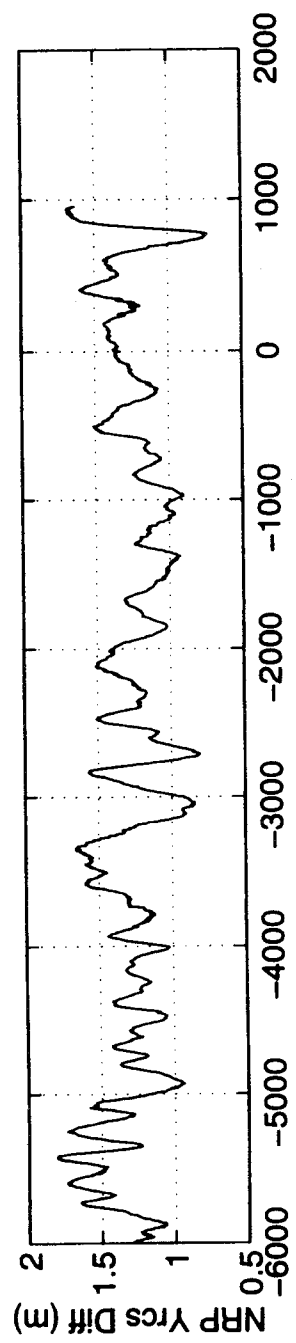
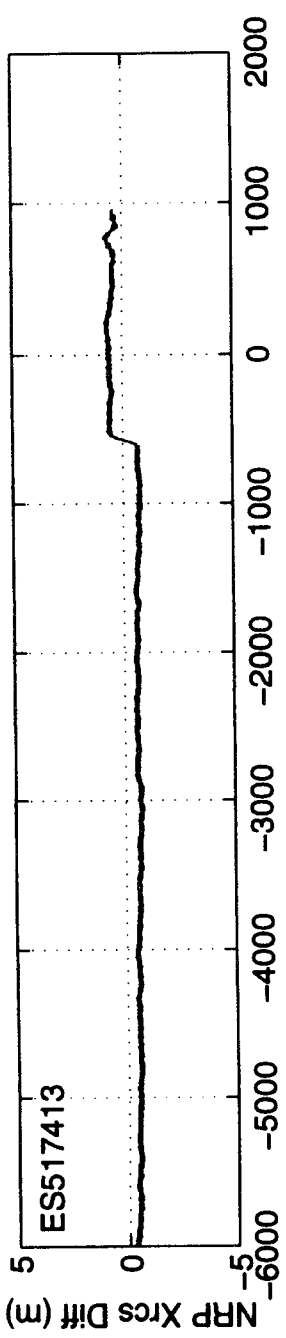
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----

LGRP Xrcs POSITION (m): 303.430  
LGRP Yrcs POSITION (m): -0.350





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517414  
START TIME: 497167.253  
STOP TIME: 497320.056

MINIMUM HDOP: 1.3  
MAXIMUM HDOP: 1.3  
AVERAGE HDOP: 1.3

MINIMUM VDOP: 4.1  
MAXIMUM VDOP: 4.3  
AVERAGE VDOP: 4.2

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

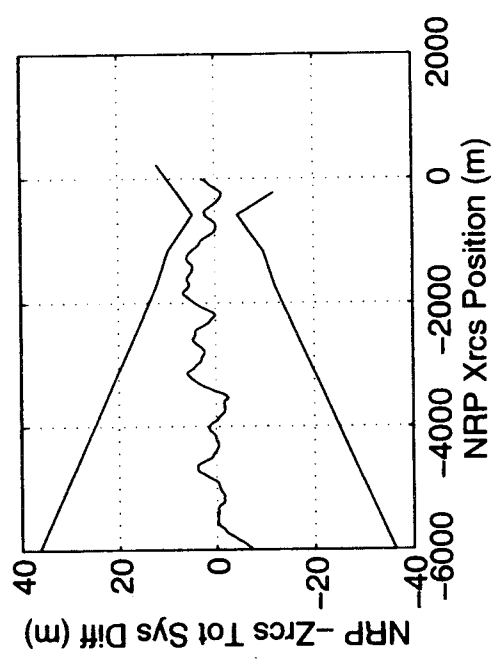
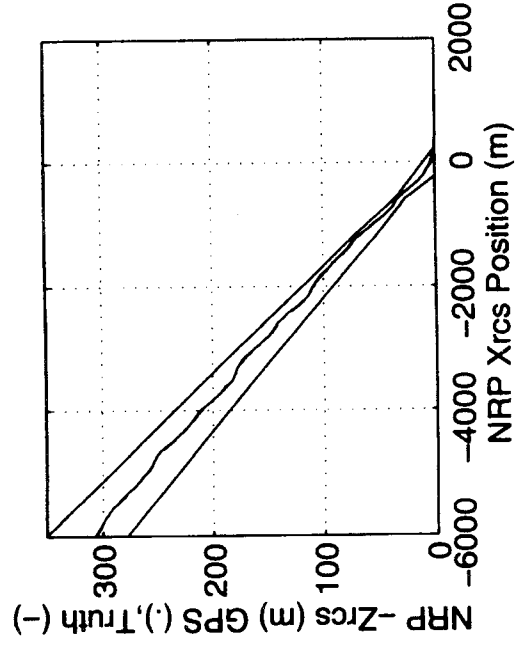
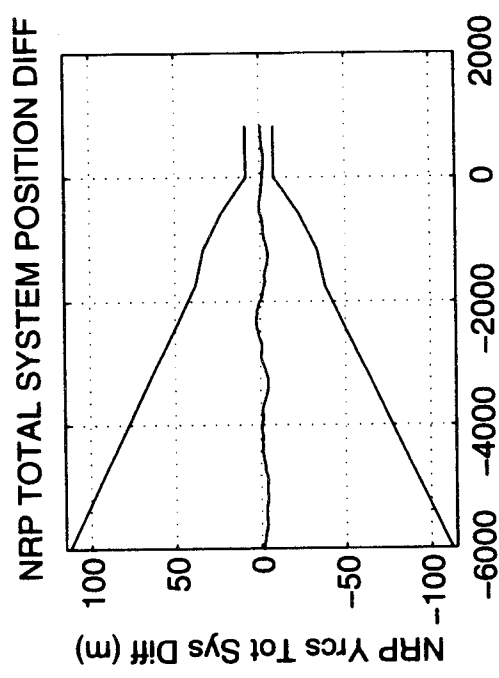
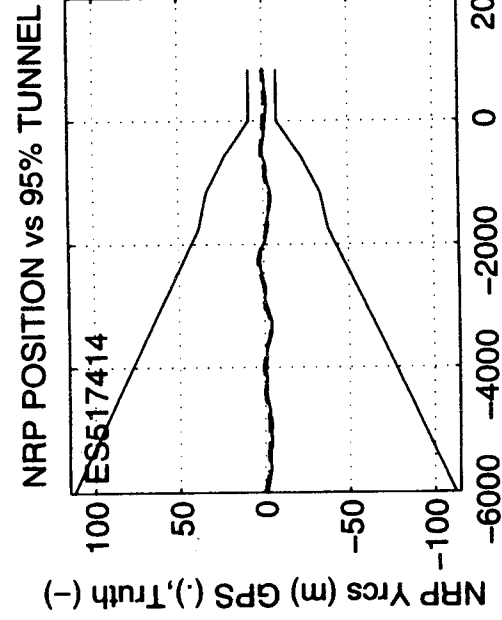
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NRP Xrcs MEAN DIFFERENCE (m): 0.378  
NRP Yrcs MEAN DIFFERENCE (m): 1.302  
NRP Zrcs MEAN DIFFERENCE (m): -0.021

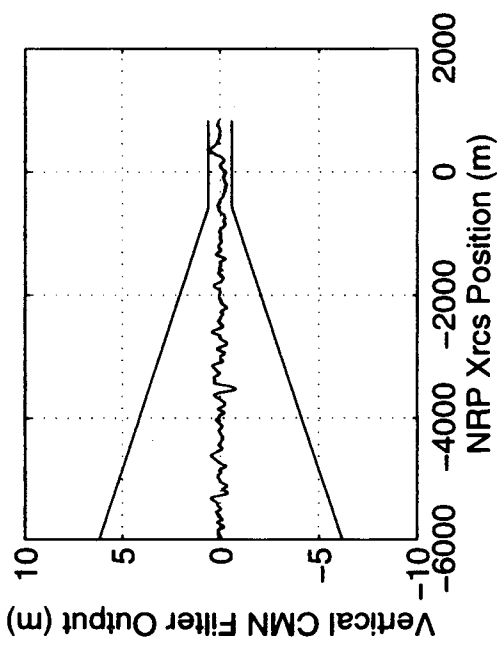
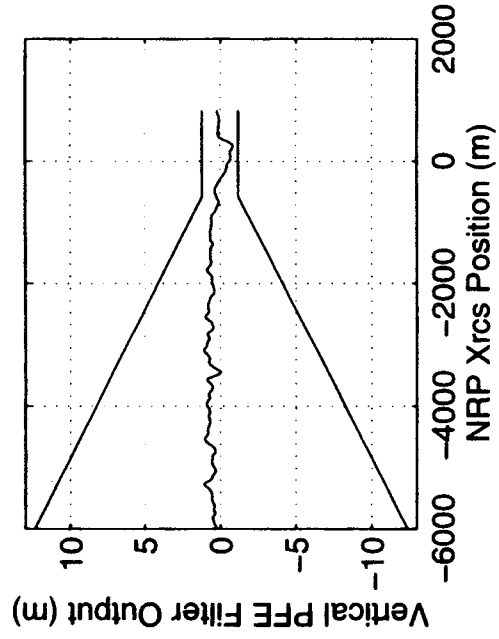
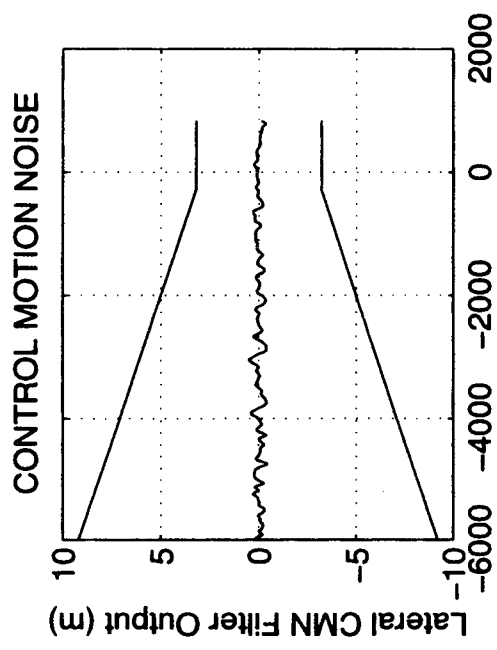
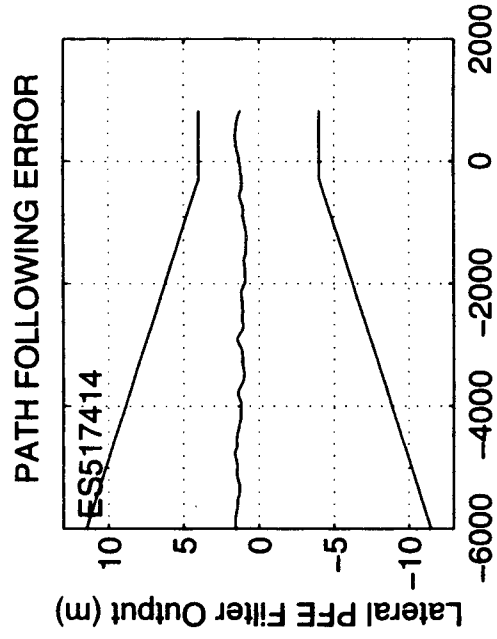
NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.940  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.397  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.855

NRP Xrcs 2-RMS DIFFERENCE (m): 1.207  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.634  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.856

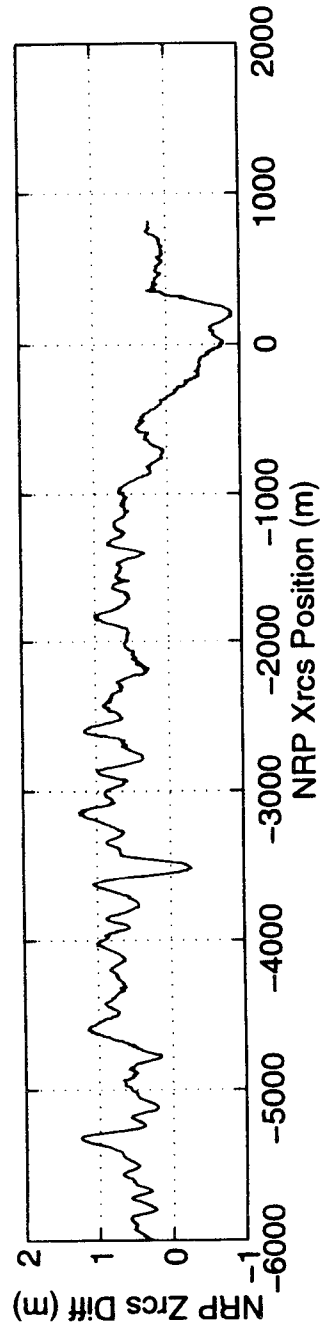
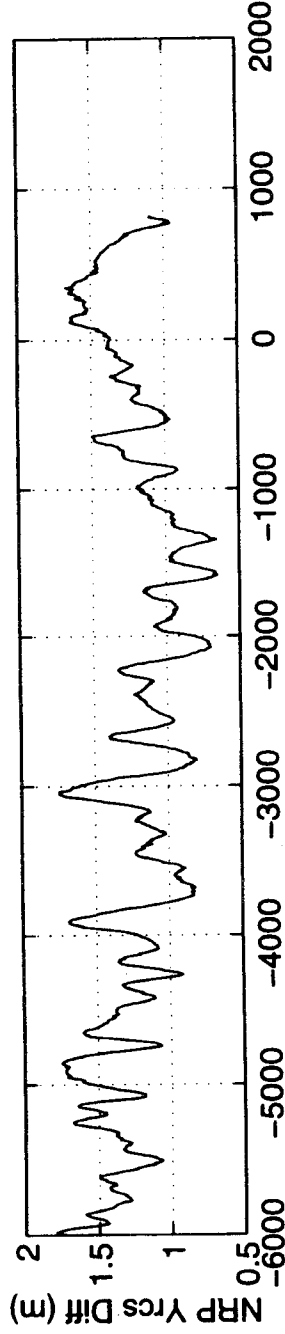
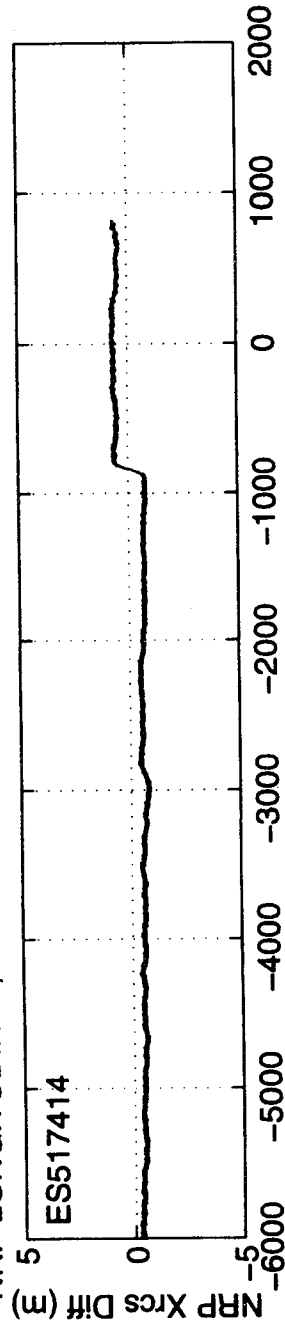
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

-----  
LGRP Xrcs POSITION (m): 311.440  
LGRP Yrcs POSITION (m): -1.988





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES





APPROACH #: ES517415  
START TIME: 497671.517  
STOP TIME: 497828.385

MINIMUM HDOP: 1.4  
MAXIMUM HDOP: 1.4  
AVERAGE HDOP: 1.4

MINIMUM VDOP: 4.1  
MAXIMUM VDOP: 4.3  
AVERAGE VDOP: 4.2

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
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\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

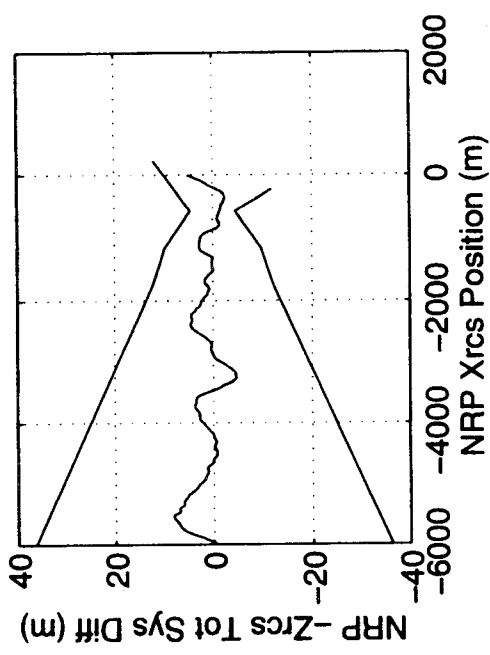
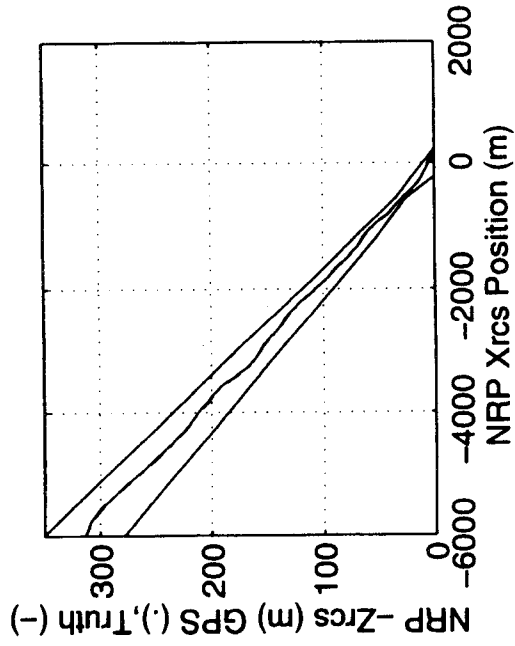
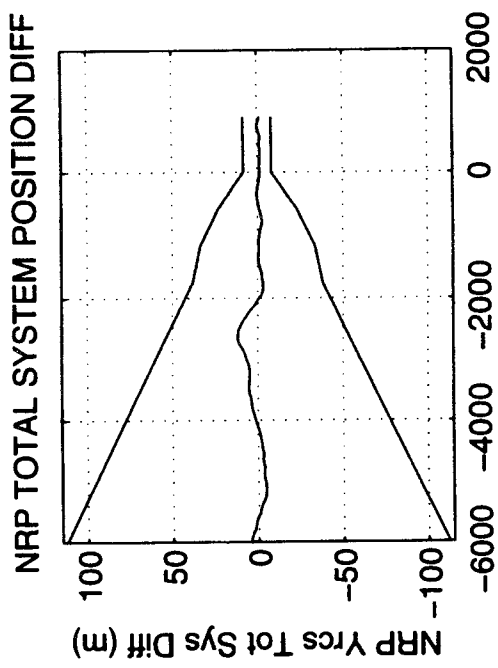
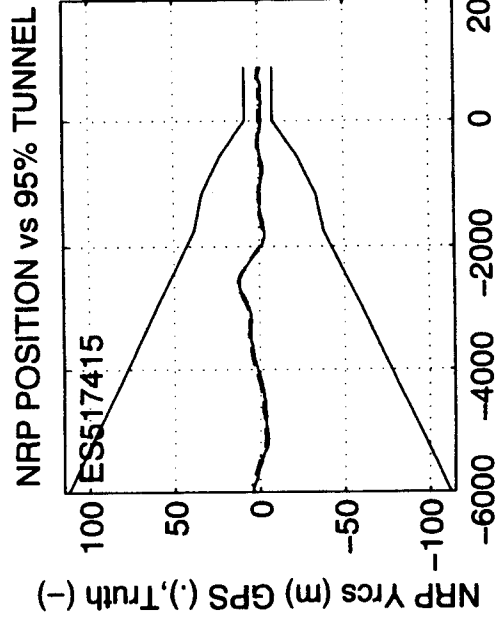
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.282  
NRP Yrcs MEAN DIFFERENCE (m): 1.135  
NRP Zrcs MEAN DIFFERENCE (m): -0.135

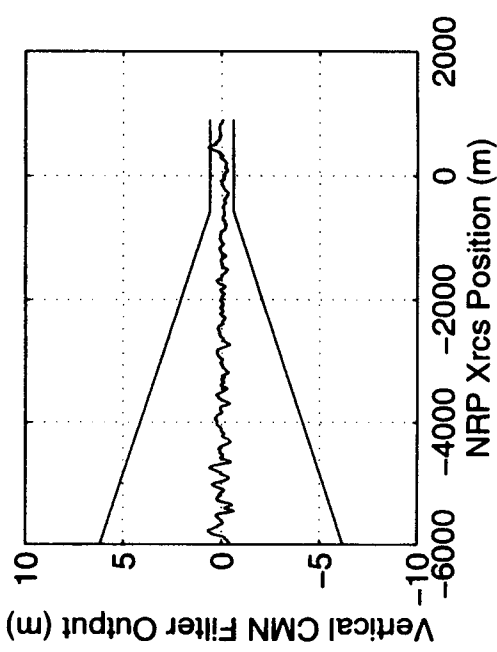
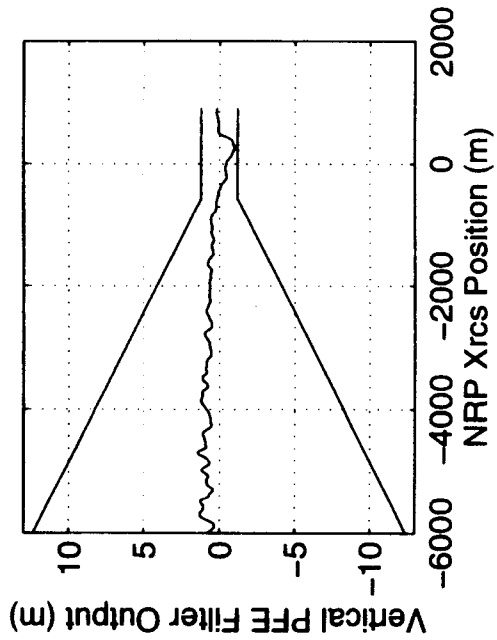
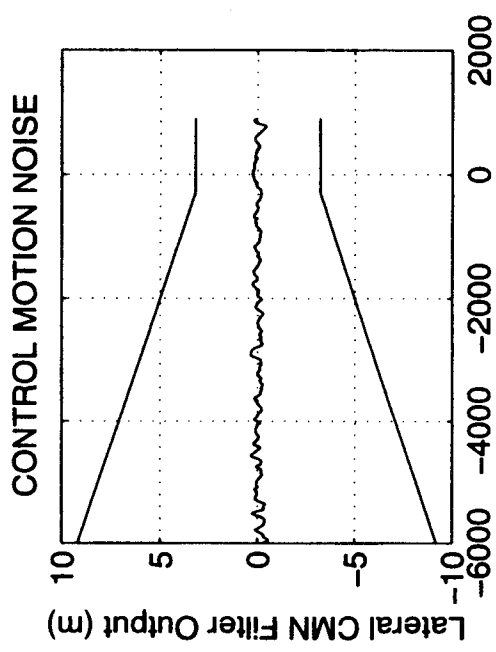
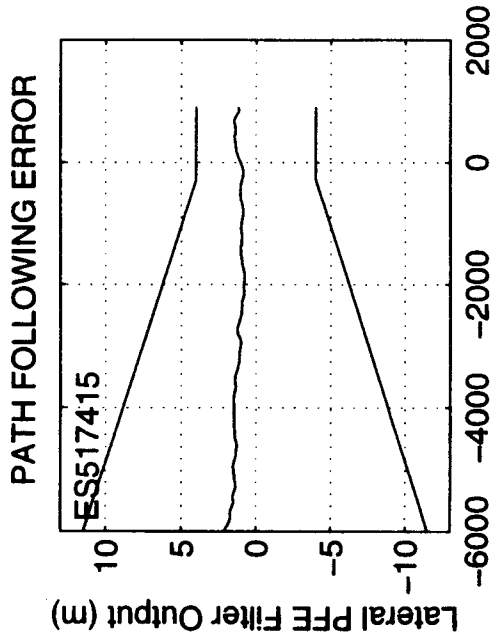
NRP Xrcs 2-SIGMA DIFFERENCE (m): 1.147  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.483  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.912

NRP Xrcs 2-RMS DIFFERENCE (m): 1.278  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.321  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.952

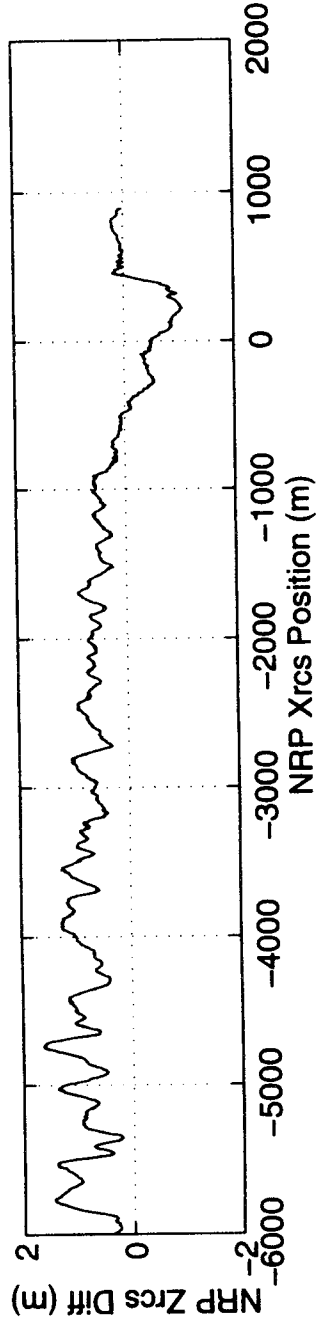
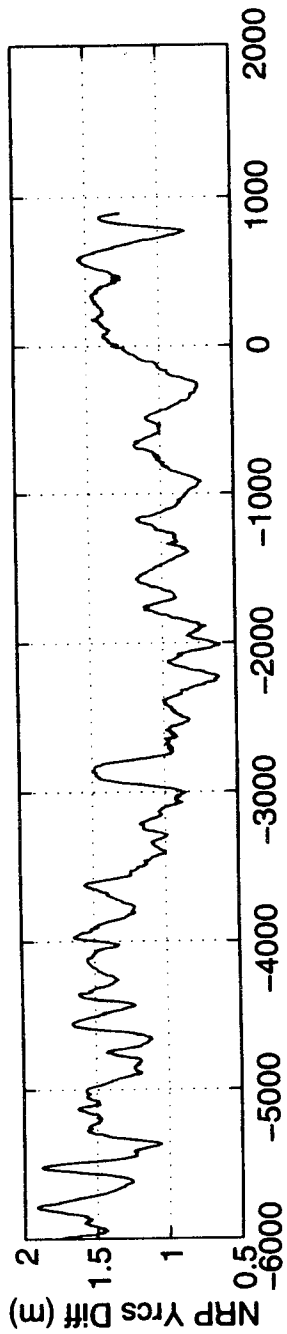
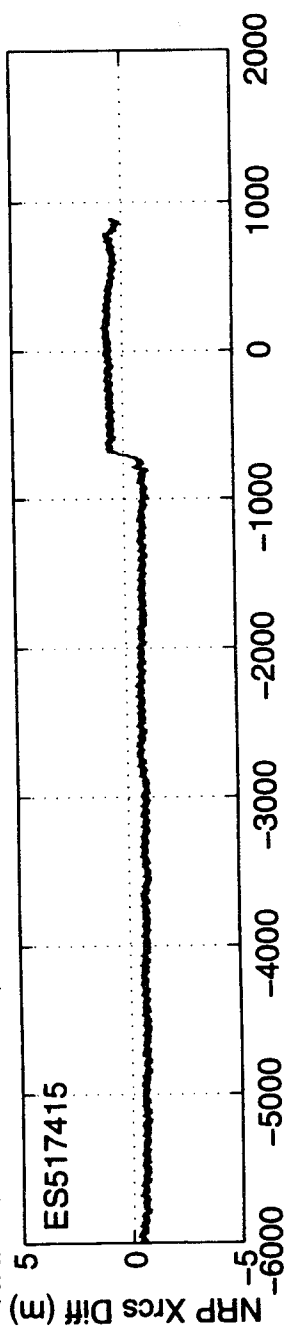
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

-----  
LGRP Xrcs POSITION (m): 440.847  
LGRP Yrcs POSITION (m): -0.711





NRP LONGITUDINAL, LATERAL AND VERTICAL POSITION DIFFERENCES



APPROACH #: ES517416  
START TIME: 498167.396  
STOP TIME: 498325.385

MINIMUM HDOP: 1.4  
MAXIMUM HDOP: 1.4  
AVERAGE HDOP: 1.4

MINIMUM VDOP: 3.7  
MAXIMUM VDOP: 4.0  
AVERAGE VDOP: 3.9

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
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\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

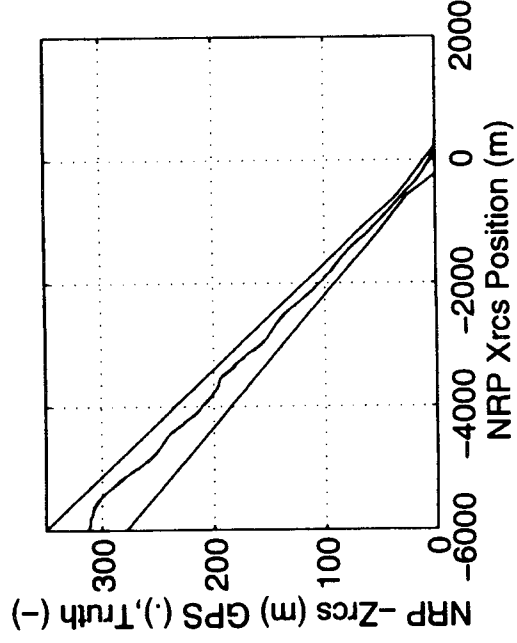
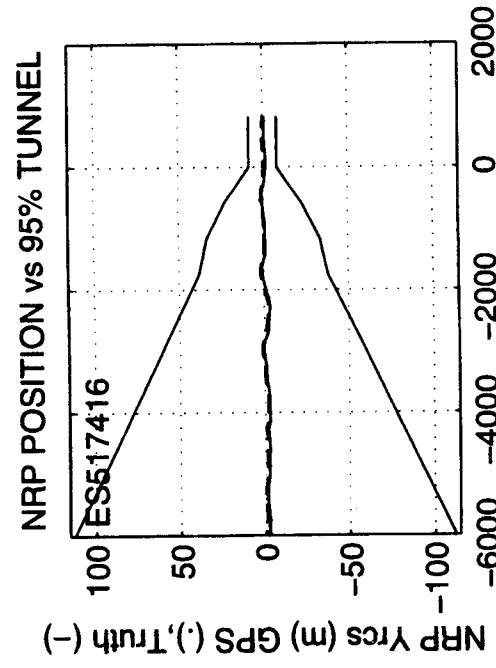
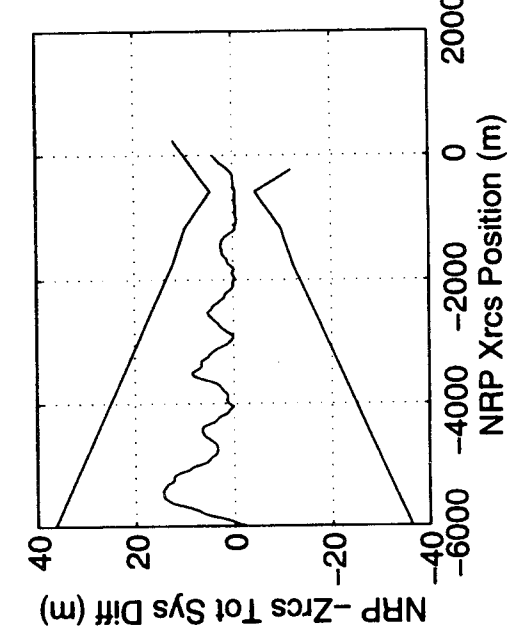
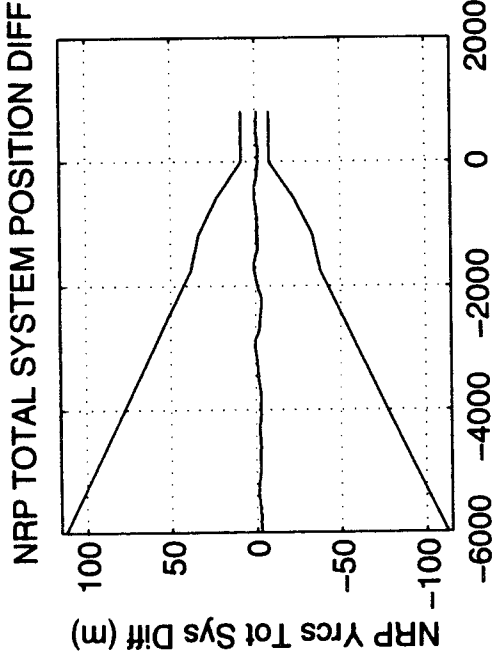
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.217  
NRP Yrcs MEAN DIFFERENCE (m): 1.205  
NRP Zrcs MEAN DIFFERENCE (m): -0.099

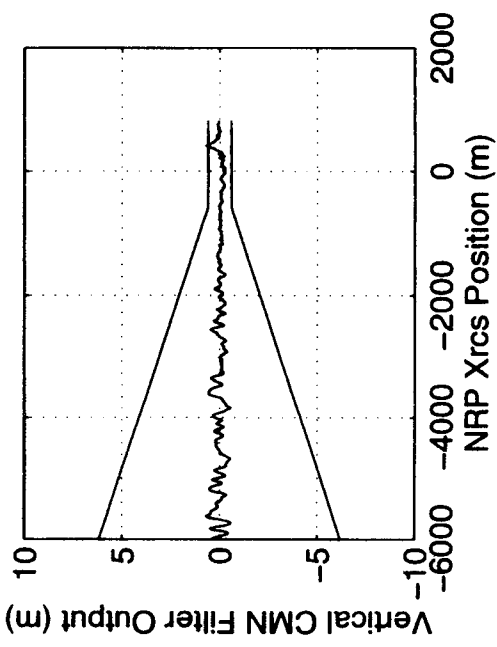
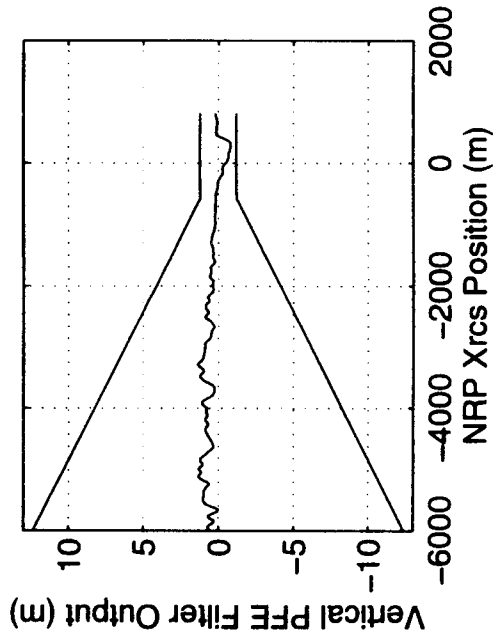
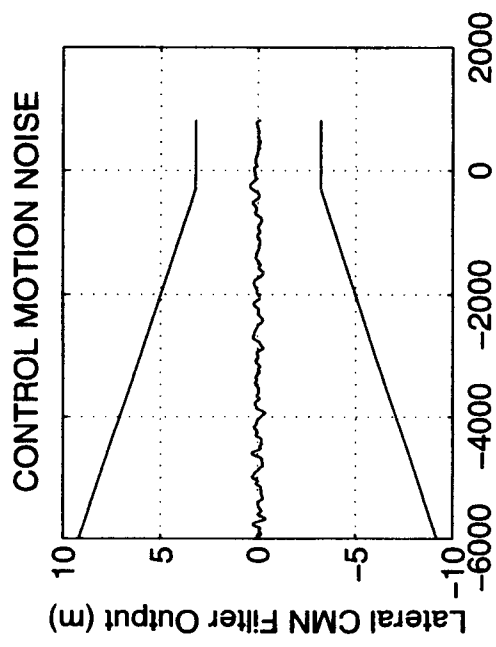
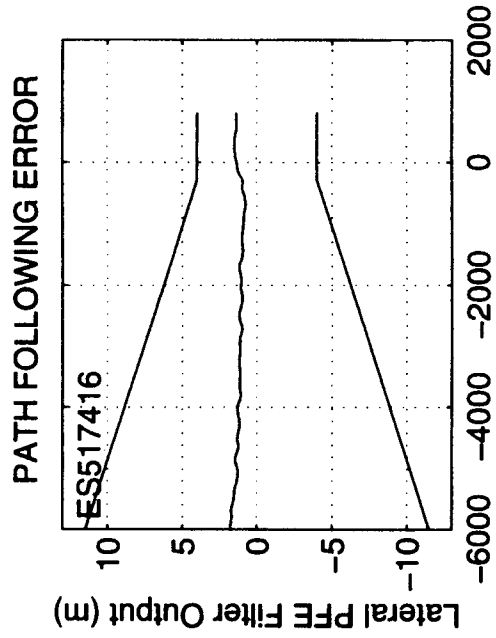
NRP Xrcs 2-SIGMA DIFFERENCE (m): 1.172  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.570  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.744

NRP Xrcs 2-RMS DIFFERENCE (m): 1.250  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.475  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.770

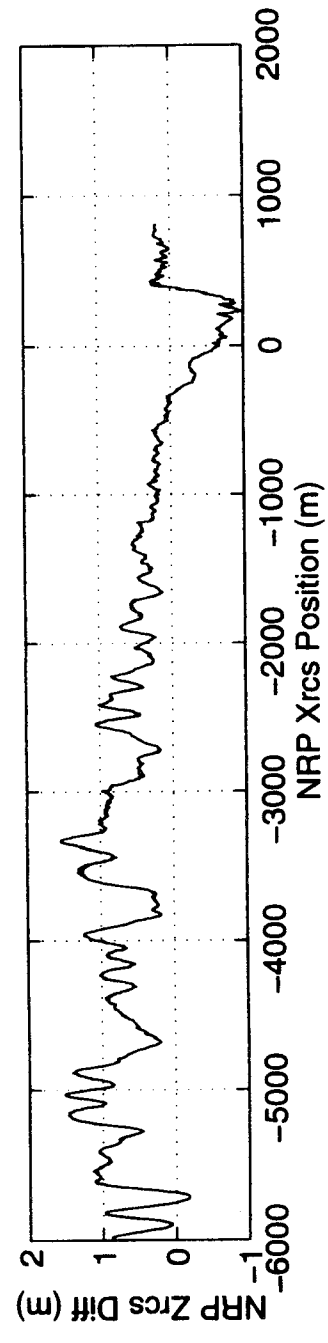
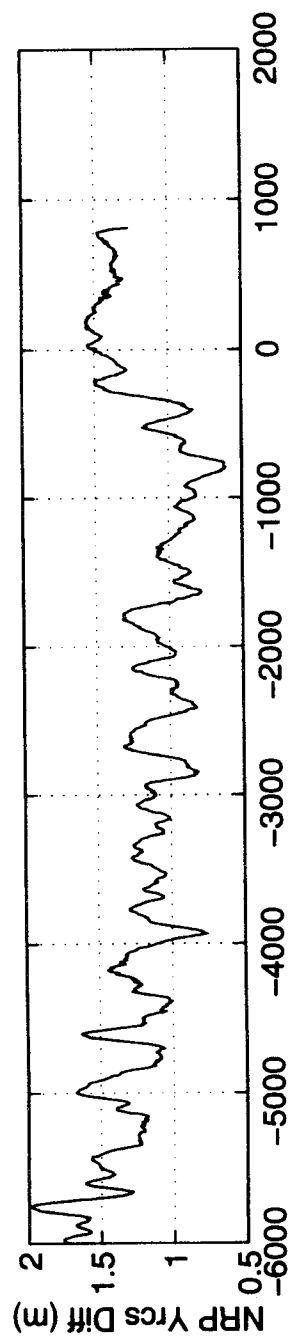
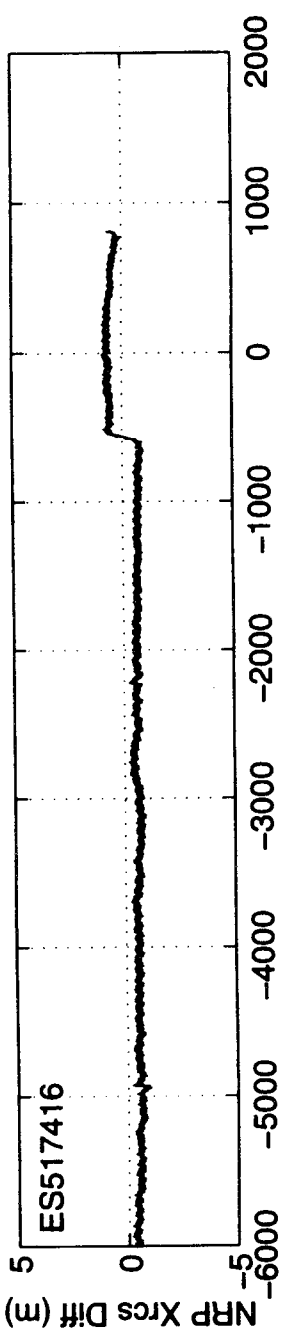
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 331.417  
LGRP Yrcs POSITION (m): -0.764





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES





APPROACH #: ES517417  
START TIME: 498666.396  
STOP TIME: 498825.330

MINIMUM HDOP: 1.1  
MAXIMUM HDOP: 1.4  
AVERAGE HDOP: 1.2

MINIMUM VDOP: 1.5  
MAXIMUM VDOP: 3.5  
AVERAGE VDOP: 2.0

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
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\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

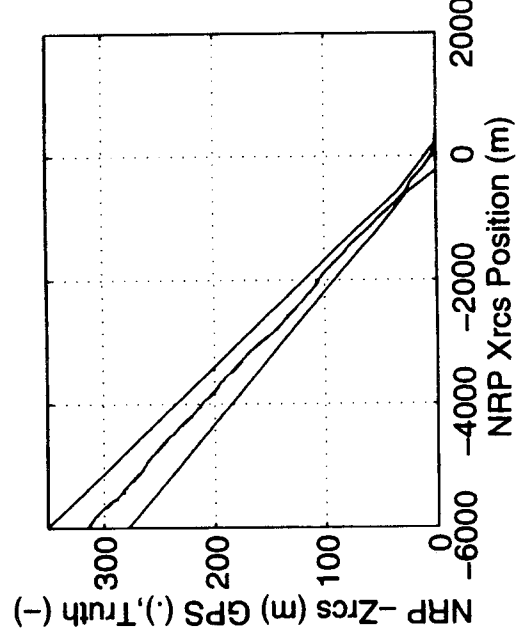
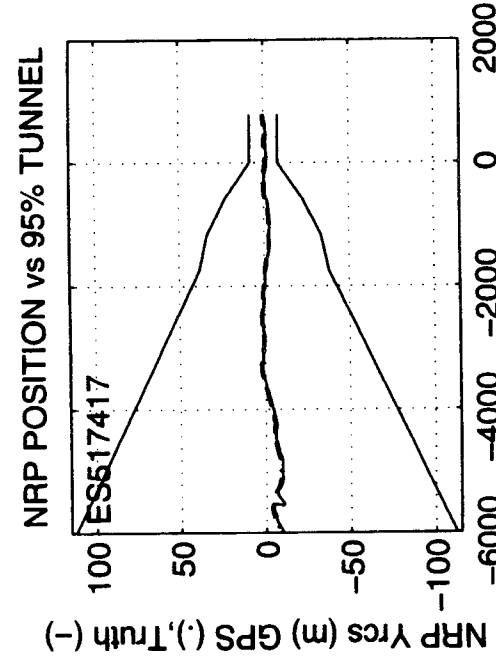
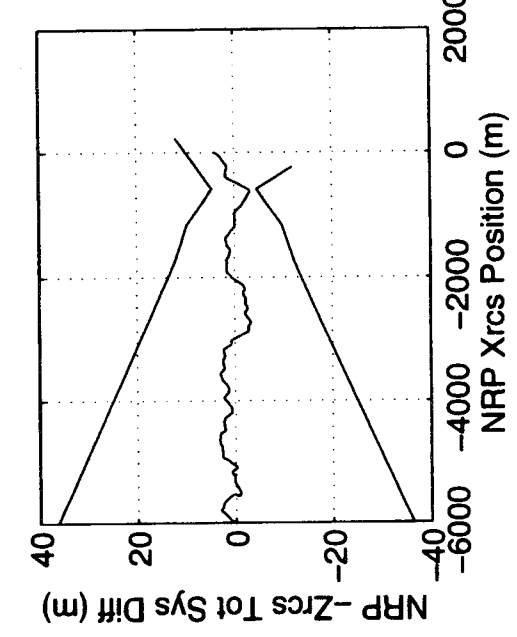
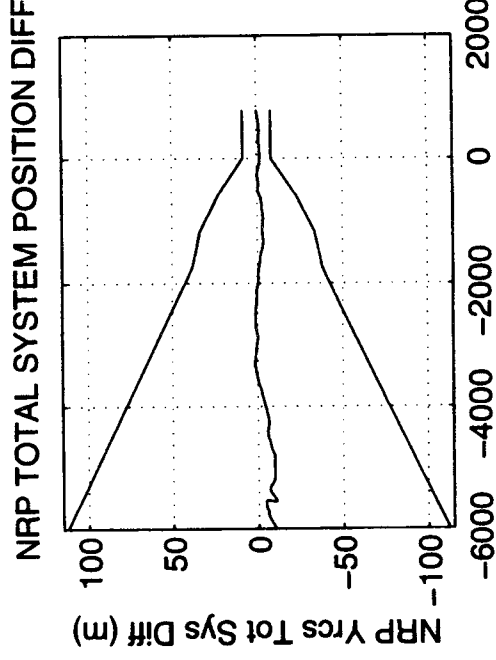
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.223  
NRP Yrcs MEAN DIFFERENCE (m): 1.298  
NRP Zrcs MEAN DIFFERENCE (m): -0.124

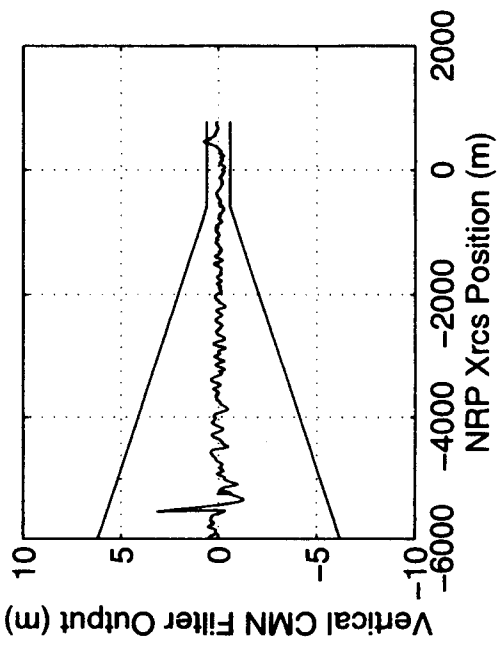
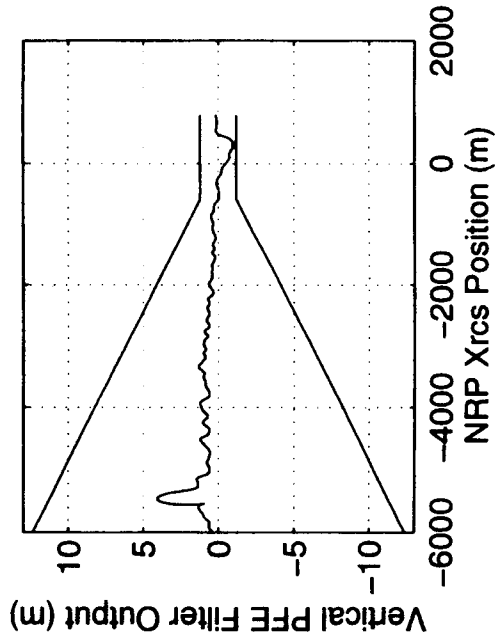
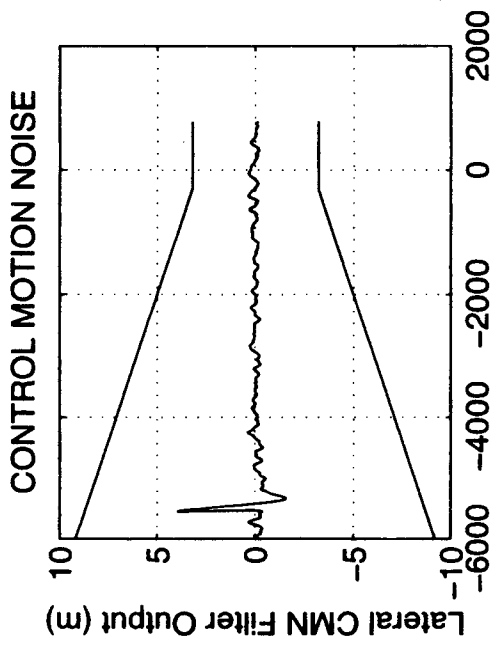
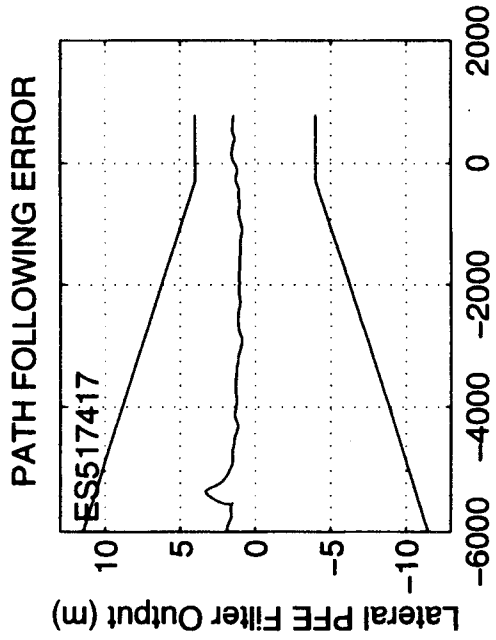
NRP Xrcs 2-SIGMA DIFFERENCE (m): 1.239  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.453  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.909

NRP Xrcs 2-RMS DIFFERENCE (m): 1.317  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.635  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.942

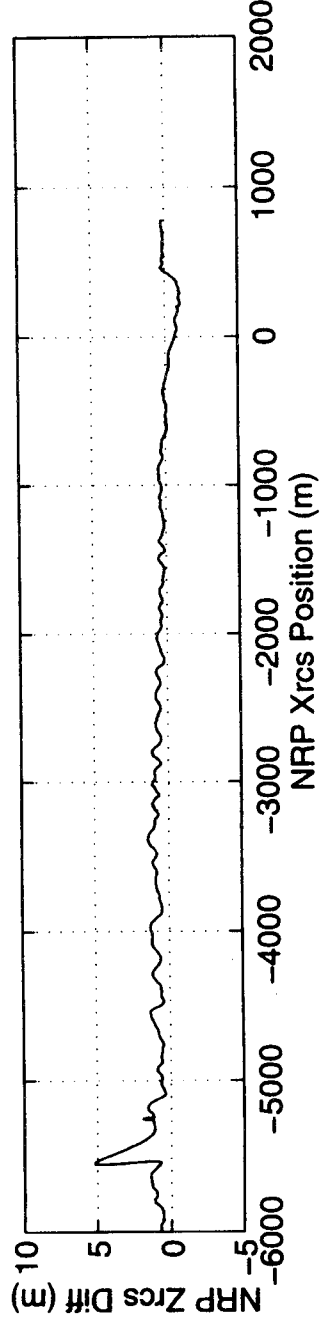
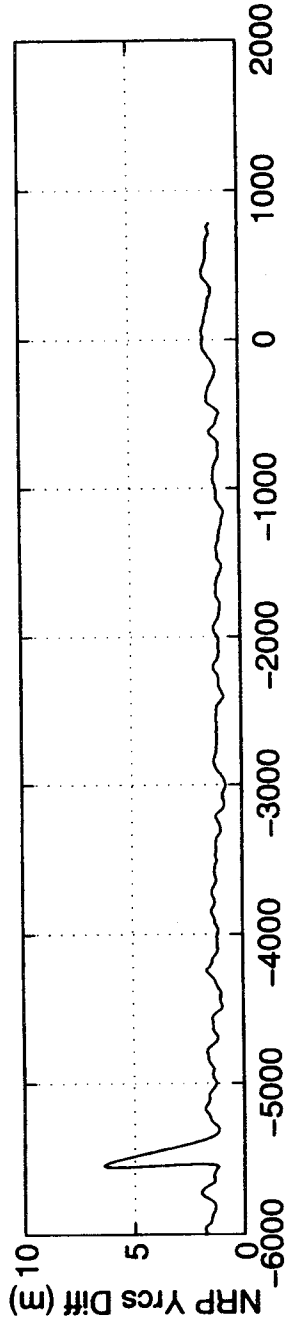
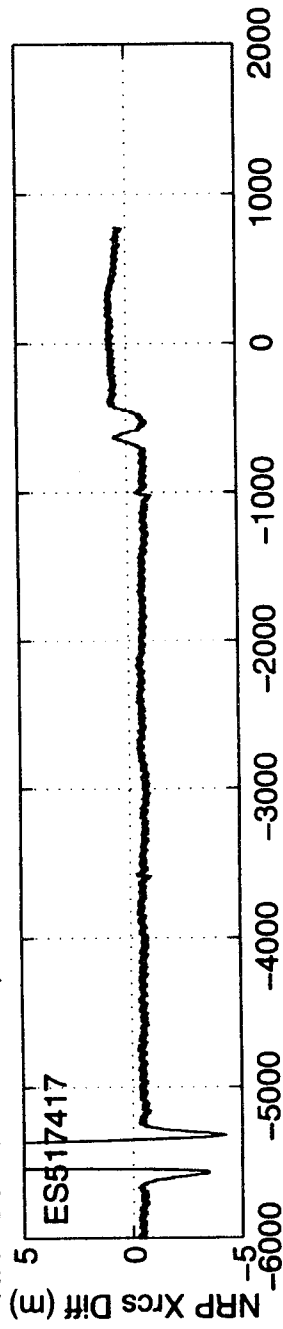
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 386.805  
LGRP Yrcs POSITION (m): -0.893





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517418  
START TIME: 499166.462  
STOP TIME: 499325.462

MINIMUM HDOP: 1.0  
MAXIMUM HDOP: 1.8  
AVERAGE HDOP: 1.6

MINIMUM VDOP: 1.5  
MAXIMUM VDOP: 4.4  
AVERAGE VDOP: 3.7

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

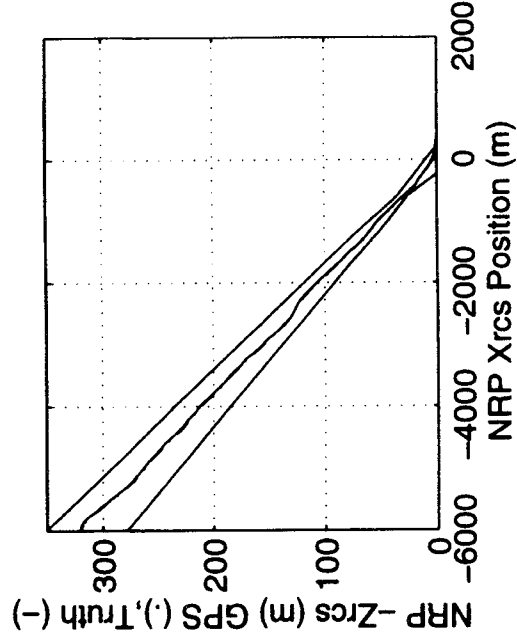
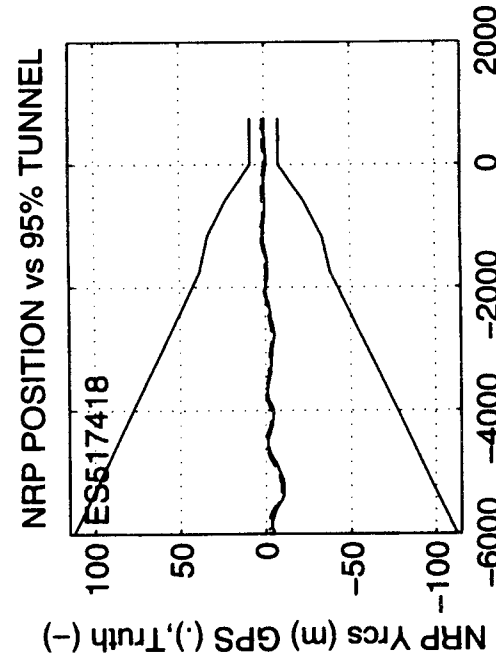
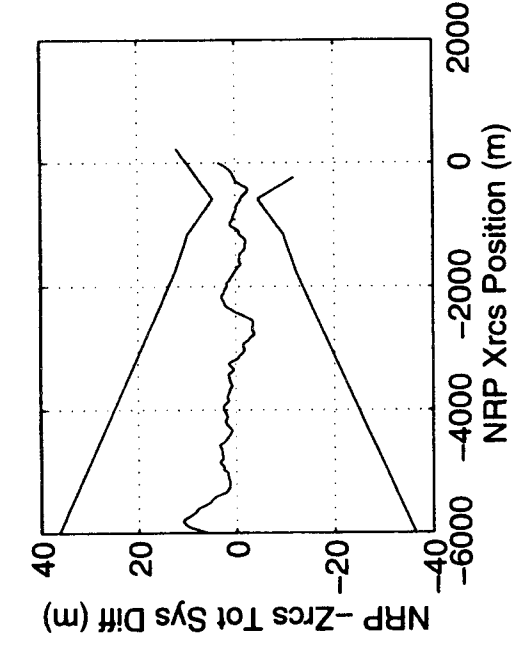
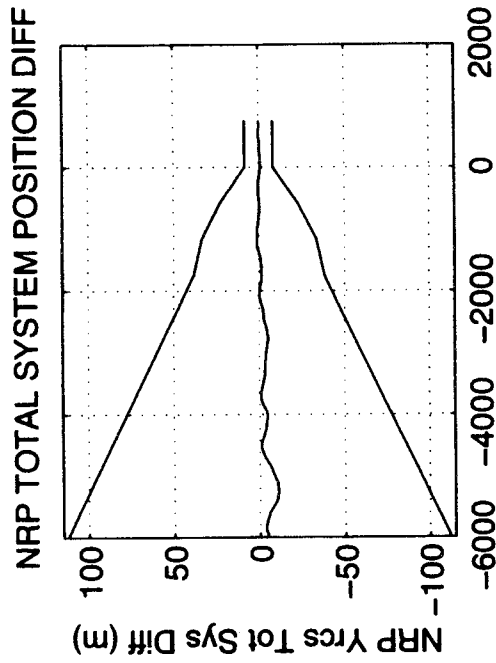
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.321  
NRP Yrcs MEAN DIFFERENCE (m): 1.286  
NRP Zrcs MEAN DIFFERENCE (m): -0.147

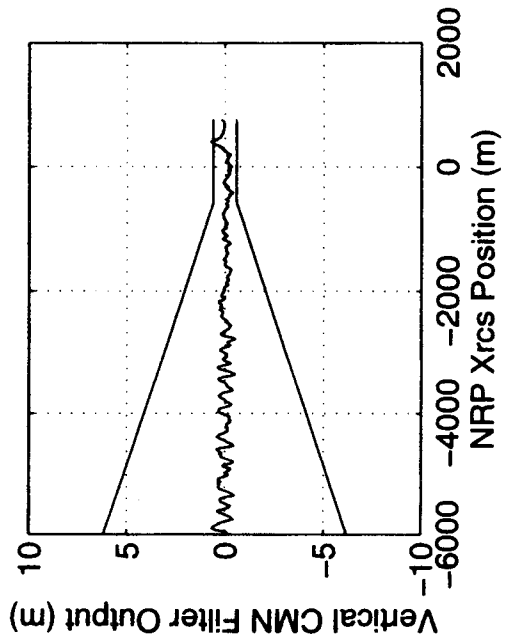
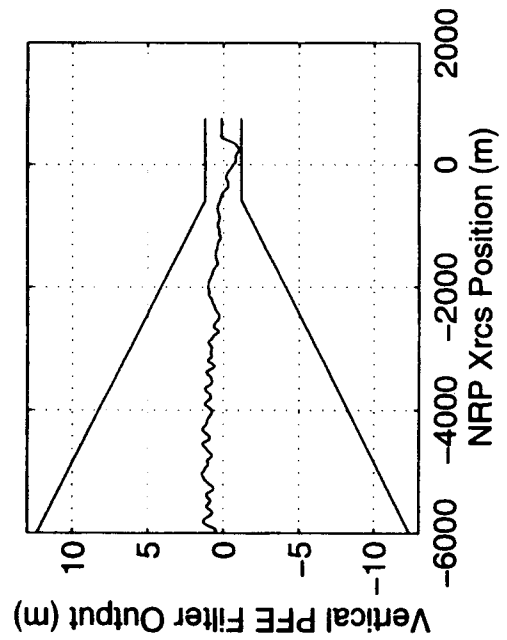
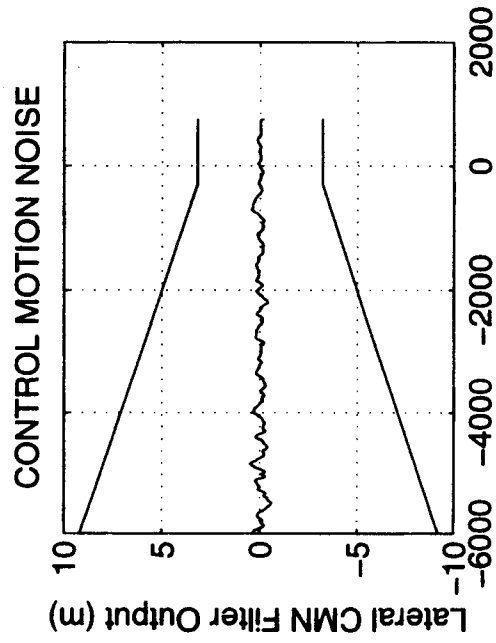
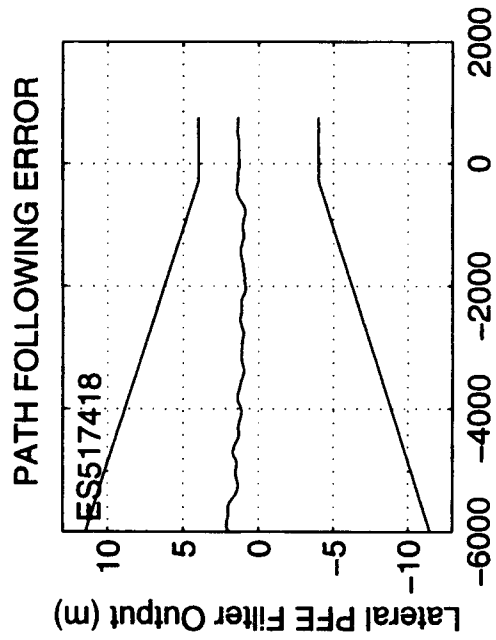
NRP Xrcs 2-SIGMA DIFFERENCE (m): 1.041  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.382  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.900

NRP Xrcs 2-RMS DIFFERENCE (m): 1.223  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.601  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.947

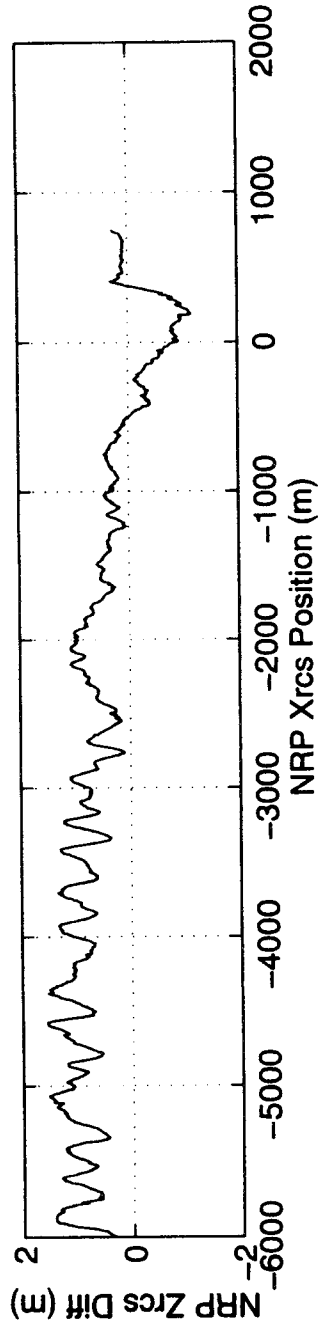
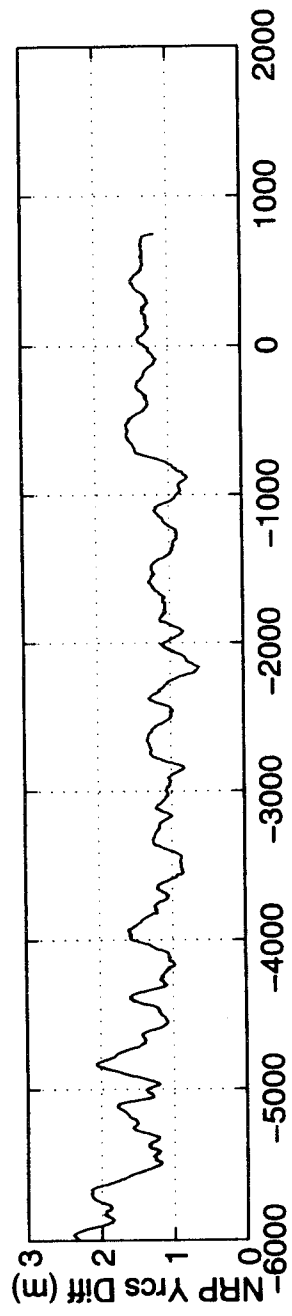
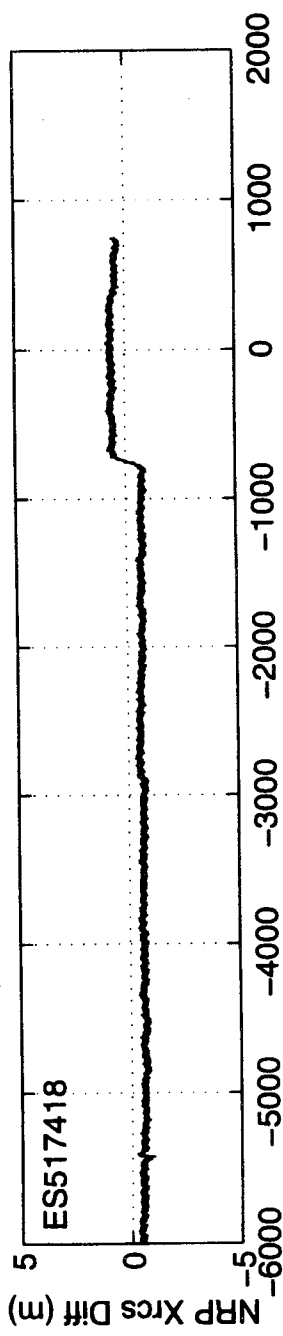
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 368.233  
LGRP Yrcs POSITION (m): 0.027





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES





APPROACH #: ES517419  
START TIME: 499680.451  
STOP TIME: 499840.858

MINIMUM HDOP: 1.4  
MAXIMUM HDOP: 1.5  
AVERAGE HDOP: 1.5

MINIMUM VDOP: 3.5  
MAXIMUM VDOP: 3.9  
AVERAGE VDOP: 3.7

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

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TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

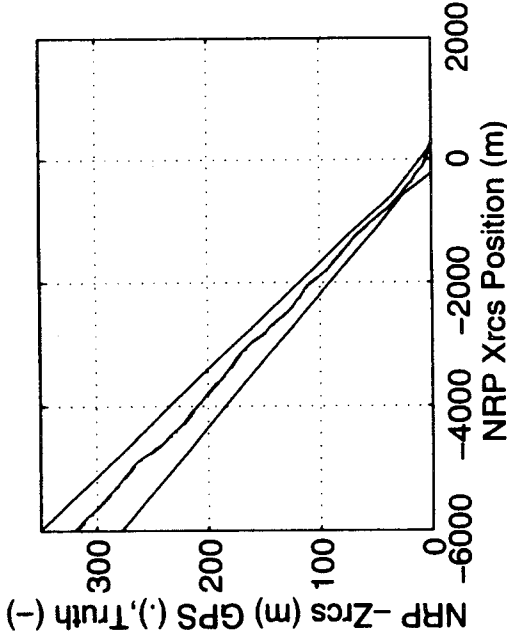
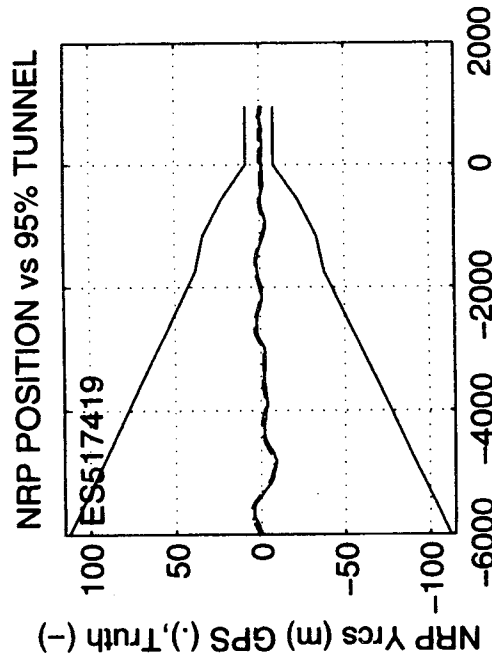
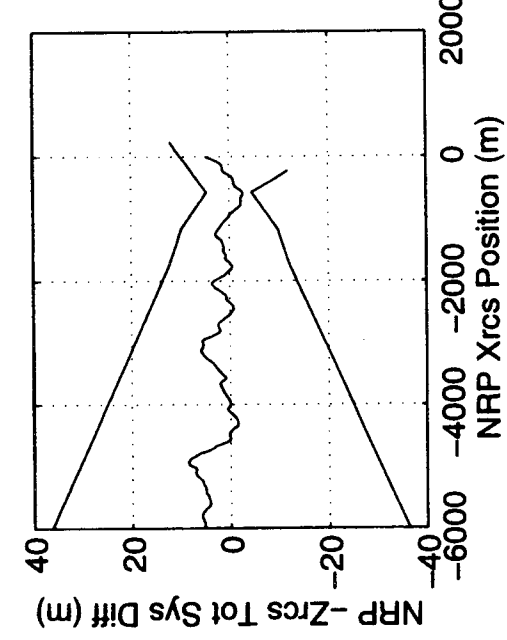
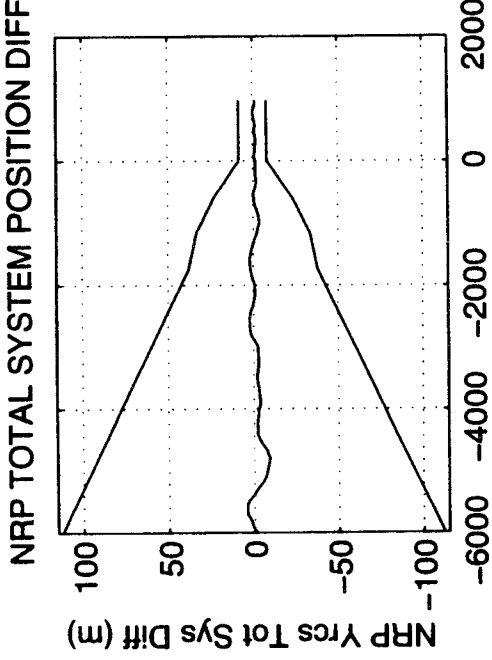
NRP Xrcs MEAN DIFFERENCE (m): 0.171  
NRP Yrcs MEAN DIFFERENCE (m): 1.232  
NRP Zrcs MEAN DIFFERENCE (m): -0.101

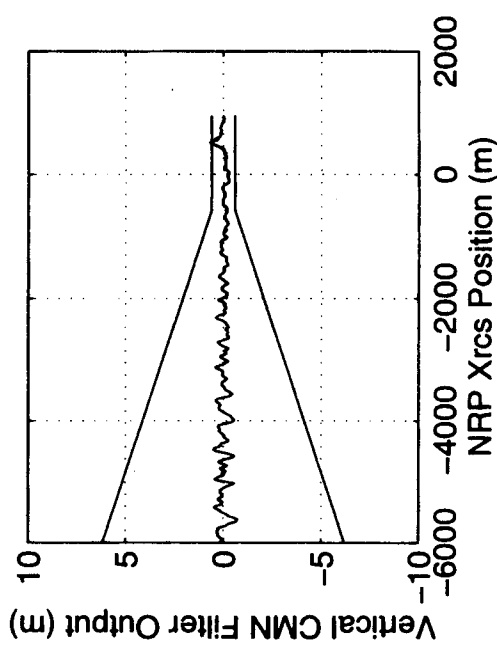
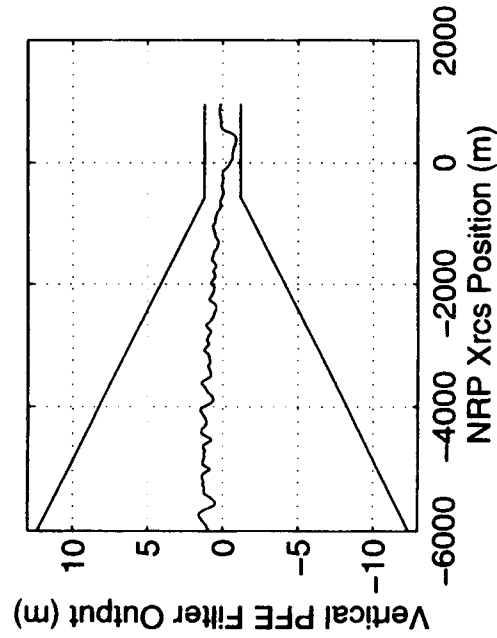
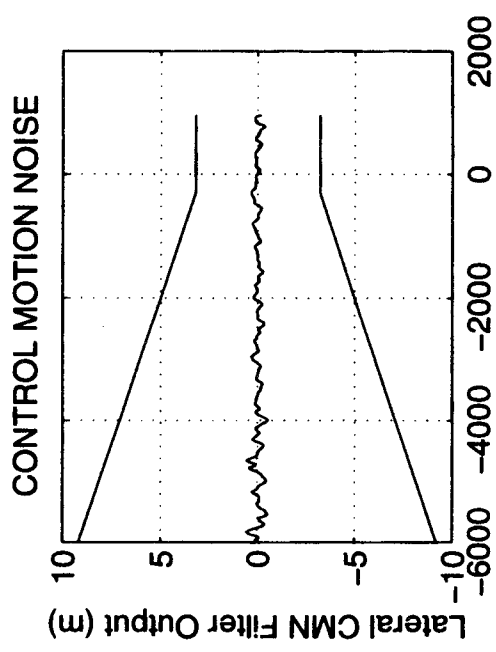
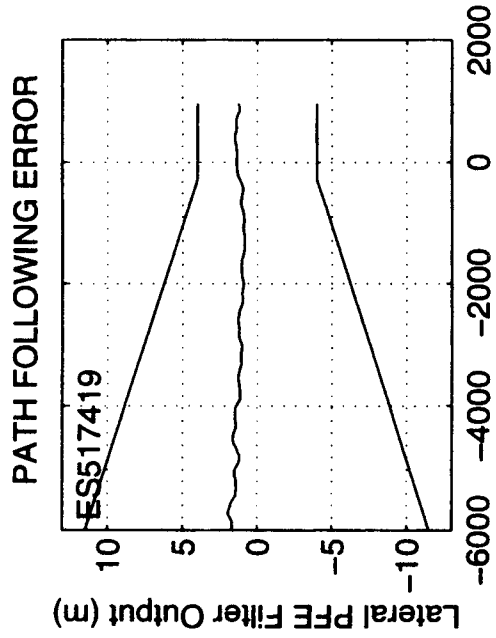
NRP Xrcs 2-SIGMA DIFFERENCE (m): 1.209  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.449  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.874

NRP Xrcs 2-RMS DIFFERENCE (m): 1.257  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.505  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.897

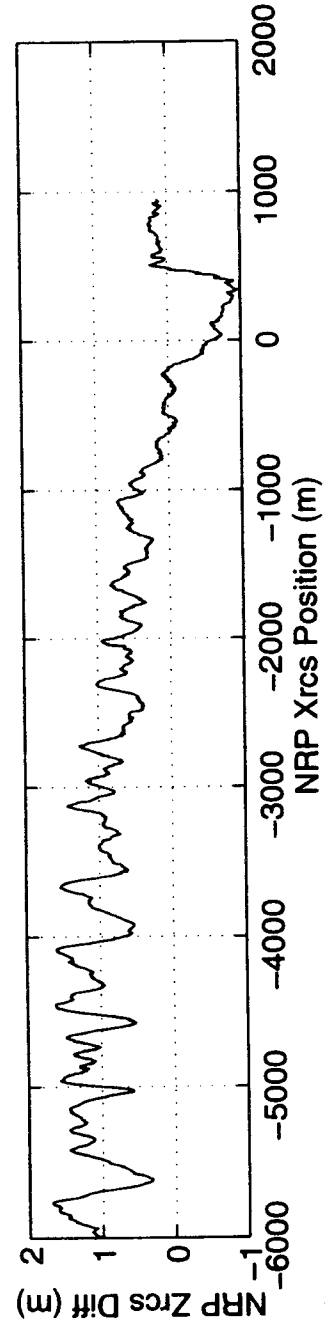
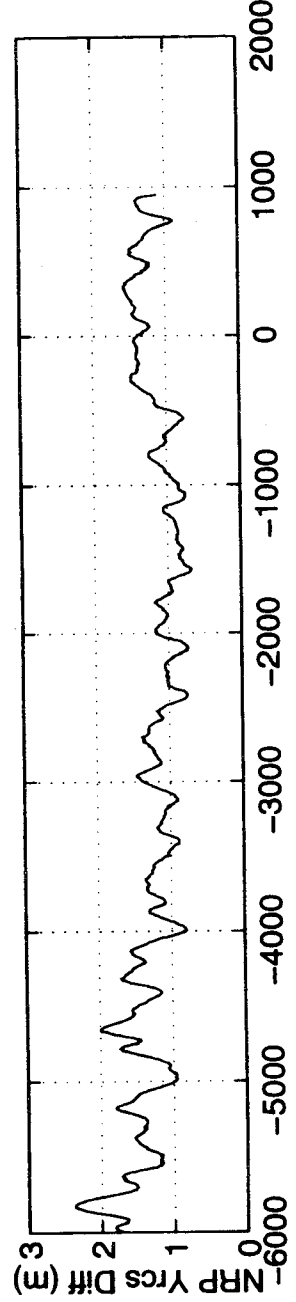
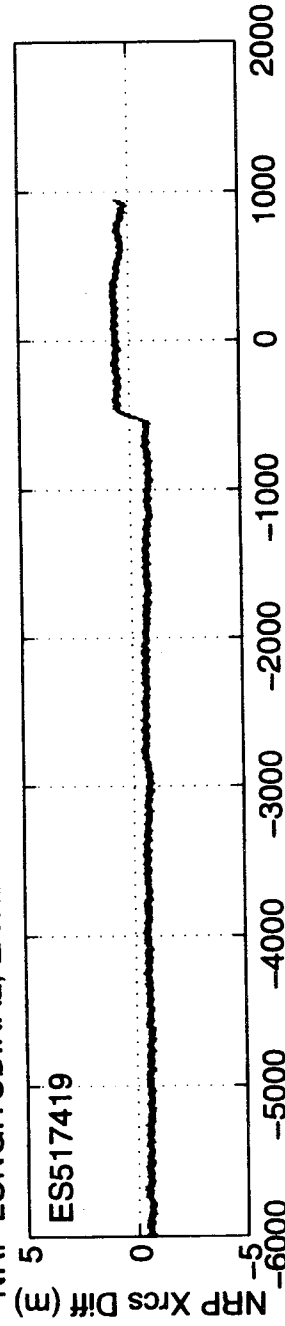
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 443.015  
LGRP Yrcs POSITION (m): -0.495





NRP LONGITUDINAL, LATERAL AND VERTICAL POSITION DIFFERENCES



APPROACH #: ES517420  
START TIME: 504860.330  
STOP TIME: 505004.330

MINIMUM HDOP: 0.7  
MAXIMUM HDOP: 0.7  
AVERAGE HDOP: 0.7

MINIMUM VDOP: 2.7  
MAXIMUM VDOP: 2.8  
AVERAGE VDOP: 2.7

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

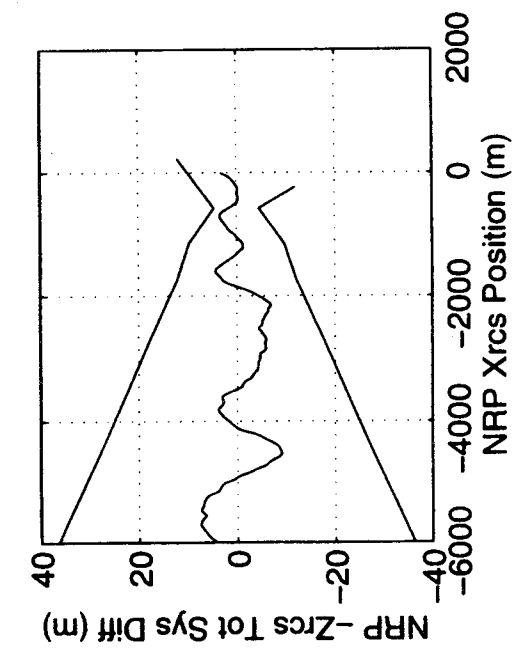
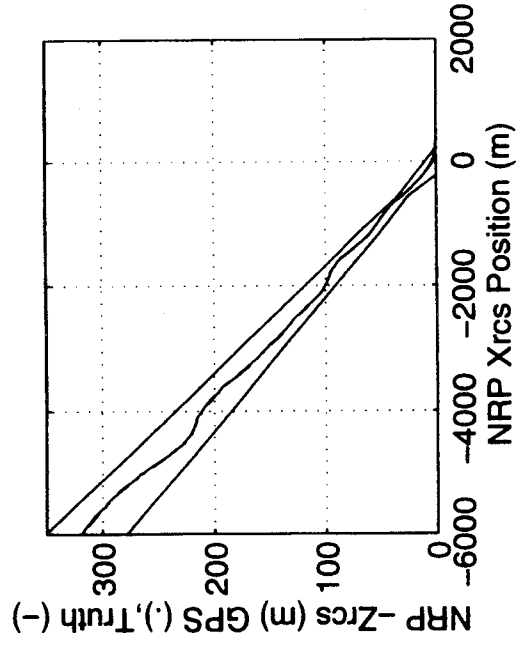
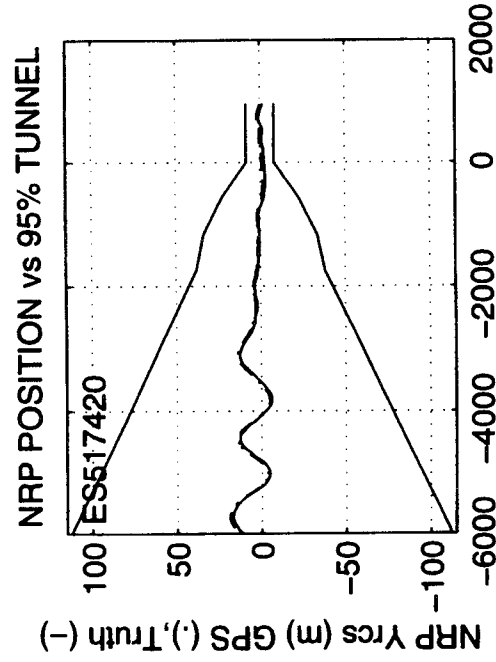
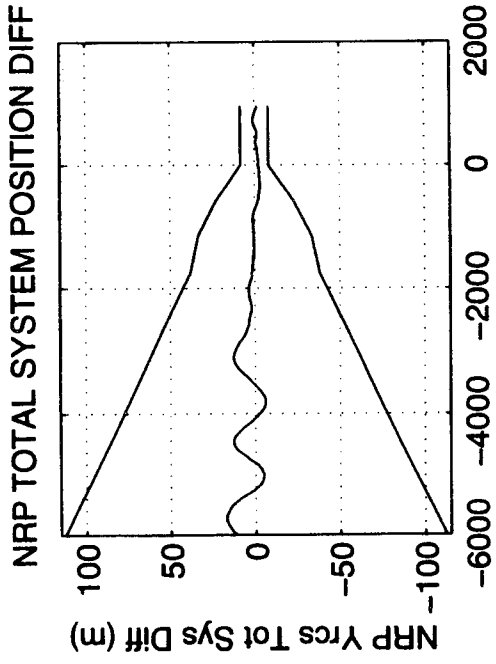
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.347  
NRP Yrcs MEAN DIFFERENCE (m): 1.344  
NRP Zrcs MEAN DIFFERENCE (m): -0.033

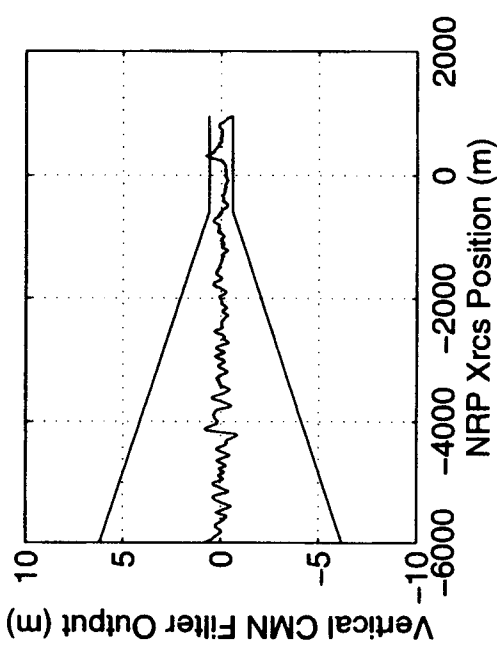
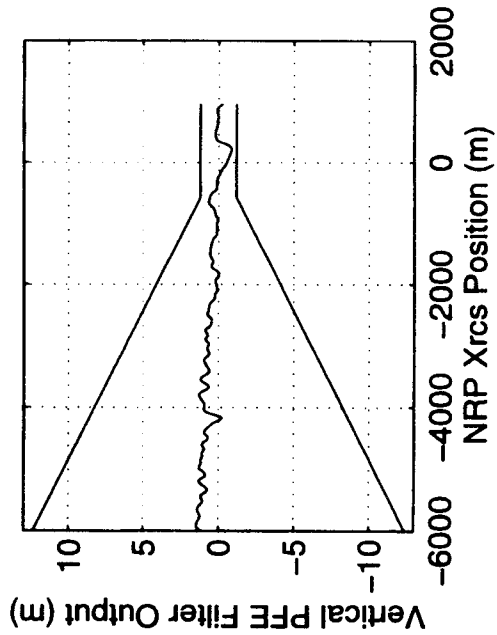
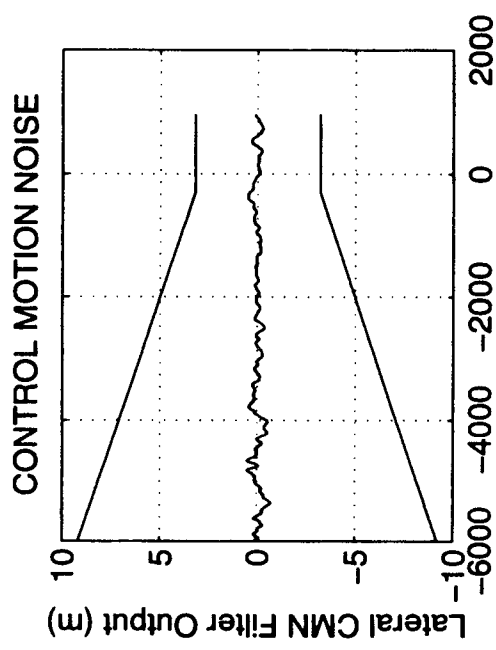
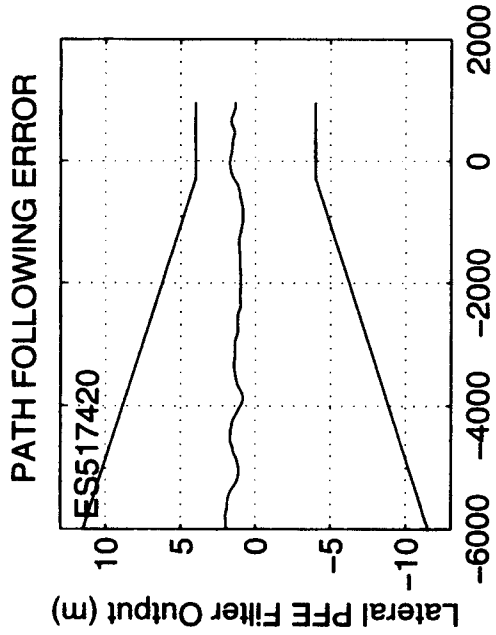
NRP Xrcs 2-SIGMA DIFFERENCE (m): 1.220  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.640  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.797

NRP Xrcs 2-RMS DIFFERENCE (m): 1.404  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.763  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.800

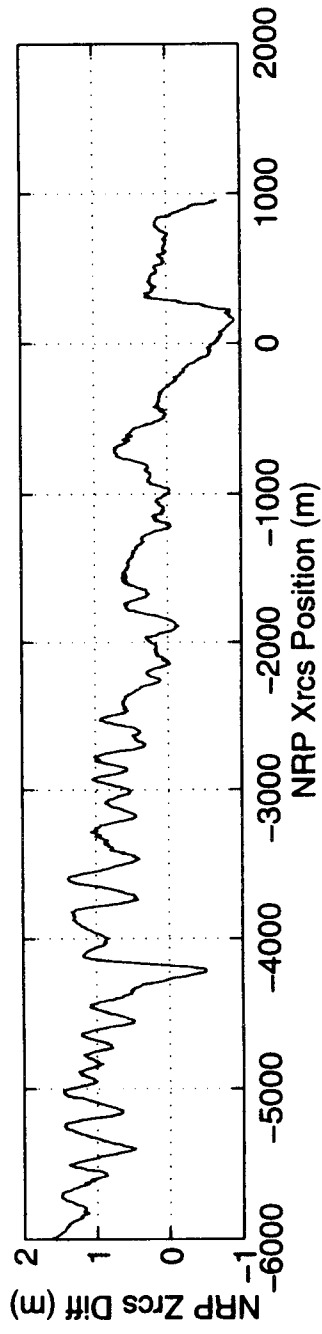
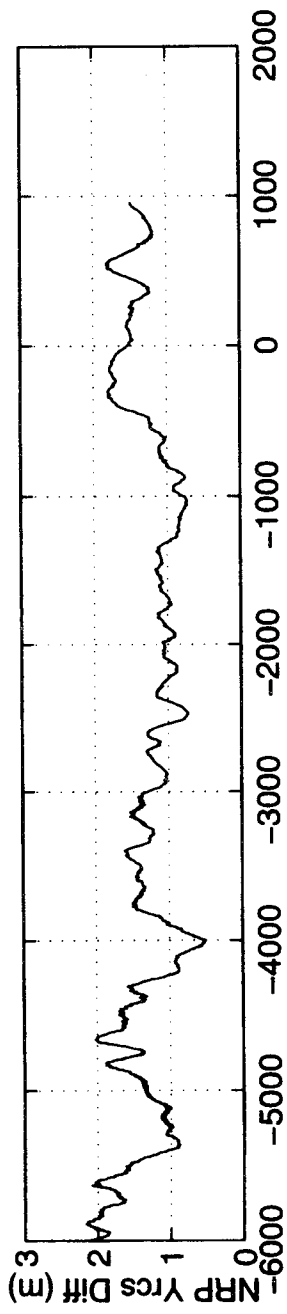
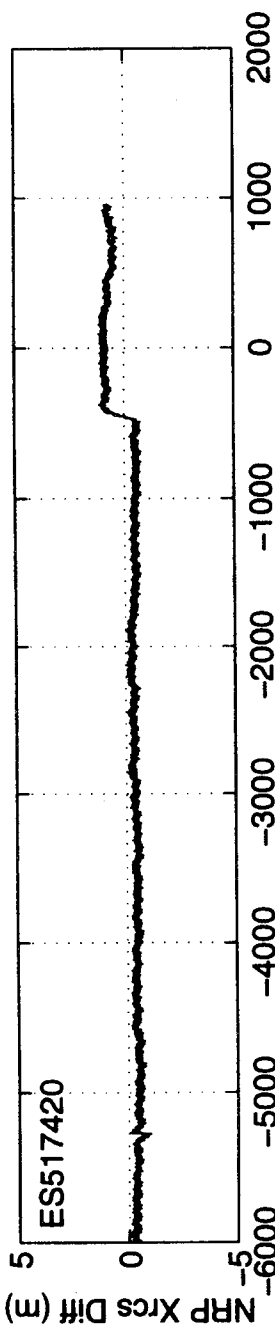
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 282.081  
LGRP Yrcs POSITION (m): -1.052





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES





APPROACH #: ES517421  
START TIME: 505317.330  
STOP TIME: 505459.858

MINIMUM HDOP: 0.7  
MAXIMUM HDOP: 0.7  
AVERAGE HDOP: 0.7

MINIMUM VDOP: 2.3  
MAXIMUM VDOP: 2.5  
AVERAGE VDOP: 2.4

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

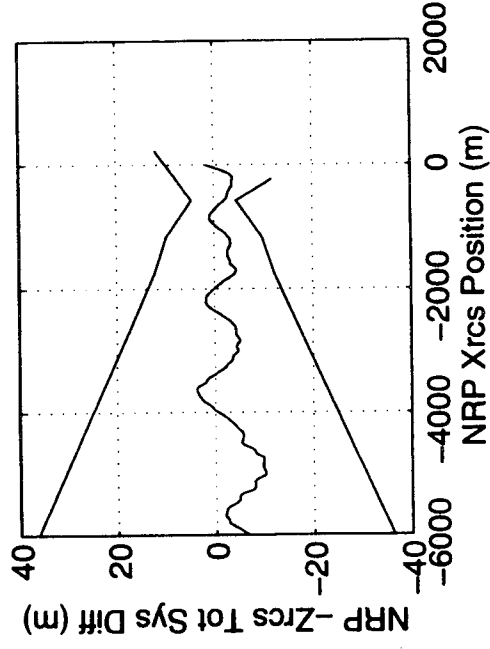
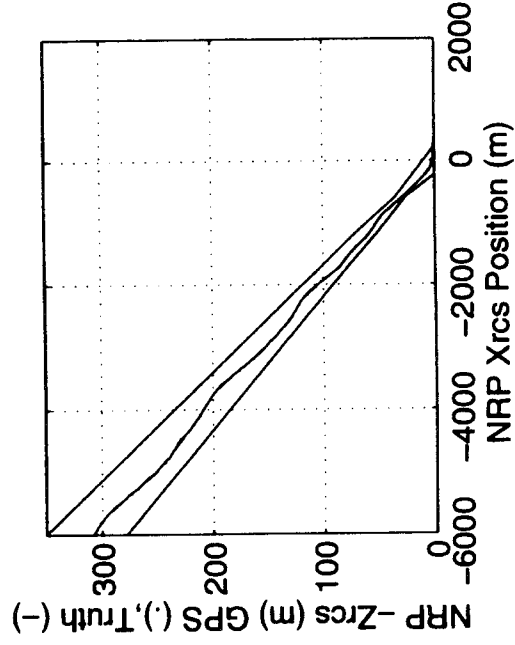
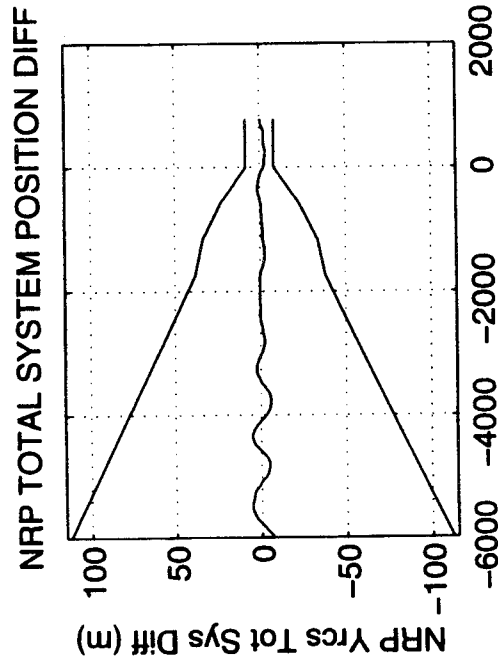
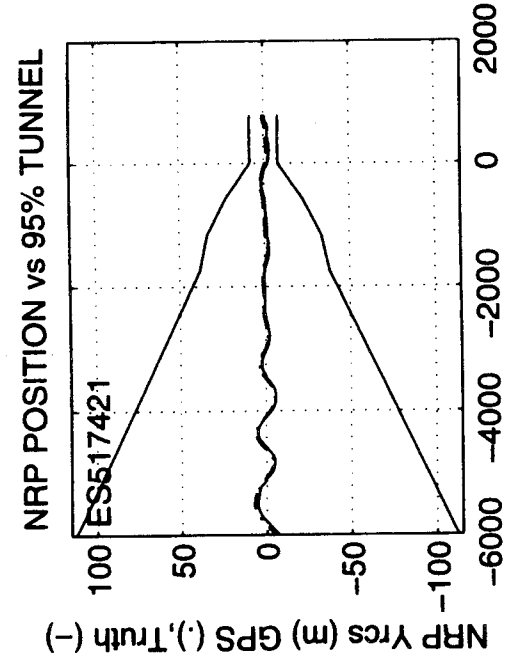
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.061  
NRP Yrcs MEAN DIFFERENCE (m): 1.395  
NRP Zrcs MEAN DIFFERENCE (m): -0.081

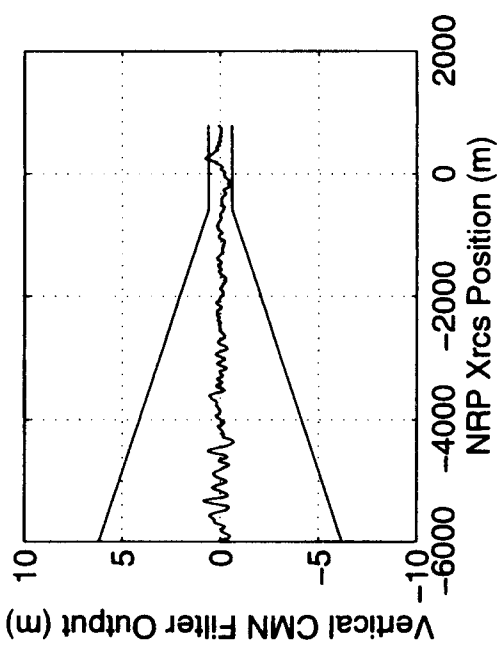
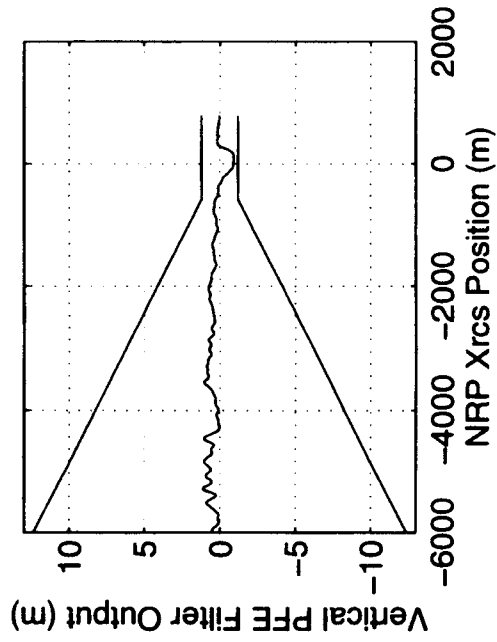
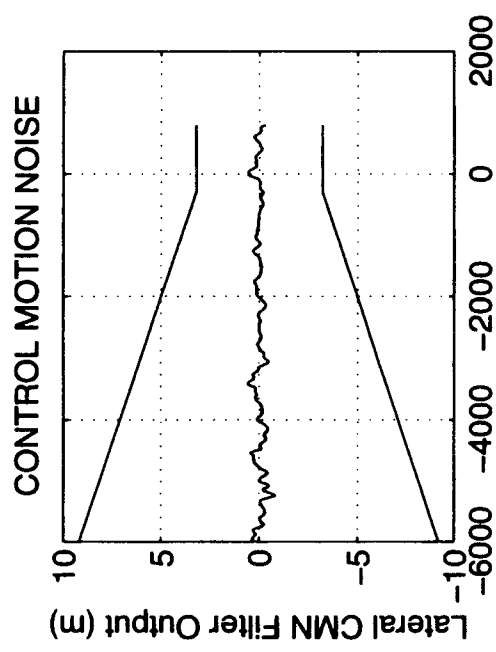
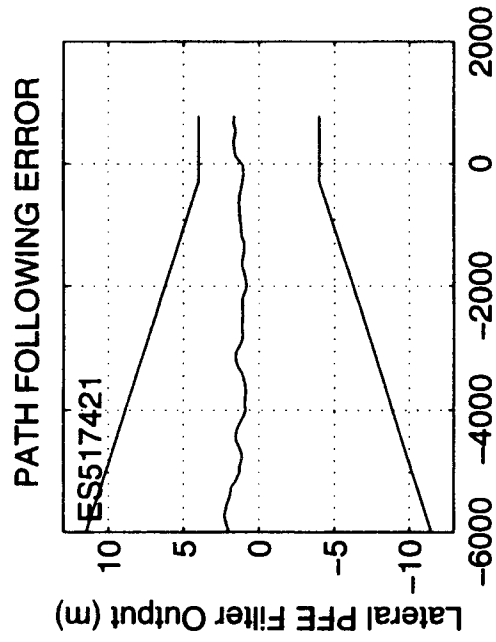
NRP Xrcs 2-SIGMA DIFFERENCE (m): 1.186  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.539  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.871

NRP Xrcs 2-RMS DIFFERENCE (m): 1.193  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.841  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.886

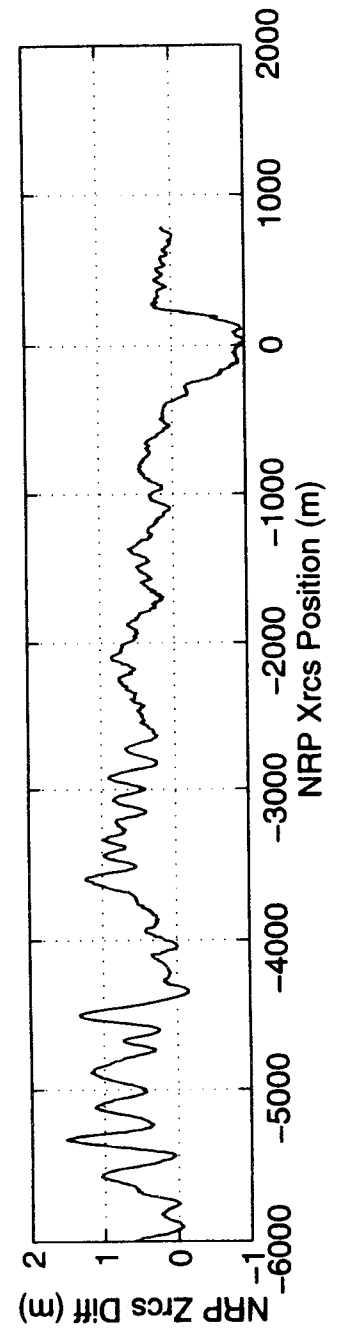
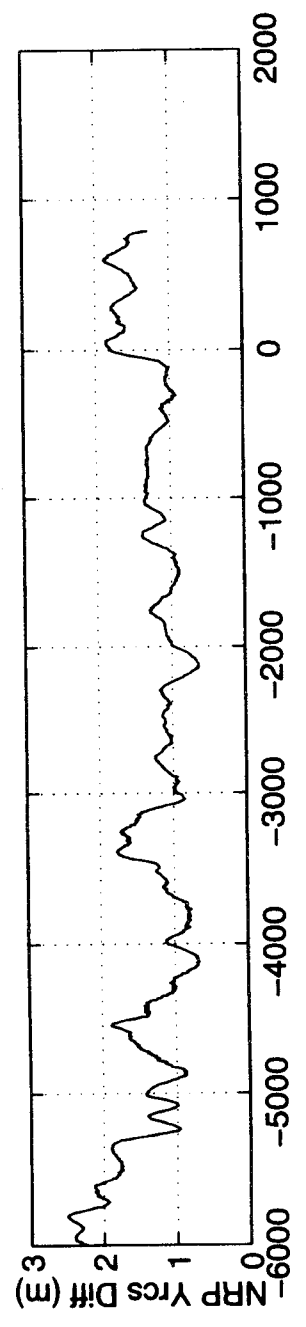
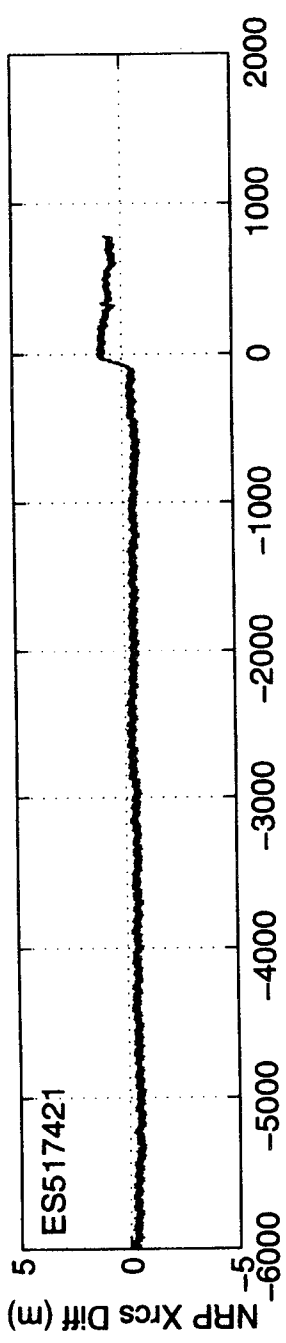
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

LGRP Xrcs POSITION (m): 162.796  
LGRP Yrcs POSITION (m): -2.560





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517422  
START TIME: 505784.122  
STOP TIME: 505924.913

MINIMUM HDOP: 0.8  
MAXIMUM HDOP: 0.8  
AVERAGE HDOP: 0.8

MINIMUM VDOP: 2.7  
MAXIMUM VDOP: 2.9  
AVERAGE VDOP: 2.8

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

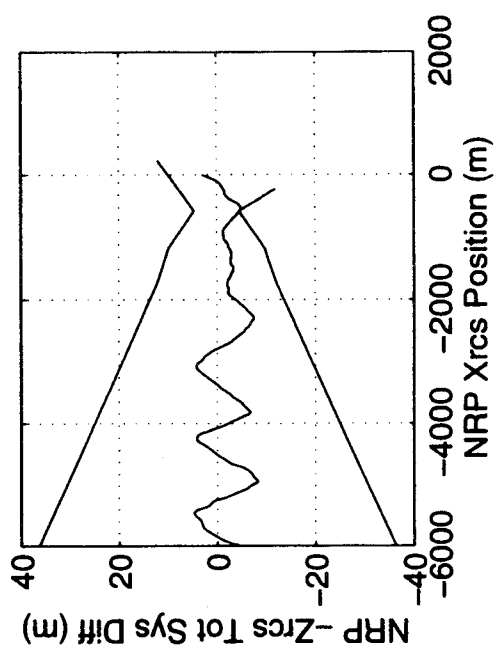
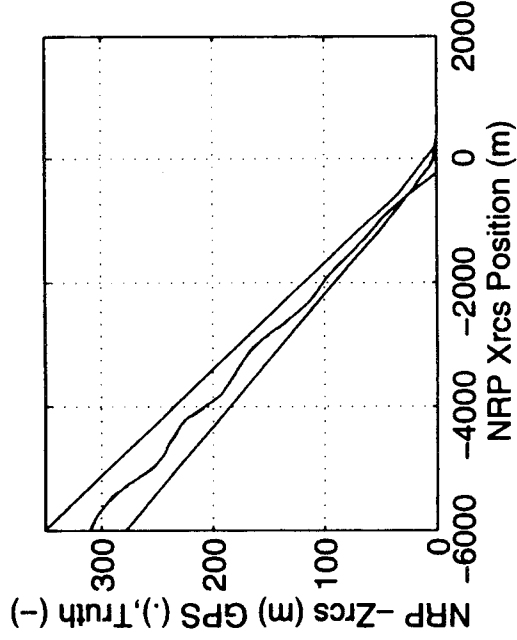
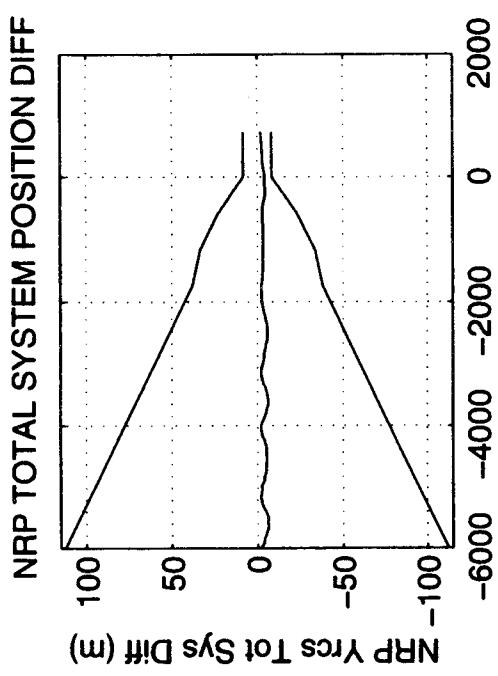
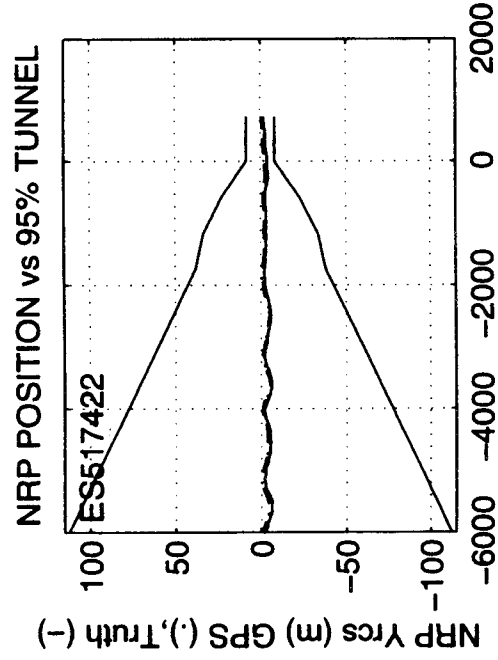
-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.364  
NRP Yrcs MEAN DIFFERENCE (m): 1.509  
NRP Zrcs MEAN DIFFERENCE (m): -0.237

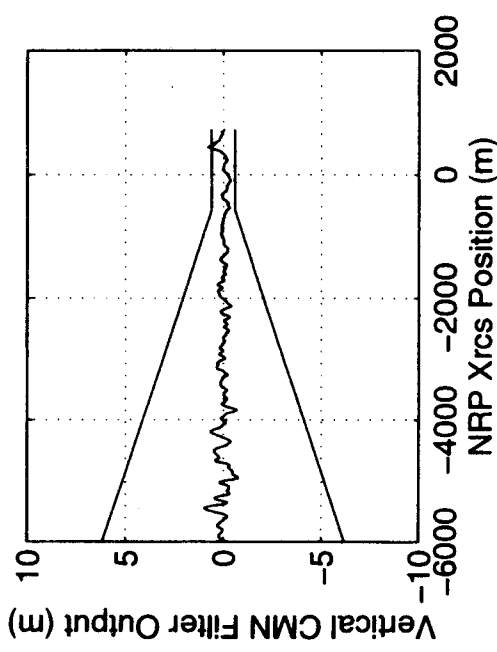
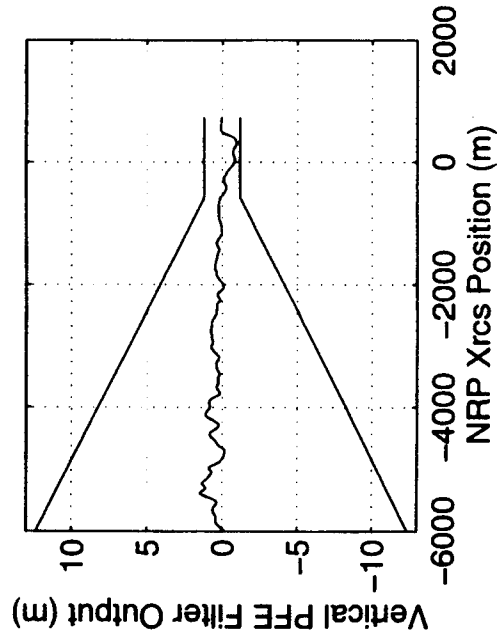
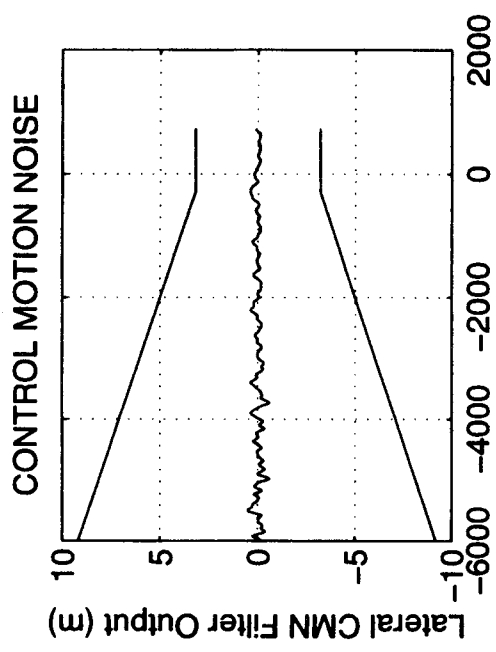
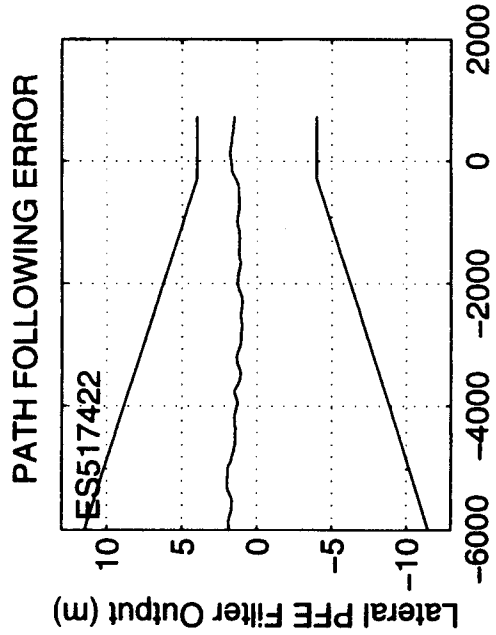
NRP Xrcs 2-SIGMA DIFFERENCE (m): 1.297  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.470  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.839

NRP Xrcs 2-RMS DIFFERENCE (m): 1.487  
NRP Yrcs 2-RMS DIFFERENCE (m): 3.054  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.964

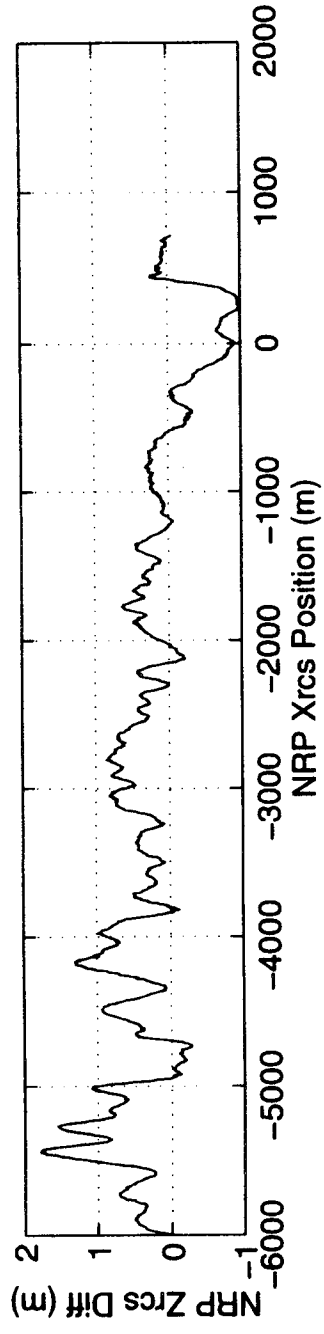
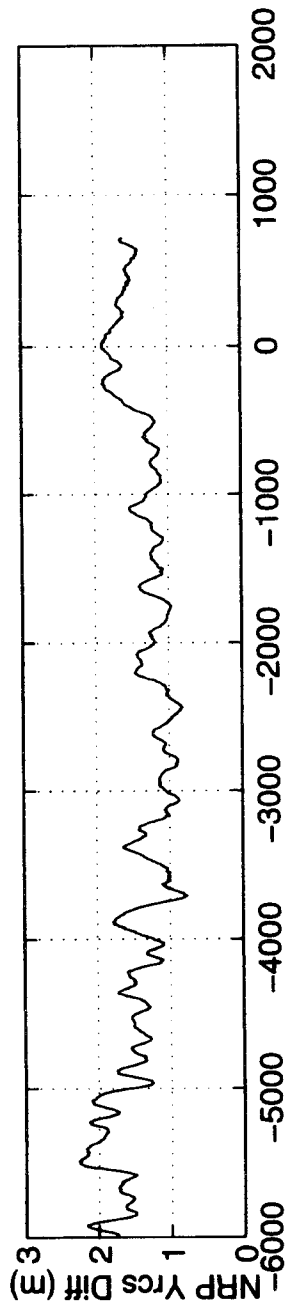
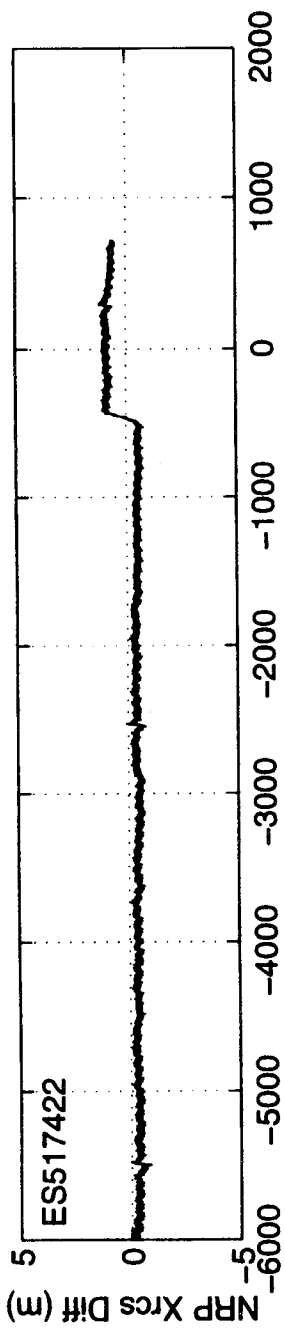
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

-----  
LGRP Xrcs POSITION (m): 387.159  
LGRP Yrcs POSITION (m): -2.346





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES





APPROACH #: ES517424  
START TIME: 506985.198  
STOP TIME: 507124.858

MINIMUM HDOP: 0.6  
MAXIMUM HDOP: 0.6  
AVERAGE HDOP: 0.6

MINIMUM VDOP: 1.4  
MAXIMUM VDOP: 1.5  
AVERAGE VDOP: 1.5

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

-----  
TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
-----

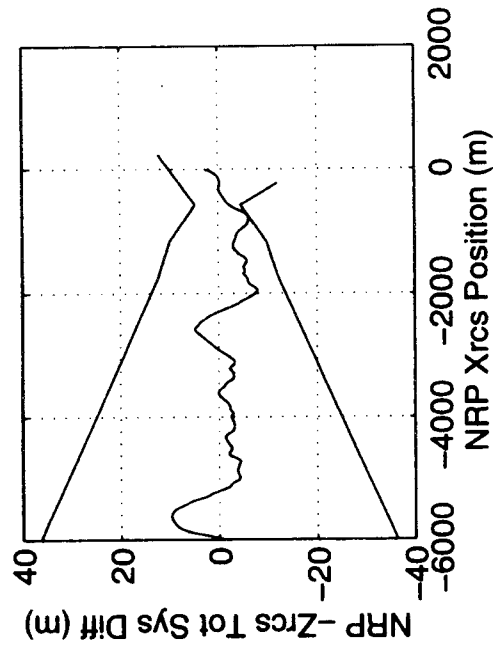
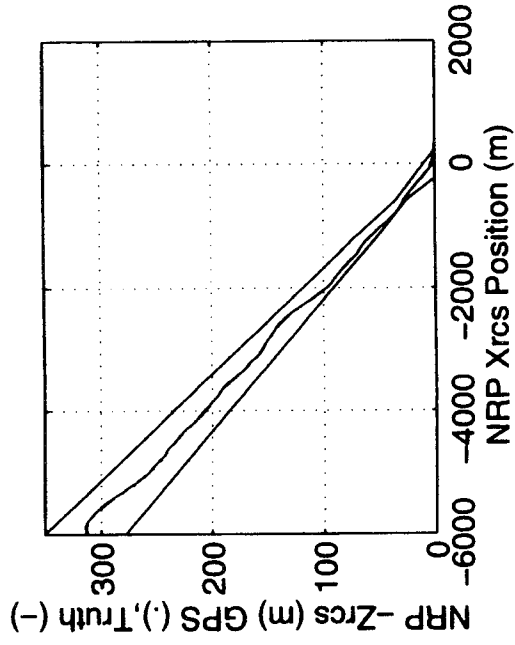
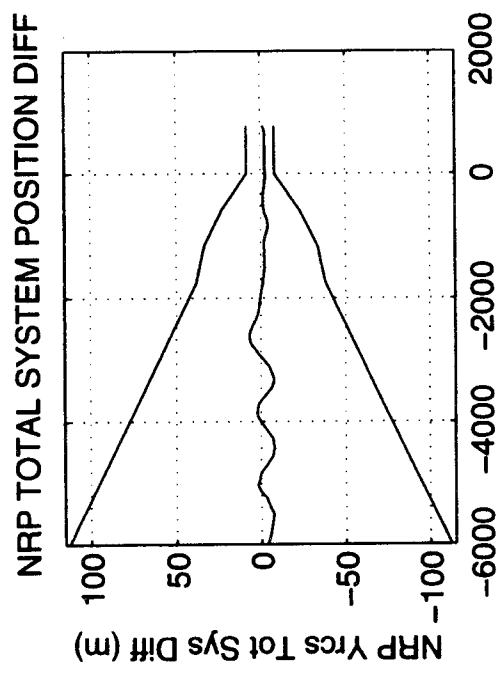
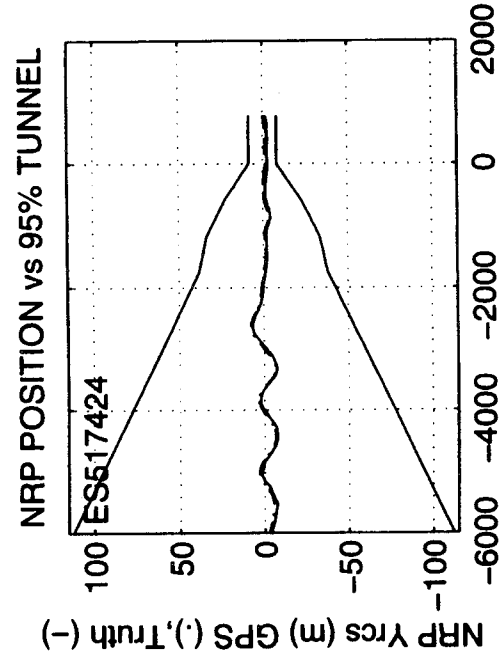
NRP Xrcs MEAN DIFFERENCE (m): 0.361  
NRP Yrcs MEAN DIFFERENCE (m): 1.366  
NRP Zrcs MEAN DIFFERENCE (m): -0.098

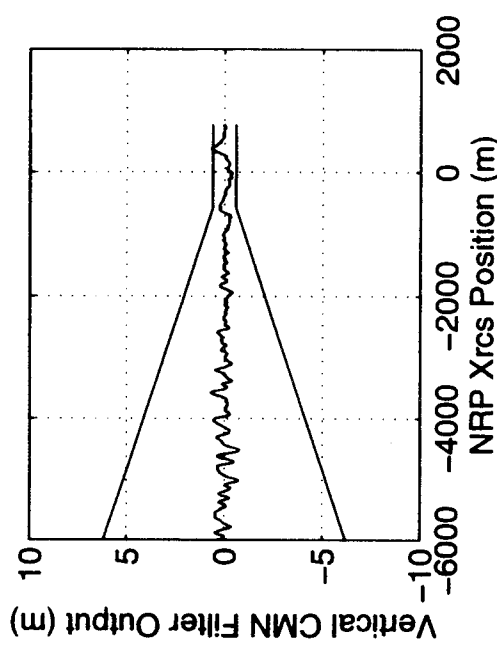
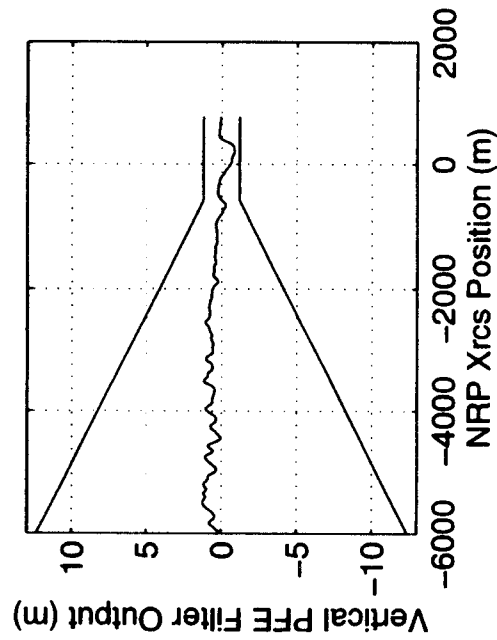
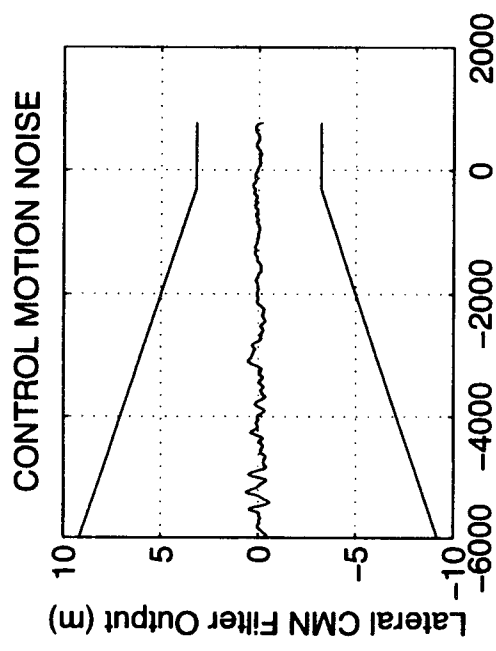
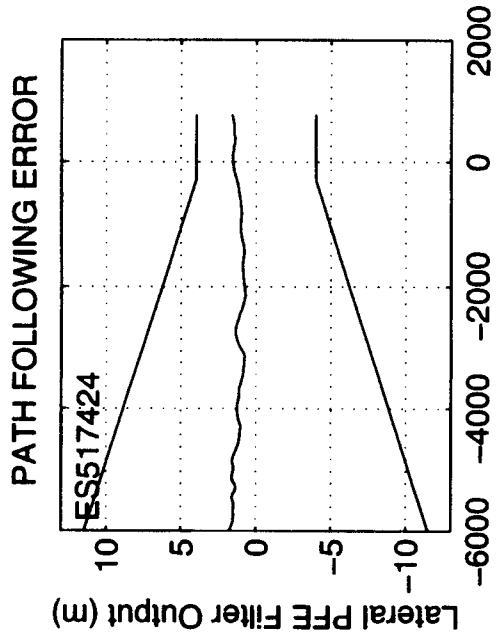
NRP Xrcs 2-SIGMA DIFFERENCE (m): 1.296  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.466  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.772

NRP Xrcs 2-RMS DIFFERENCE (m): 1.484  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.772  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.797

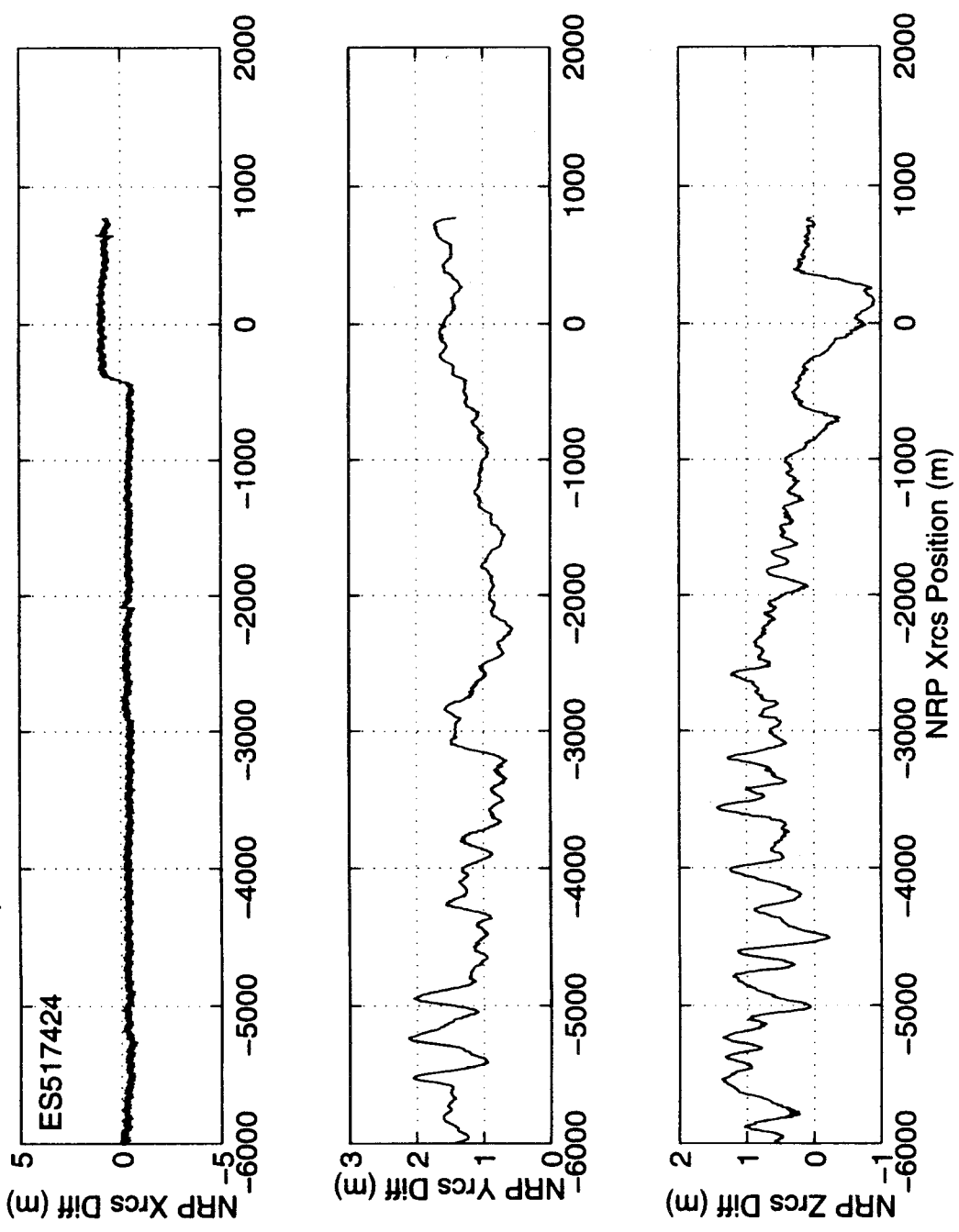
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION  
-----

LGRP Xrcs POSITION (m): 340.446  
LGRP Yrcs POSITION (m): -2.308





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517425  
START TIME: 507484.462  
STOP TIME: 507634.198

MINIMUM HDOP: 0.5  
MAXIMUM HDOP: 0.7  
AVERAGE HDOP: 0.6

MINIMUM VDOP: 1.2  
MAXIMUM VDOP: 1.6  
AVERAGE VDOP: 1.3

MINIMUM NUMBER OF SVs: 8  
MAXIMUM NUMBER OF SVs: 9  
AVERAGE NUMBER OF SVs: 9

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID APPROACH \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL APPROACH \*  
\*\*\*\*\*

TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.431  
NRP Yrcs MEAN DIFFERENCE (m): 1.454  
NRP Zrcs MEAN DIFFERENCE (m): -0.144

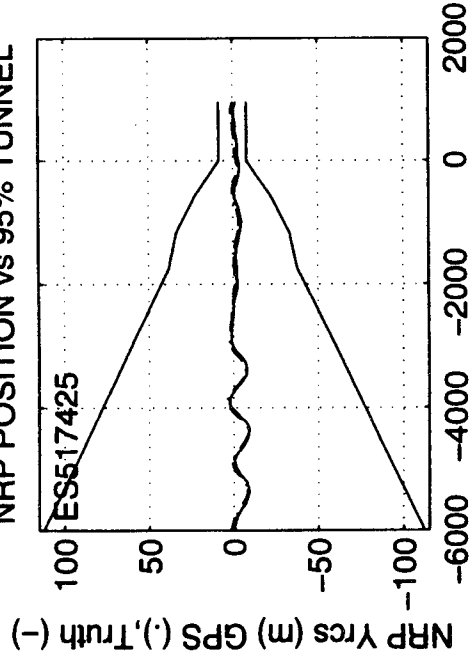
NRP Xrcs 2-SIGMA DIFFERENCE (m): 1.278  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.385  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.690

NRP Xrcs 2-RMS DIFFERENCE (m): 1.541  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.933  
NRP Zrcs 2-RMS DIFFERENCE (m): 0.747

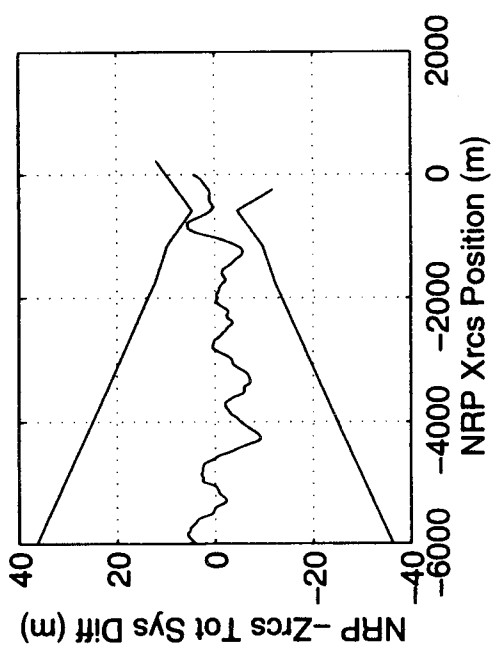
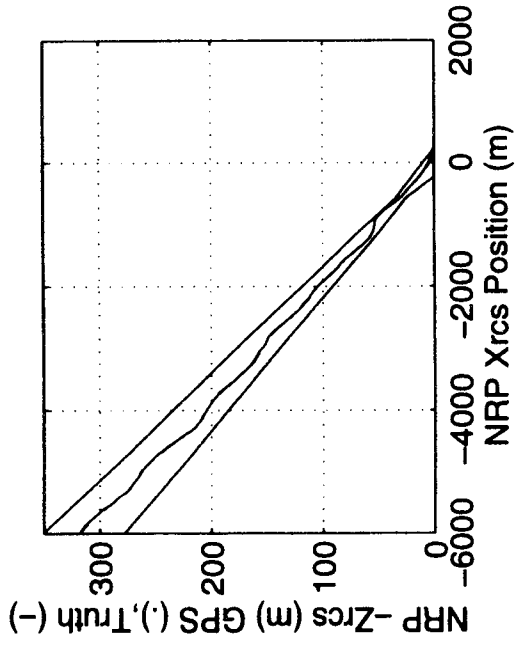
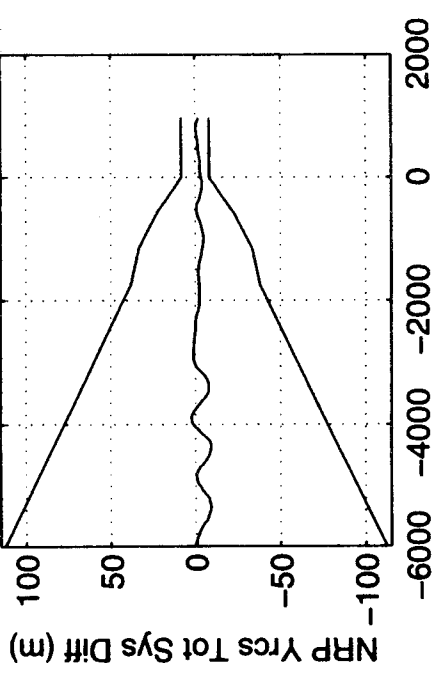
-----  
LANDING GEAR REFERENCE POINT TOUCHDOWN POSITION

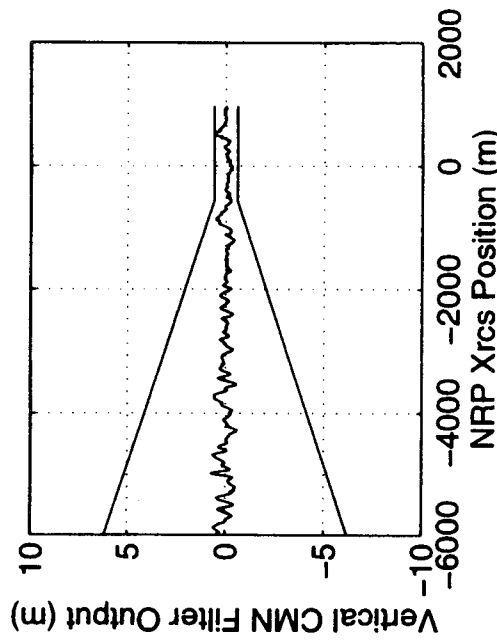
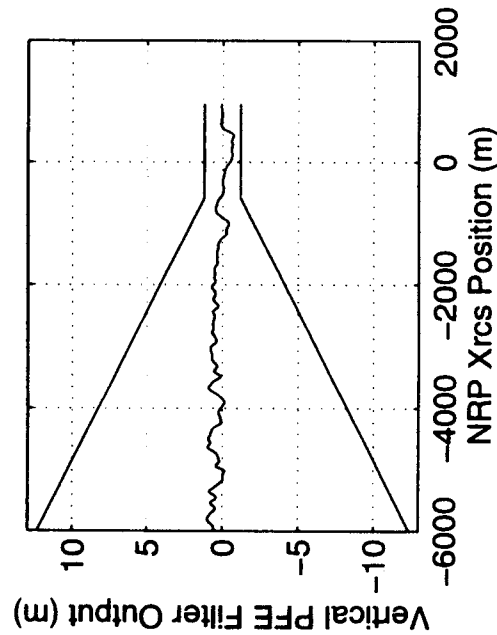
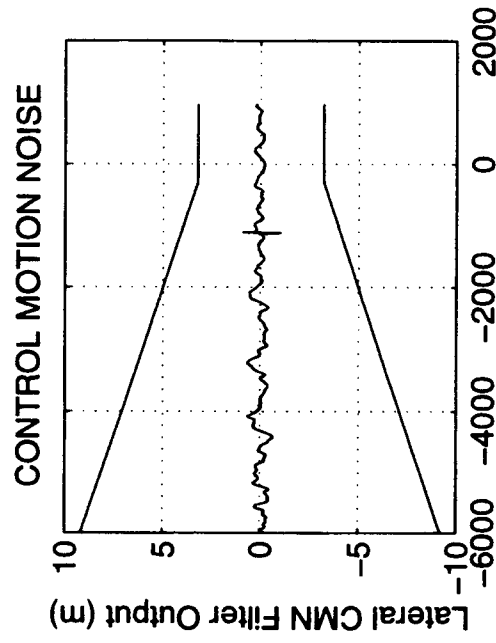
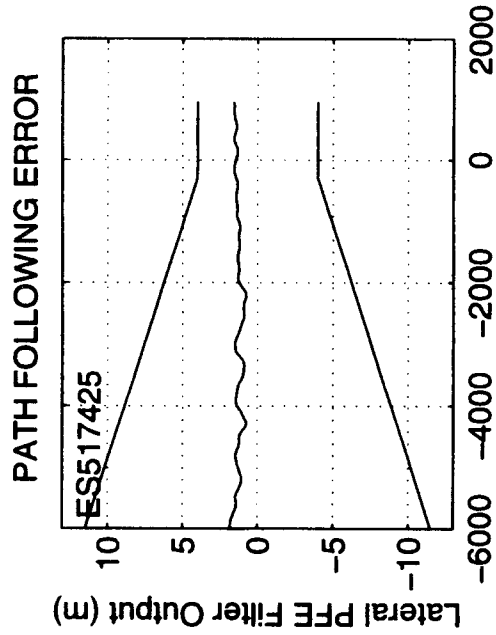
LGRP Xrcs POSITION (m): 470.908  
LGRP Yrcs POSITION (m): -0.962

NRP POSITION vs 95% TUNNEL

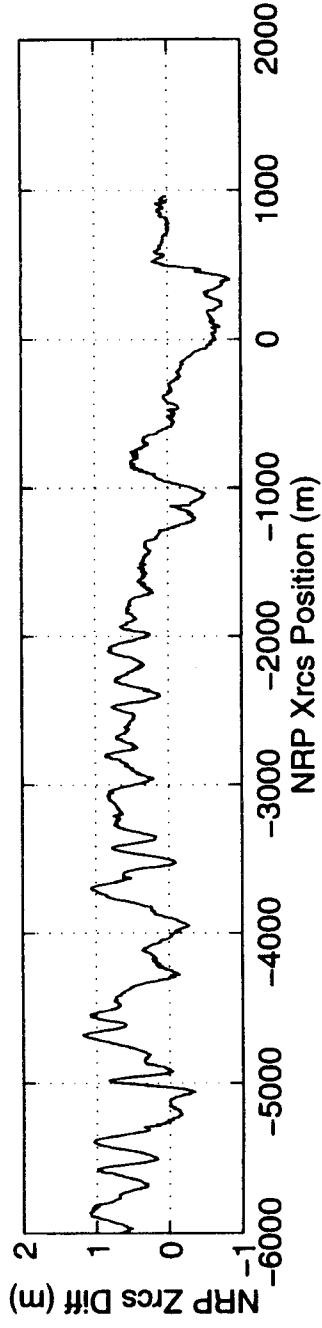
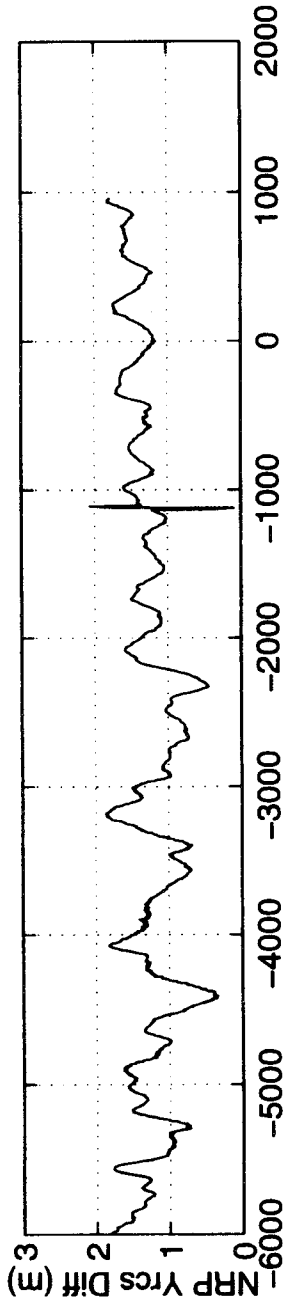
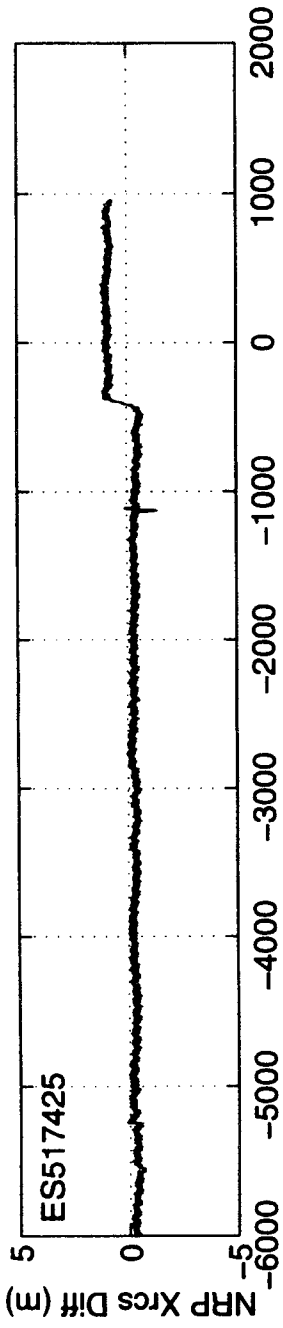


NRP TOTAL SYSTEM POSITION DIFF





NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES





APPROACH #: ES517426  
START TIME: 508529.056  
STOP TIME: 508829.847

MINIMUM HDOP: 0.8  
MAXIMUM HDOP: 0.9  
AVERAGE HDOP: 0.8

MINIMUM VDOP: 1.7  
MAXIMUM VDOP: 2.9  
AVERAGE VDOP: 1.8

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 8  
AVERAGE NUMBER OF SVs: 8

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID STATIC TRIAL \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL STATIC TRIAL \*  
\*\*\*\*\*

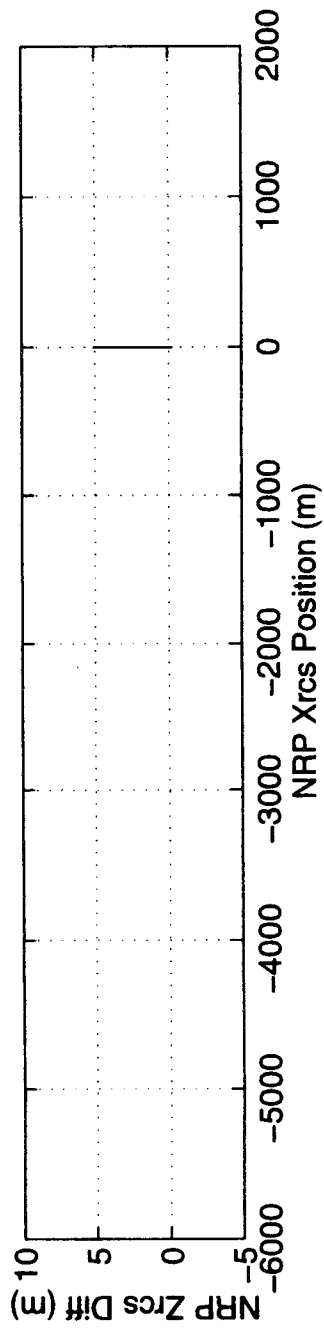
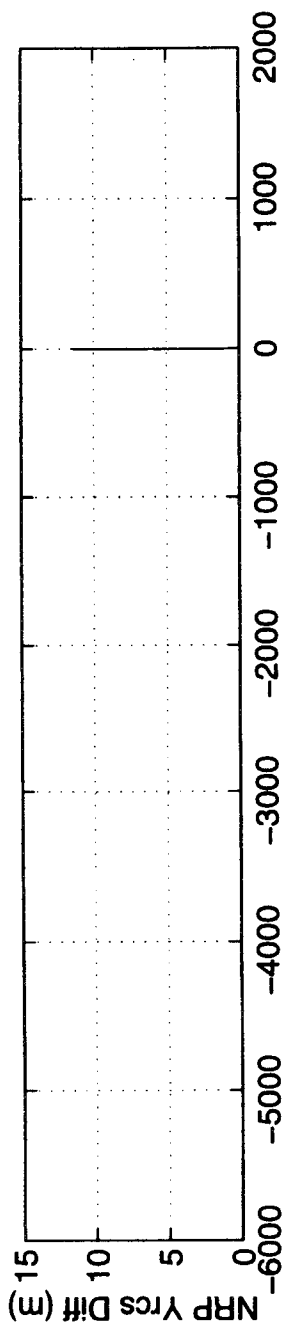
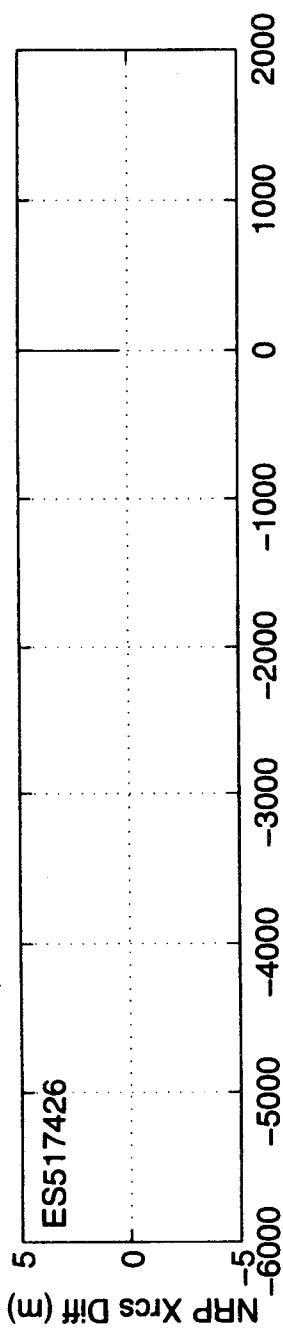
TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

-----  
NRP Xrcs MEAN DIFFERENCE (m): 1.755  
NRP Yrcs MEAN DIFFERENCE (m): 3.473  
NRP Zrcs MEAN DIFFERENCE (m): 1.063

NRP Xrcs 2-SIGMA DIFFERENCE (m): 3.507  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 6.275  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 3.121

NRP Xrcs 2-RMS DIFFERENCE (m): 4.962  
NRP Yrcs 2-RMS DIFFERENCE (m): 9.360  
NRP Zrcs 2-RMS DIFFERENCE (m): 3.776

NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517427  
START TIME: 509244.264  
STOP TIME: 509519.847

MINIMUM HDOP: 0.9  
MAXIMUM HDOP: 0.9  
AVERAGE HDOP: 0.9

MINIMUM VDOP: 3.1  
MAXIMUM VDOP: 3.1  
AVERAGE VDOP: 3.1

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID STATIC TRIAL \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL STATIC TRIAL \*  
\*\*\*\*\*

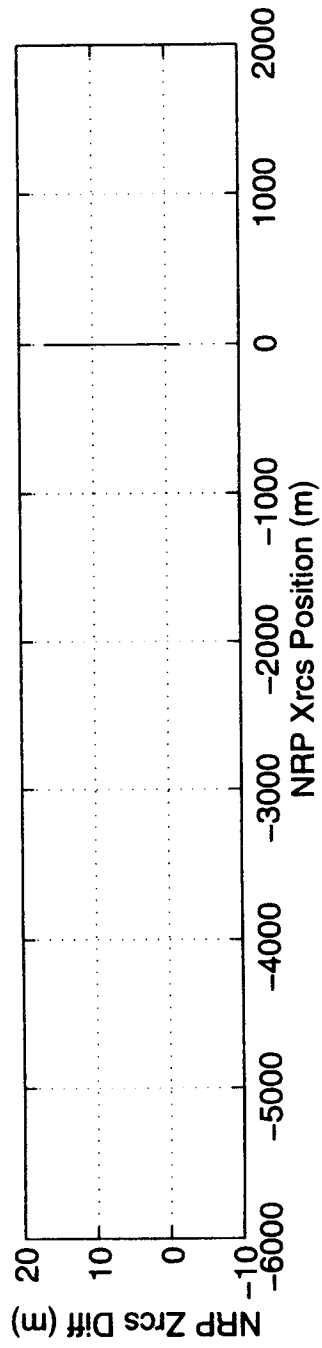
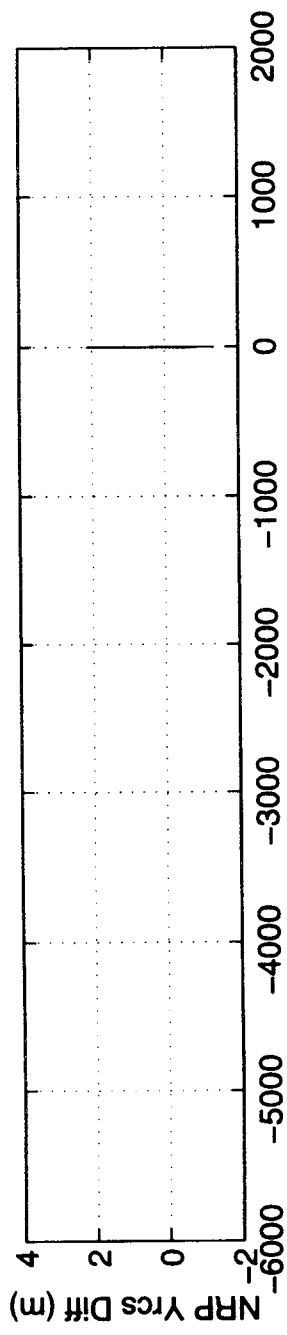
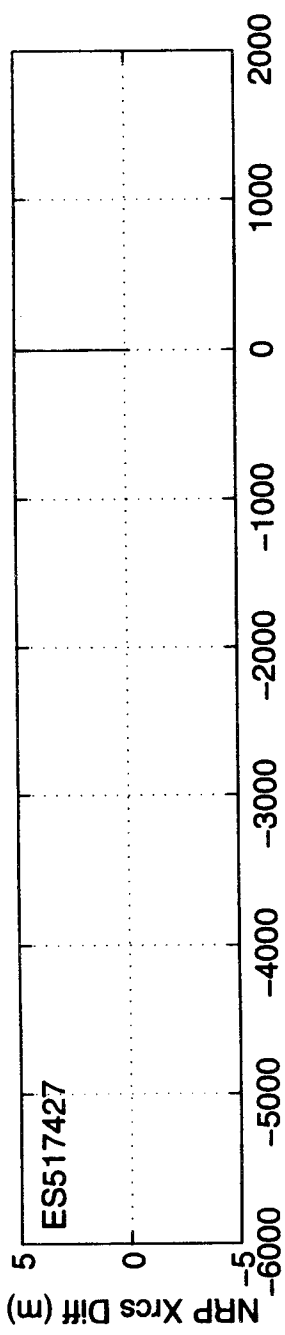
-----  
TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT  
-----

NRP Xrcs MEAN DIFFERENCE (m): 0.921  
NRP Yrcs MEAN DIFFERENCE (m): 0.582  
NRP Zrcs MEAN DIFFERENCE (m): 3.877

NRP Xrcs 2-SIGMA DIFFERENCE (m): 1.820  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 1.989  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 11.282

NRP Xrcs 2-RMS DIFFERENCE (m): 2.590  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.304  
NRP Zrcs 2-RMS DIFFERENCE (m): 13.689

NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517428  
START TIME: 510531.198  
STOP TIME: 510580.972

MINIMUM HDOP: 0.9  
MAXIMUM HDOP: 0.9  
AVERAGE HDOP: 0.9

MINIMUM VDOP: 2.7  
MAXIMUM VDOP: 2.7  
AVERAGE VDOP: 2.7

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID STATIC TRIAL \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL STATIC TRIAL \*  
\*\*\*\*\*

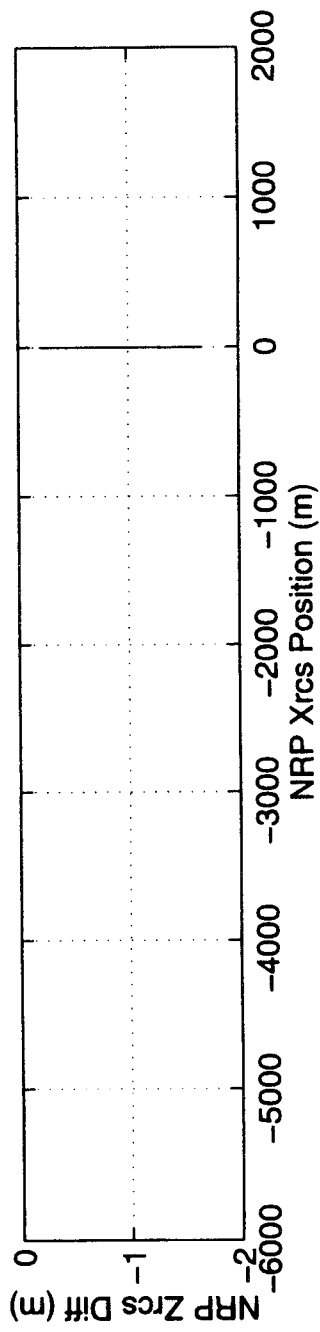
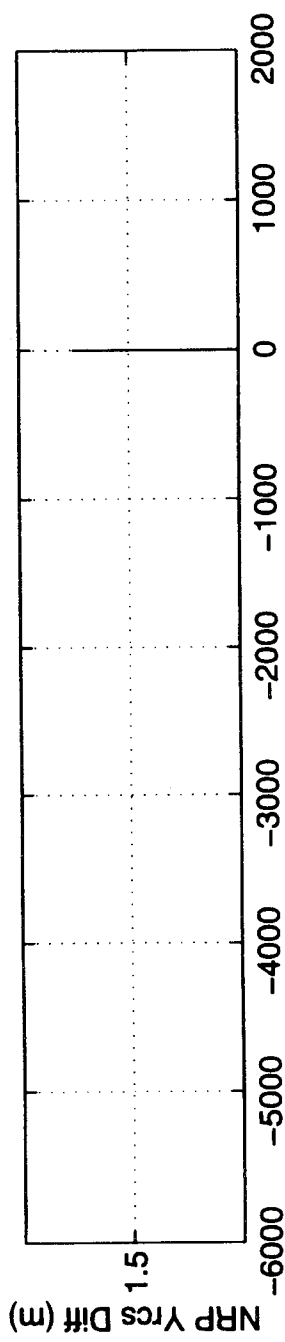
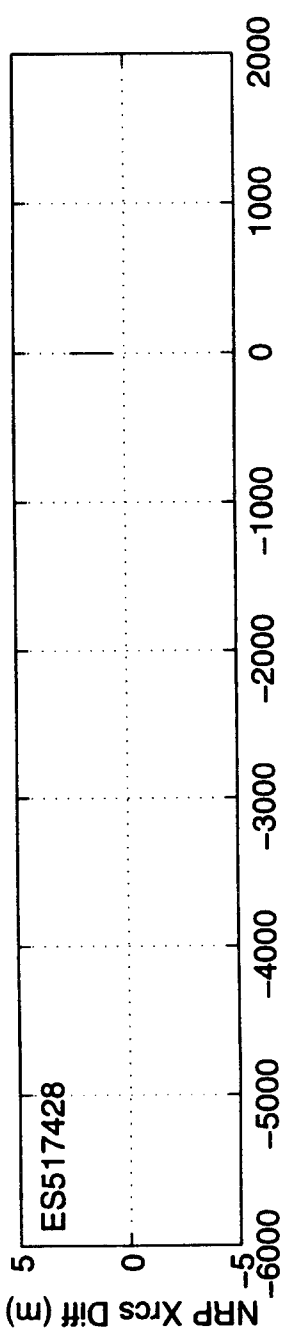
TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

-----  
NRP Xrcs MEAN DIFFERENCE (m): 1.480  
NRP Yrcs MEAN DIFFERENCE (m): 1.403  
NRP Zrcs MEAN DIFFERENCE (m): -0.937

NRP Xrcs 2-SIGMA DIFFERENCE (m): 1.102  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 0.177  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 0.866

NRP Xrcs 2-RMS DIFFERENCE (m): 3.158  
NRP Yrcs 2-RMS DIFFERENCE (m): 2.812  
NRP Zrcs 2-RMS DIFFERENCE (m): 2.064

NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



APPROACH #: ES517429  
START TIME: 510946.121  
STOP TIME: 511004.937

MINIMUM HDOP: 0.9  
MAXIMUM HDOP: 0.9  
AVERAGE HDOP: 0.9

MINIMUM VDOP: 2.5  
MAXIMUM VDOP: 2.6  
AVERAGE VDOP: 2.6

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID STATIC TRIAL \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL STATIC TRIAL \*  
\*\*\*\*\*

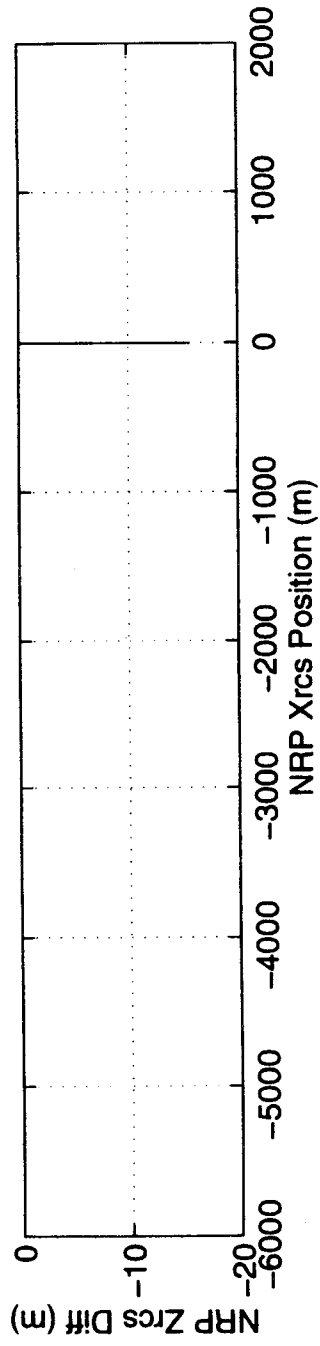
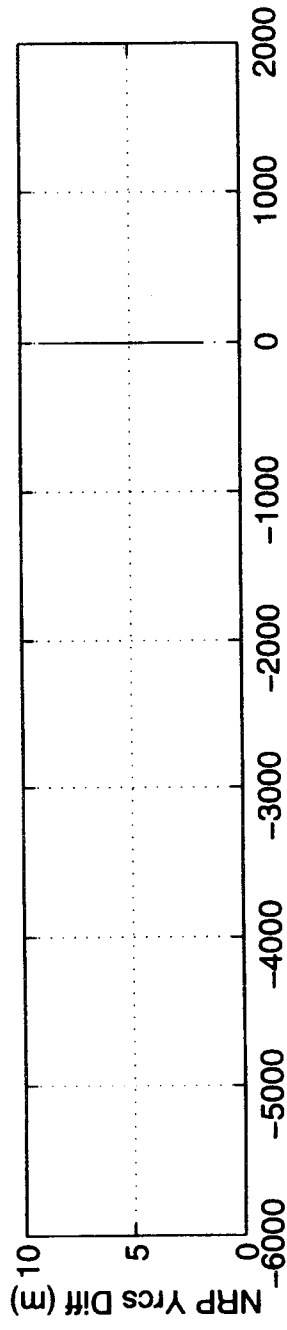
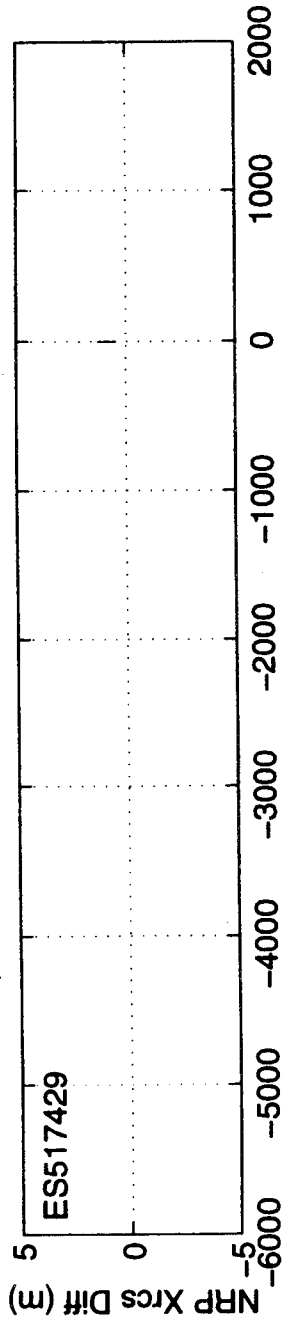
TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

-----  
NRP Xrcs MEAN DIFFERENCE (m): 0.900  
NRP Yrcs MEAN DIFFERENCE (m): 5.396  
NRP Zrcs MEAN DIFFERENCE (m): -7.968

NRP Xrcs 2-SIGMA DIFFERENCE (m): 0.406  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 4.389  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 8.867

NRP Xrcs 2-RMS DIFFERENCE (m): 1.845  
NRP Yrcs 2-RMS DIFFERENCE (m): 11.650  
NRP Zrcs 2-RMS DIFFERENCE (m): 18.236

NRP LONGITUDINAL, LATERAL AND VERTICAL POSITION DIFFERENCES





APPROACH #: ES517430  
START TIME: 511432.187  
STOP TIME: 511499.888

MINIMUM HDOP: 0.8  
MAXIMUM HDOP: 0.8  
AVERAGE HDOP: 0.8

MINIMUM VDOP: 2.2  
MAXIMUM VDOP: 2.3  
AVERAGE VDOP: 2.3

MINIMUM NUMBER OF SVs: 7  
MAXIMUM NUMBER OF SVs: 7  
AVERAGE NUMBER OF SVs: 7

\*\*\*\*\*  
\* METHOD OF EVALUATION: NAV SENSOR ACCURACY \*  
\*\*\*\*\*

\*\*\*\*\*  
\* VALID STATIC TRIAL \*  
\*\*\*\*\*

\*\*\*\*\*  
\* SUCCESSFUL STATIC TRIAL \*  
\*\*\*\*\*

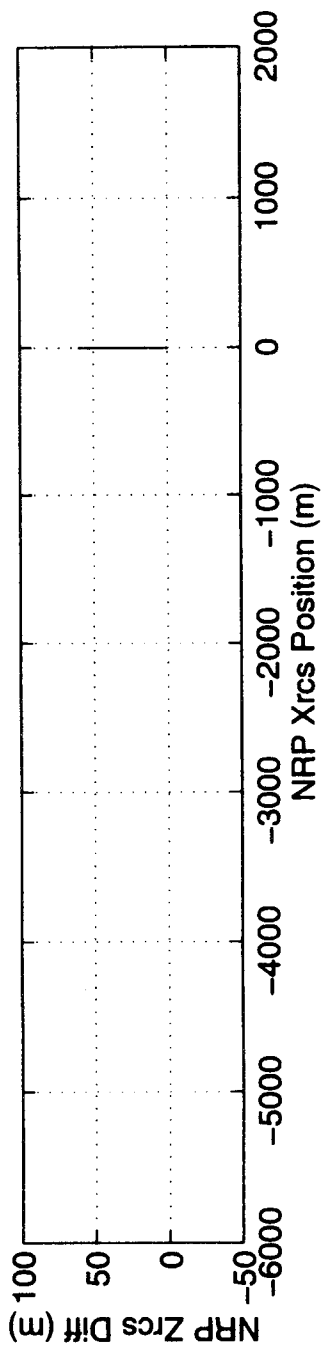
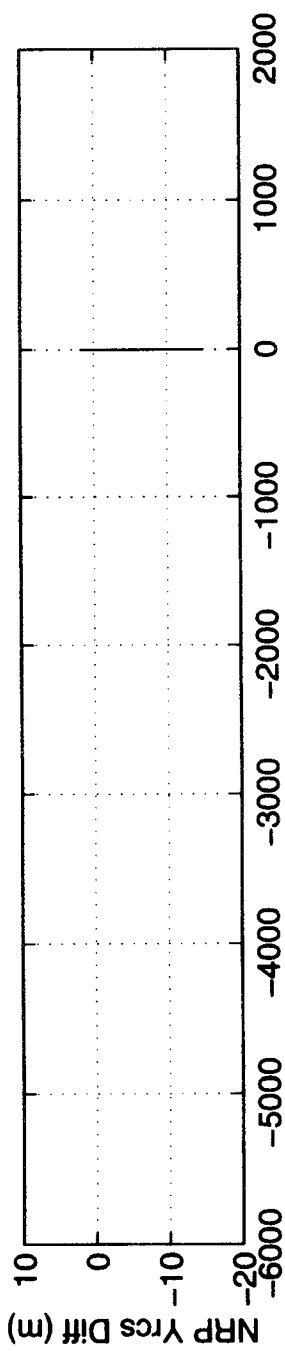
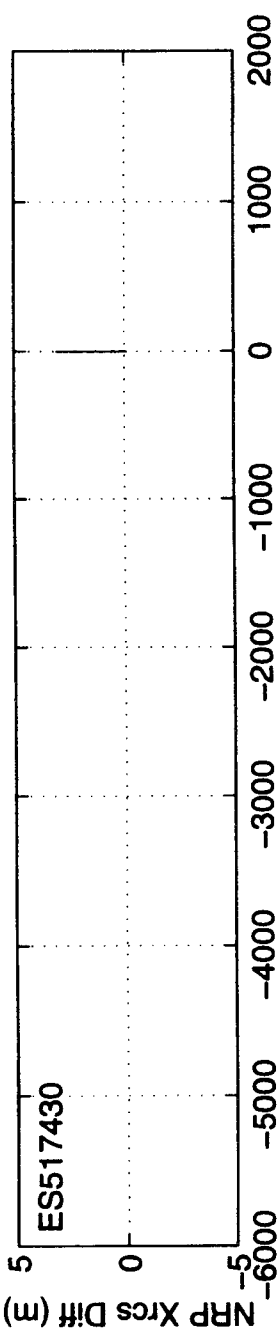
TIME HISTORY ANALYSIS FROM 200 ft HAT -> ROLL-OUT

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NRP Yrcs MEAN DIFFERENCE (m): -6.250  
NRP Zrcs MEAN DIFFERENCE (m): 28.820

NRP Xrcs 2-SIGMA DIFFERENCE (m): 1.516  
NRP Yrcs 2-SIGMA DIFFERENCE (m): 9.811  
NRP Zrcs 2-SIGMA DIFFERENCE (m): 36.144

NRP Xrcs 2-RMS DIFFERENCE (m): 3.871  
NRP Yrcs 2-RMS DIFFERENCE (m): 15.890  
NRP Zrcs 2-RMS DIFFERENCE (m): 68.035

NRP LONGITUDINAL, LATERAL AND VERTICAL UNFILTERED POSITION DIFFERENCES



## **APPENDIX C**

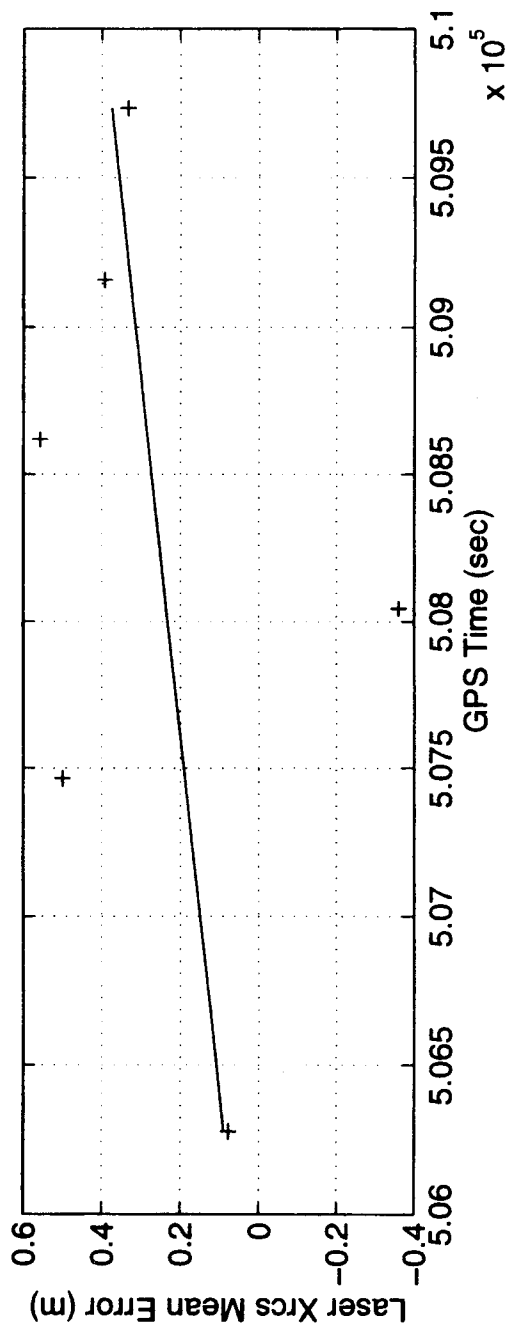
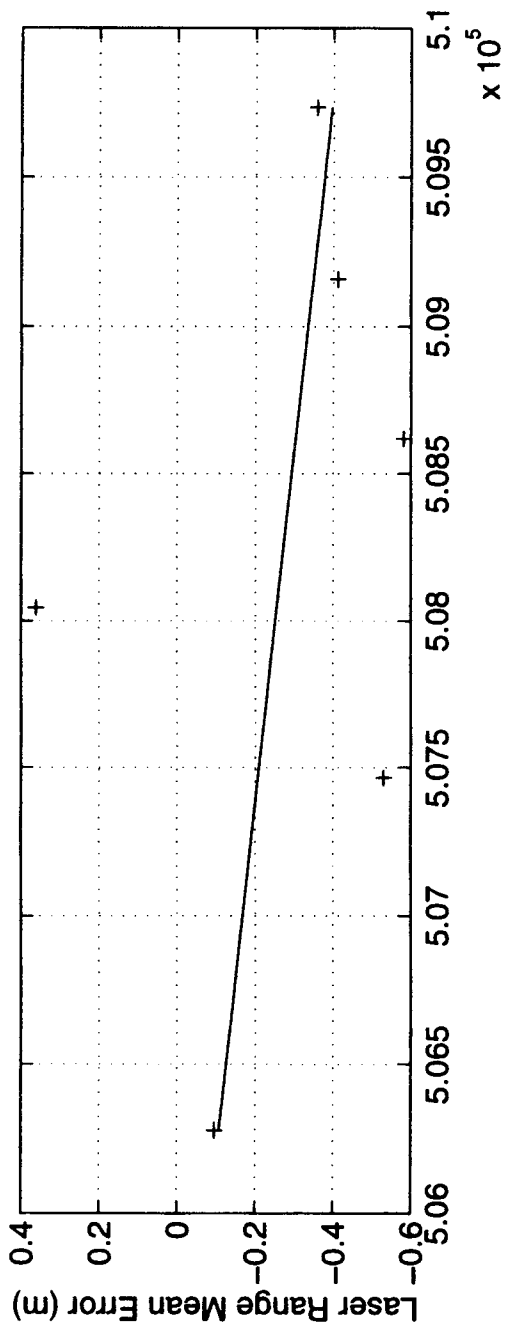
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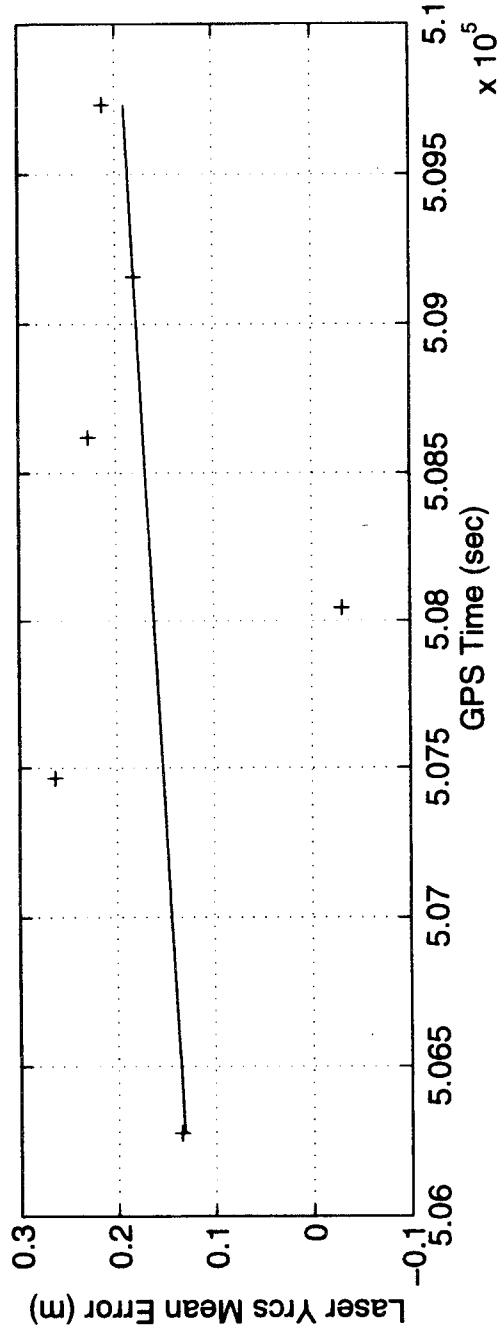
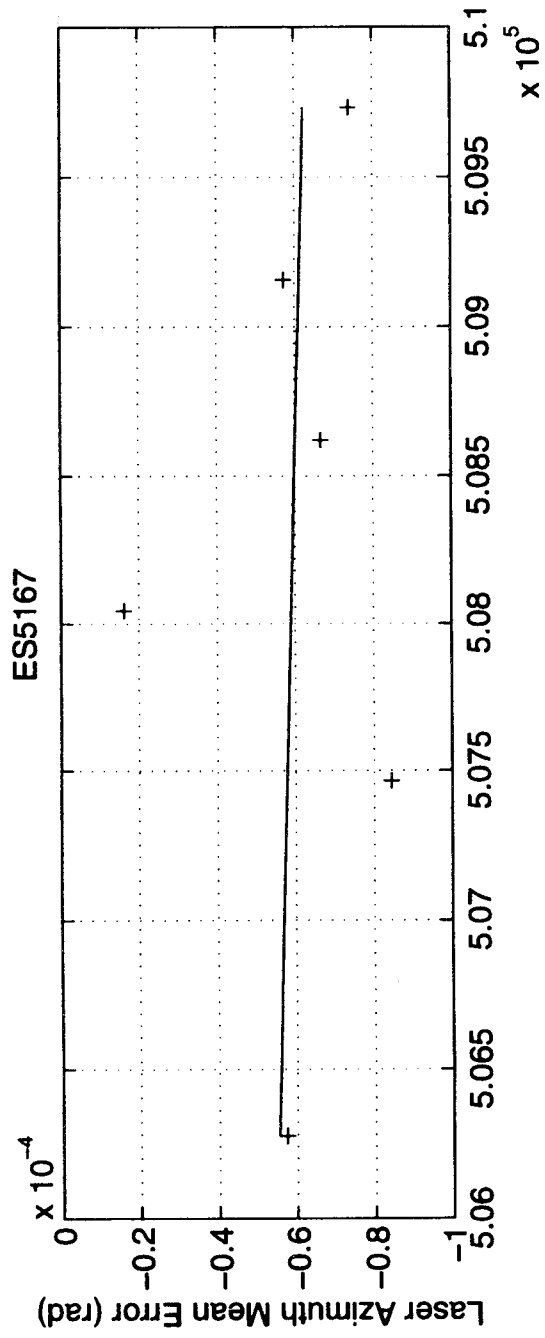
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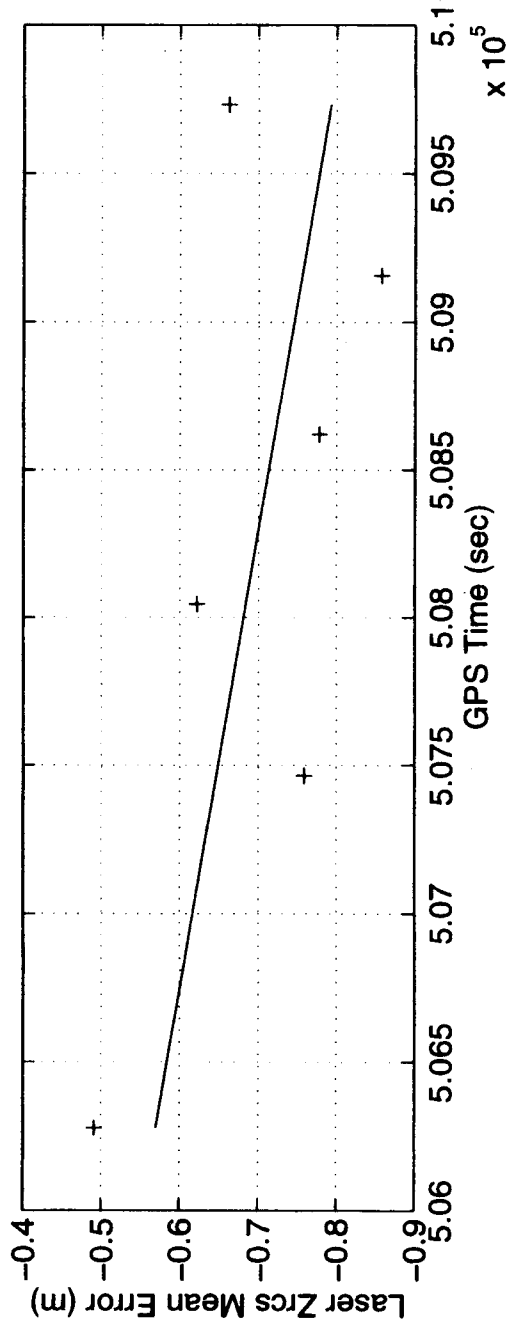
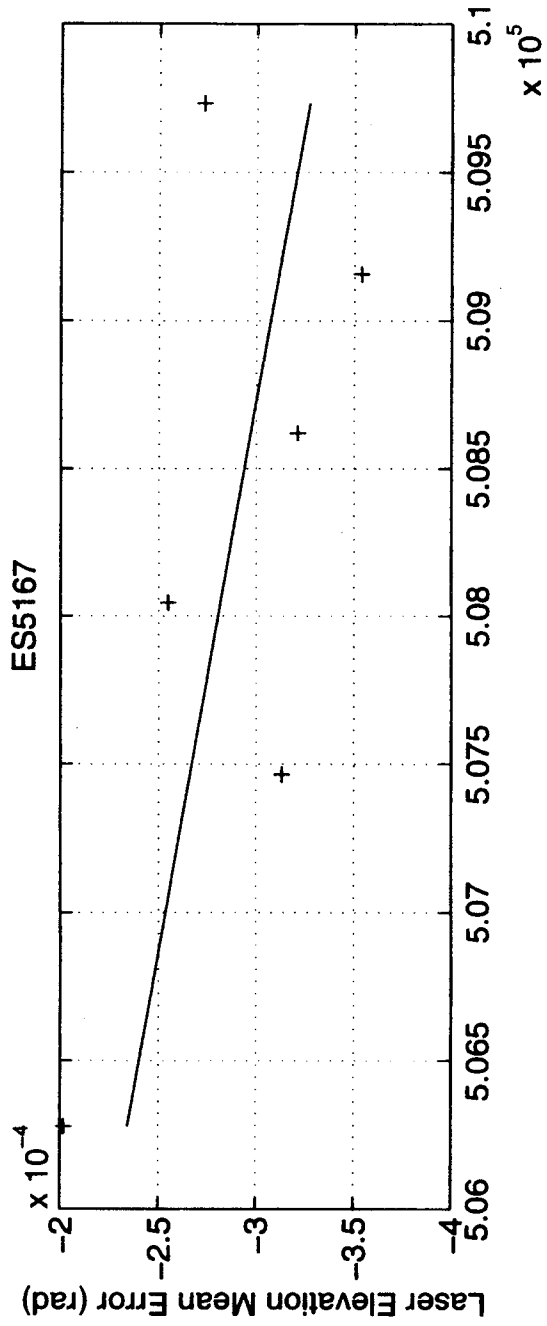
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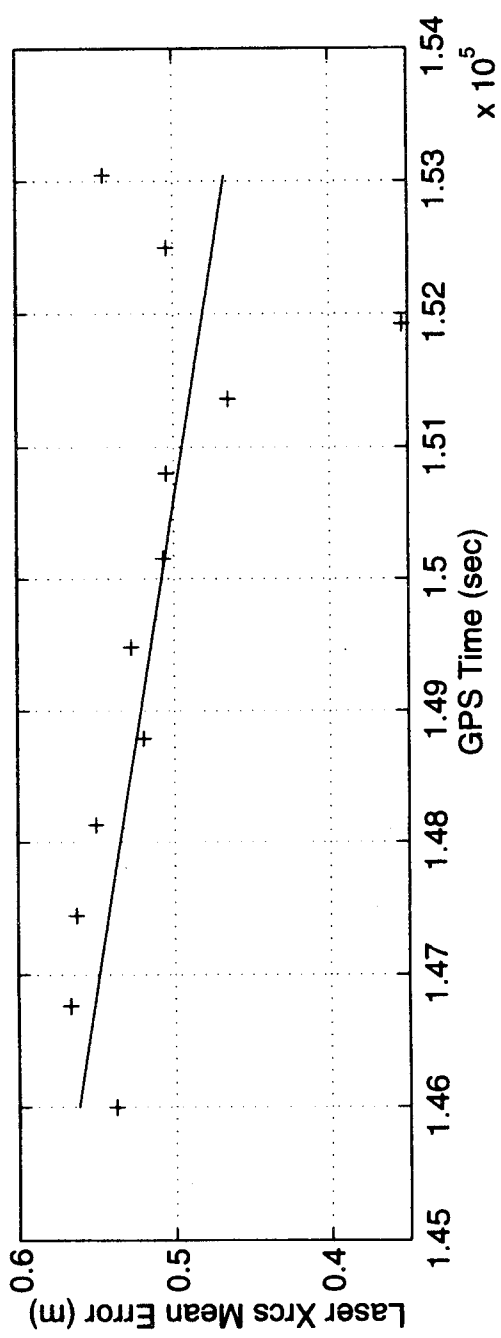
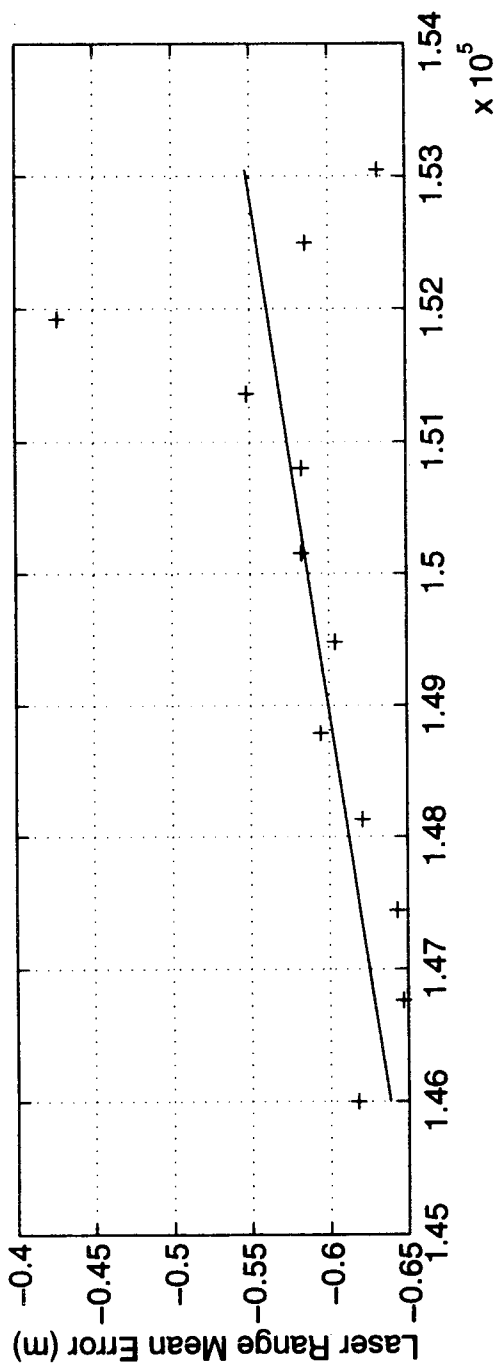
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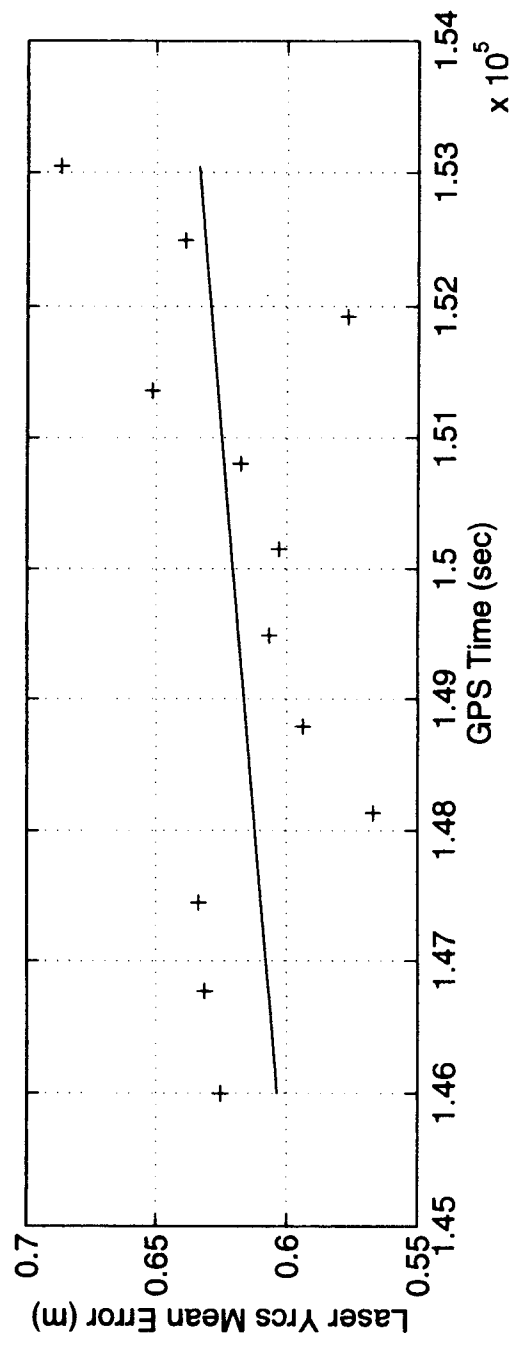
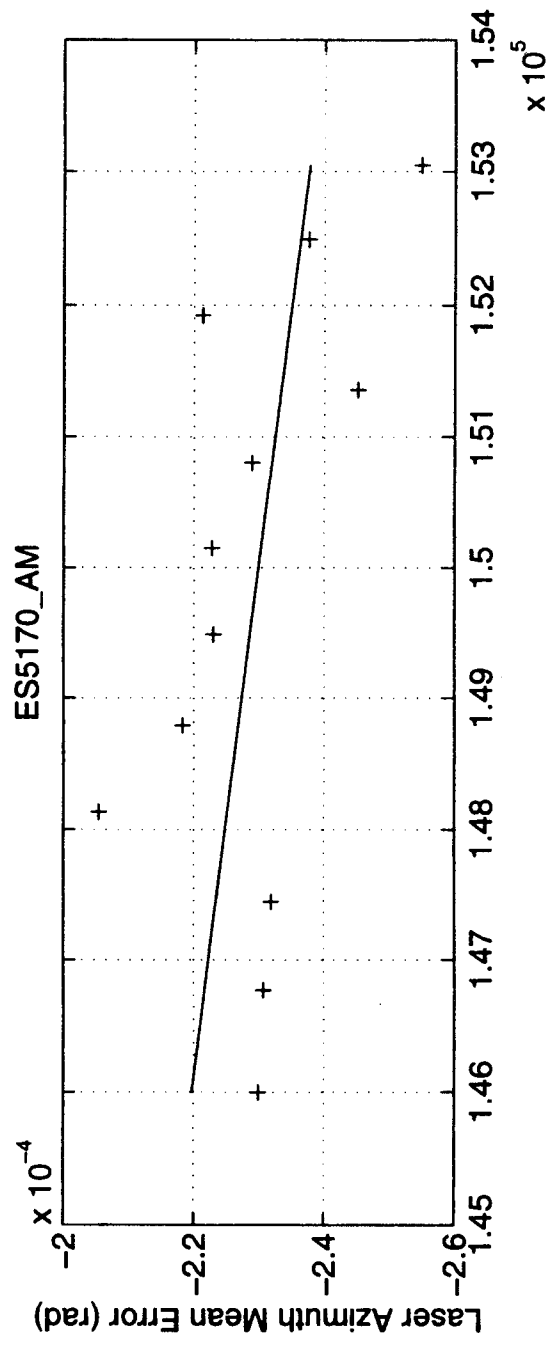


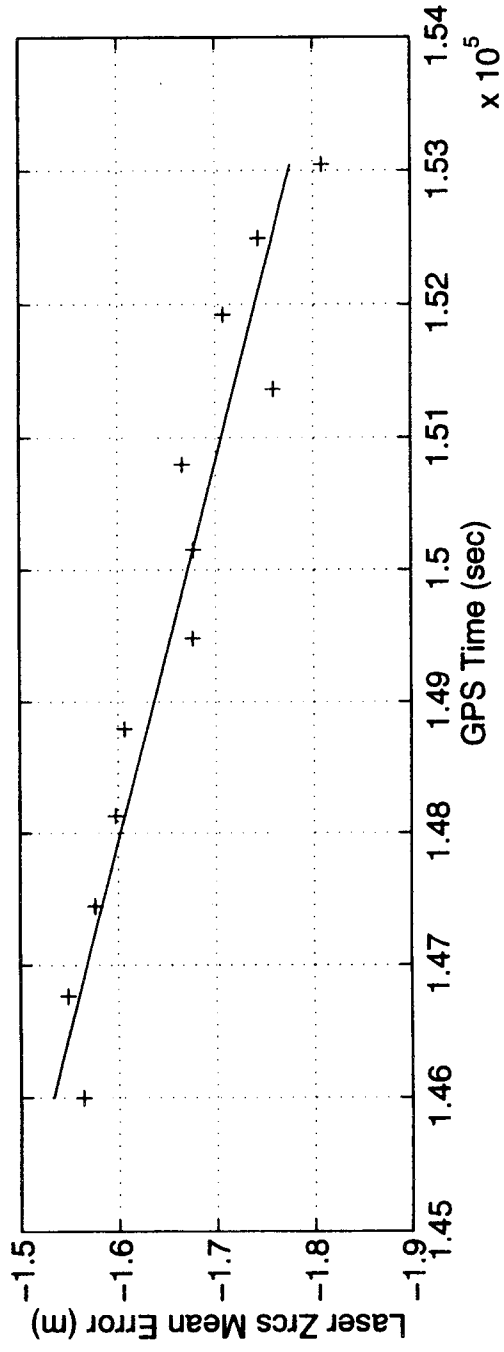
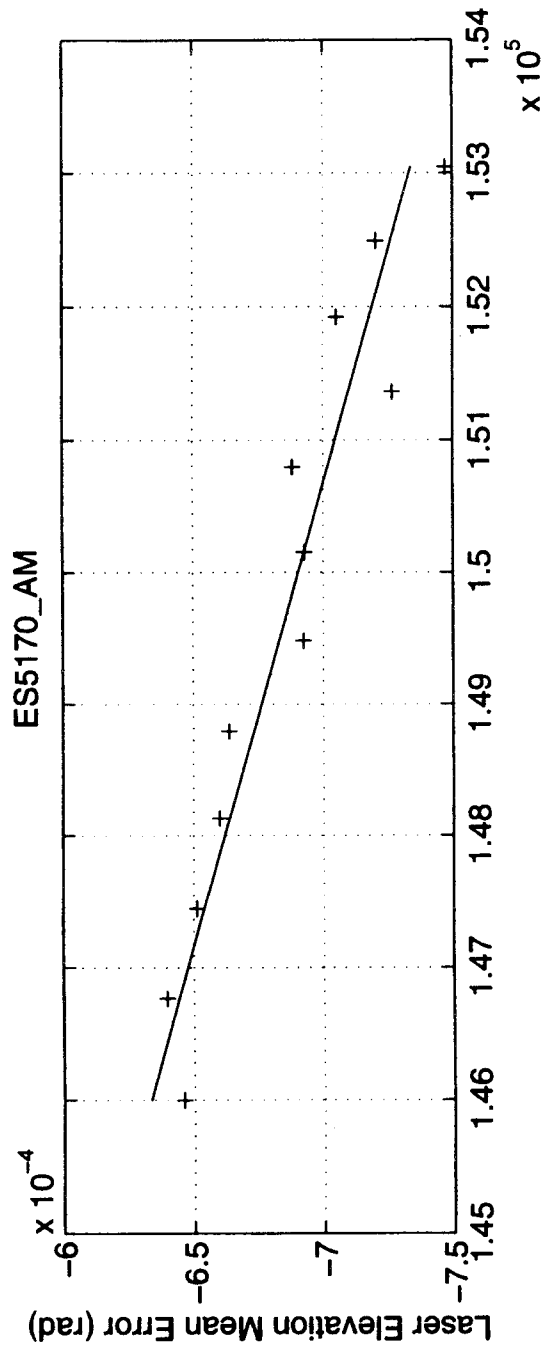


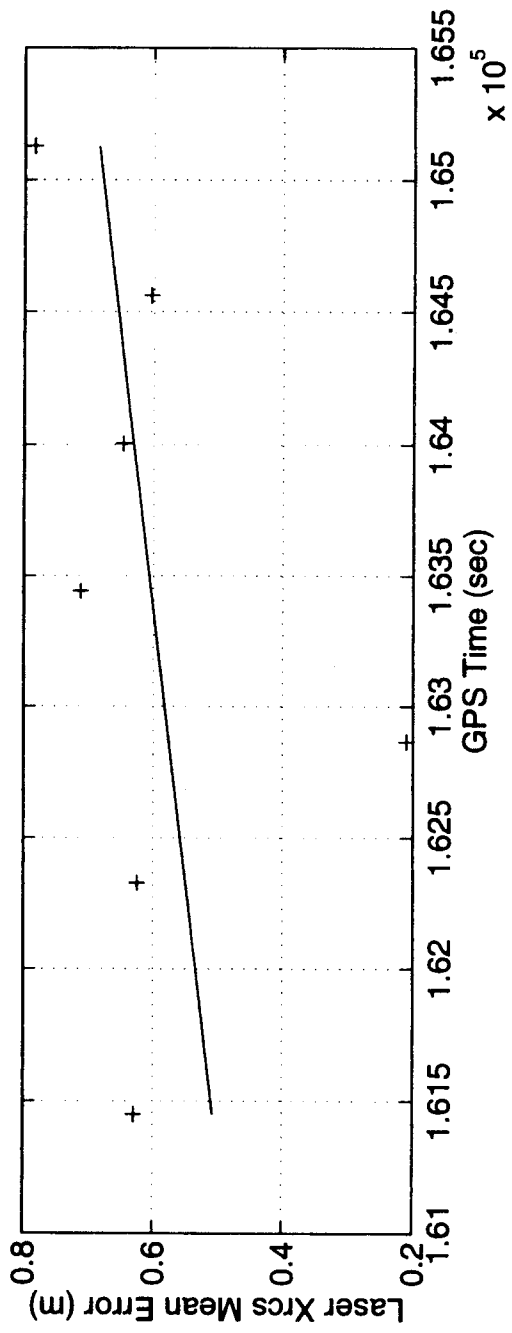
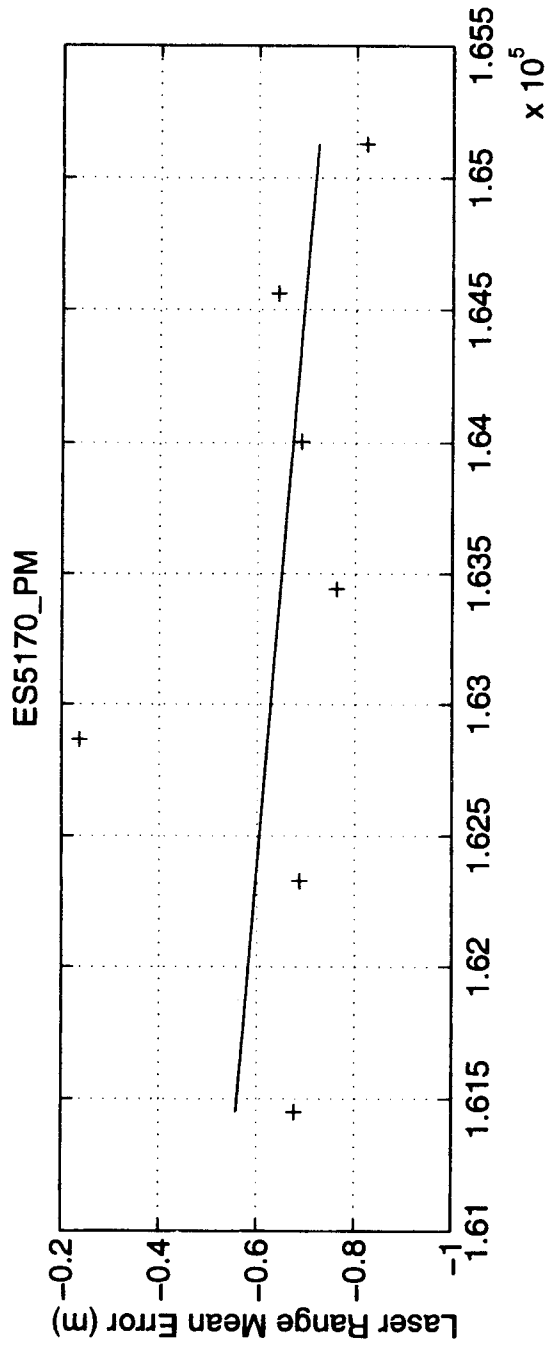
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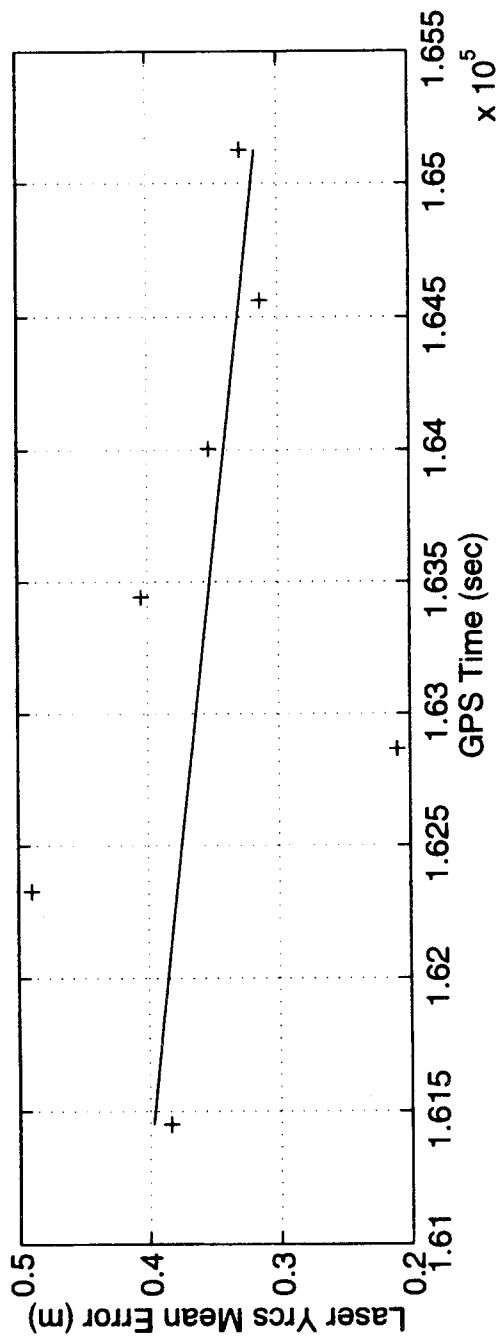
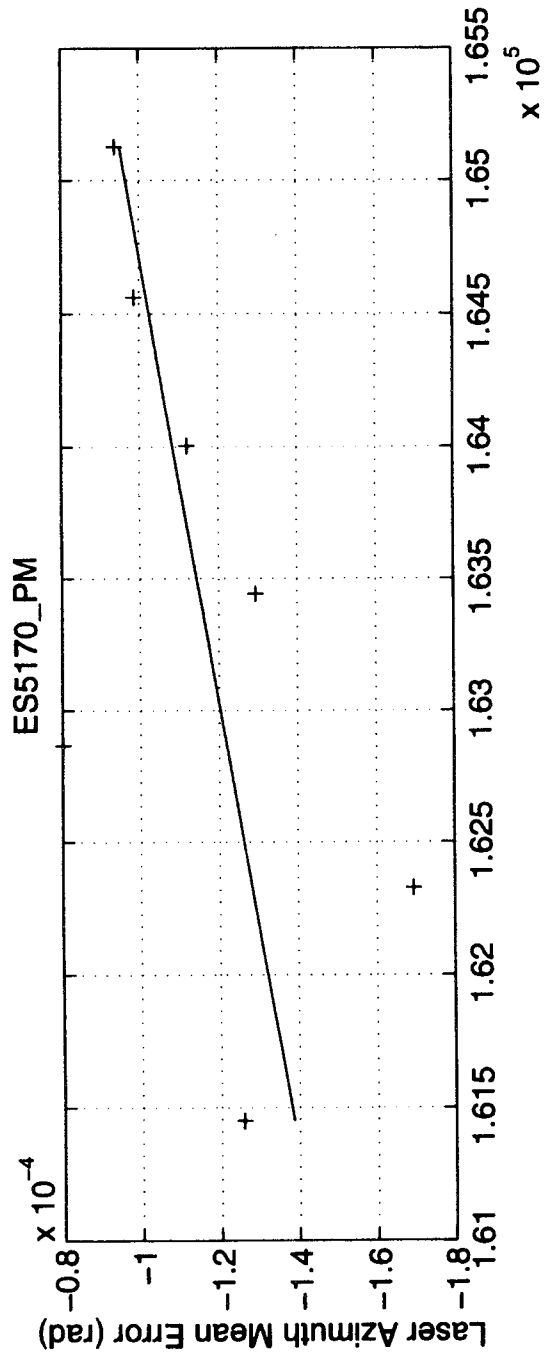


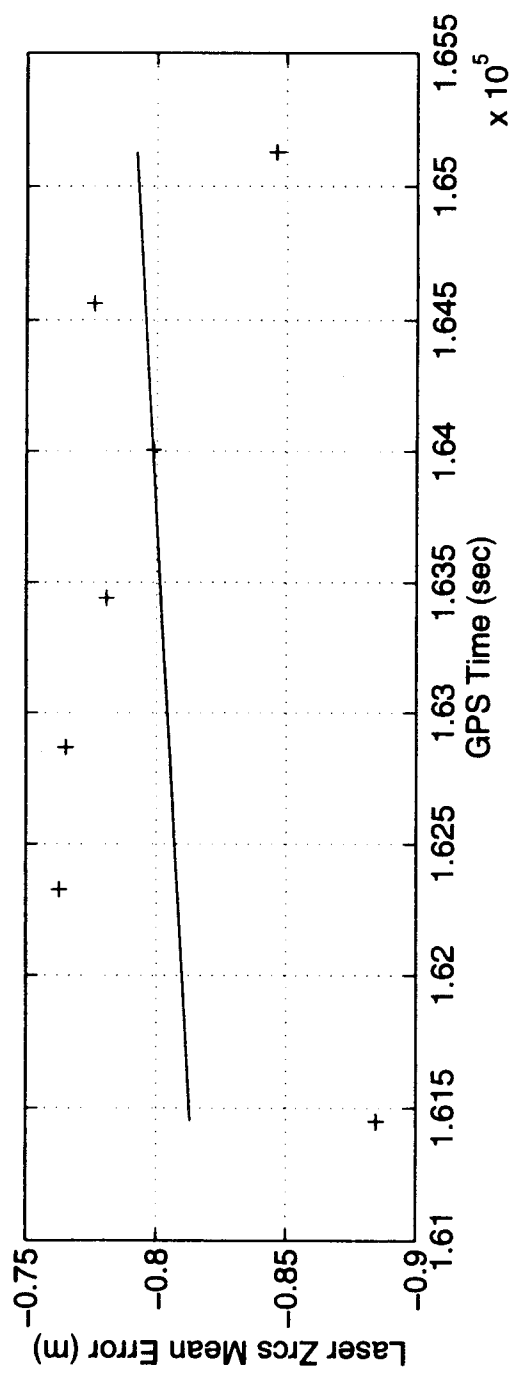
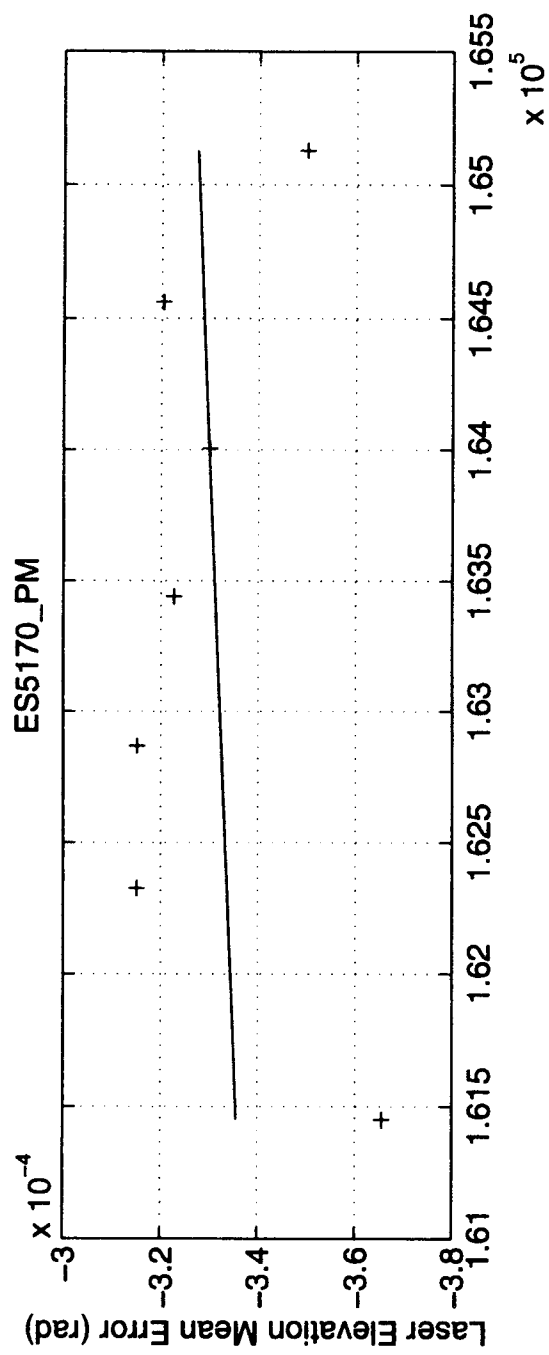




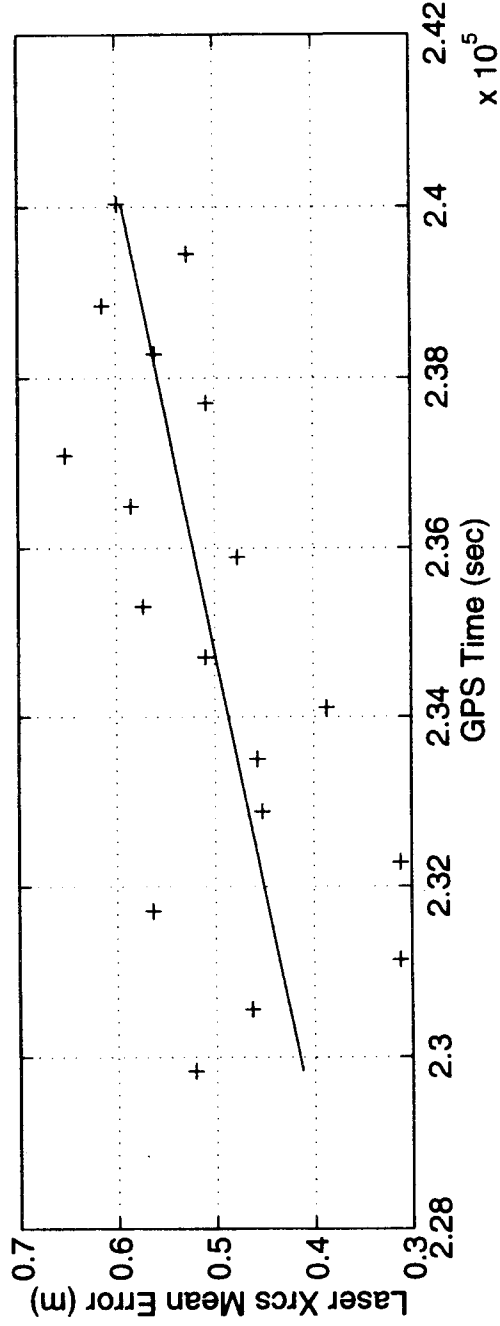
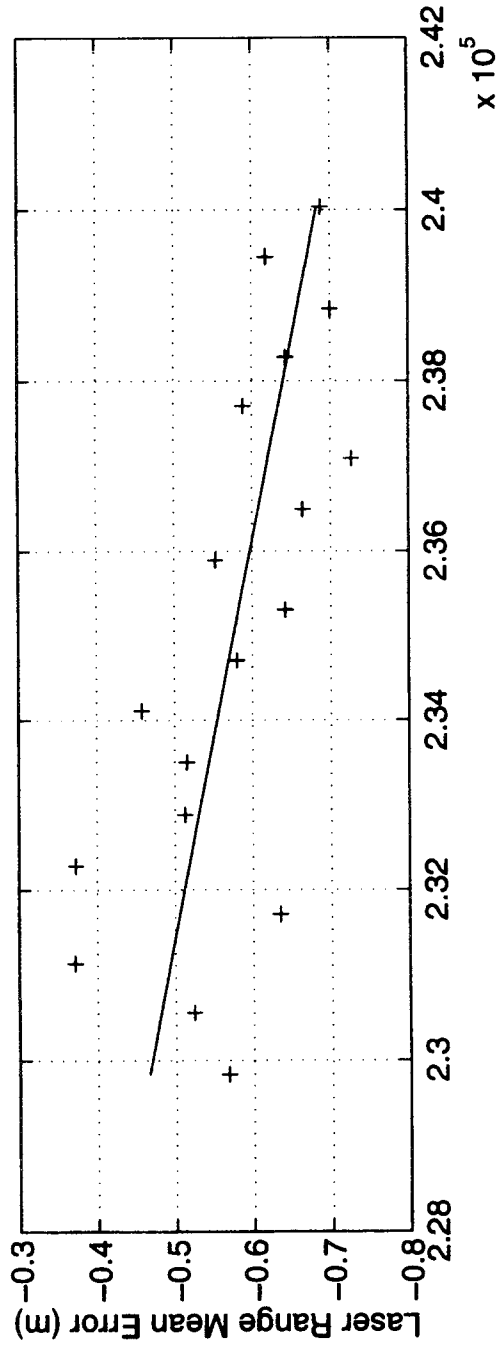


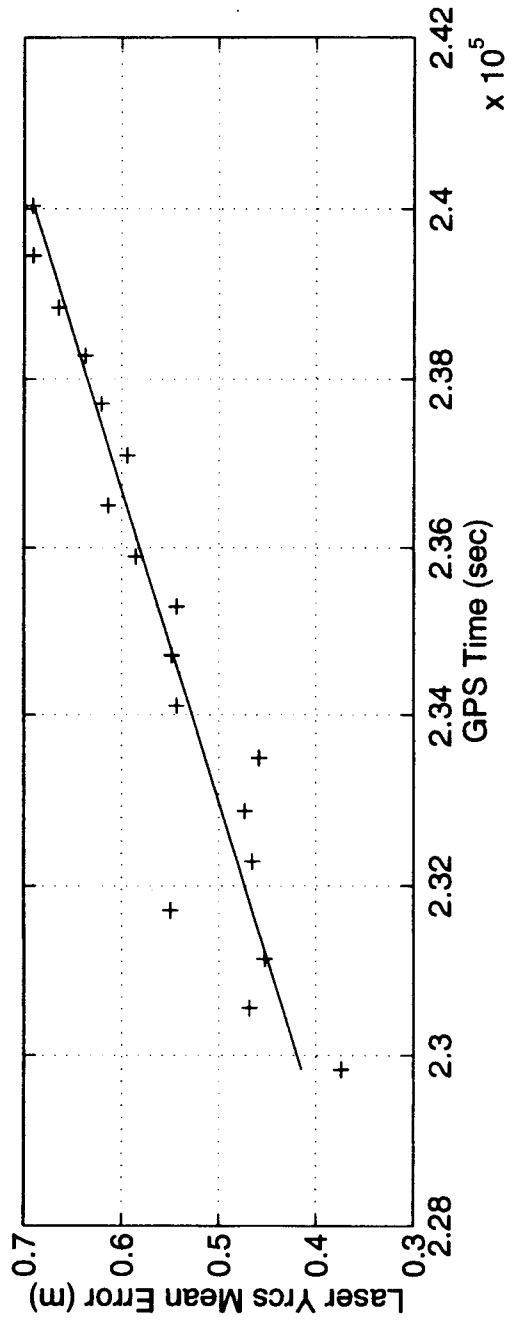
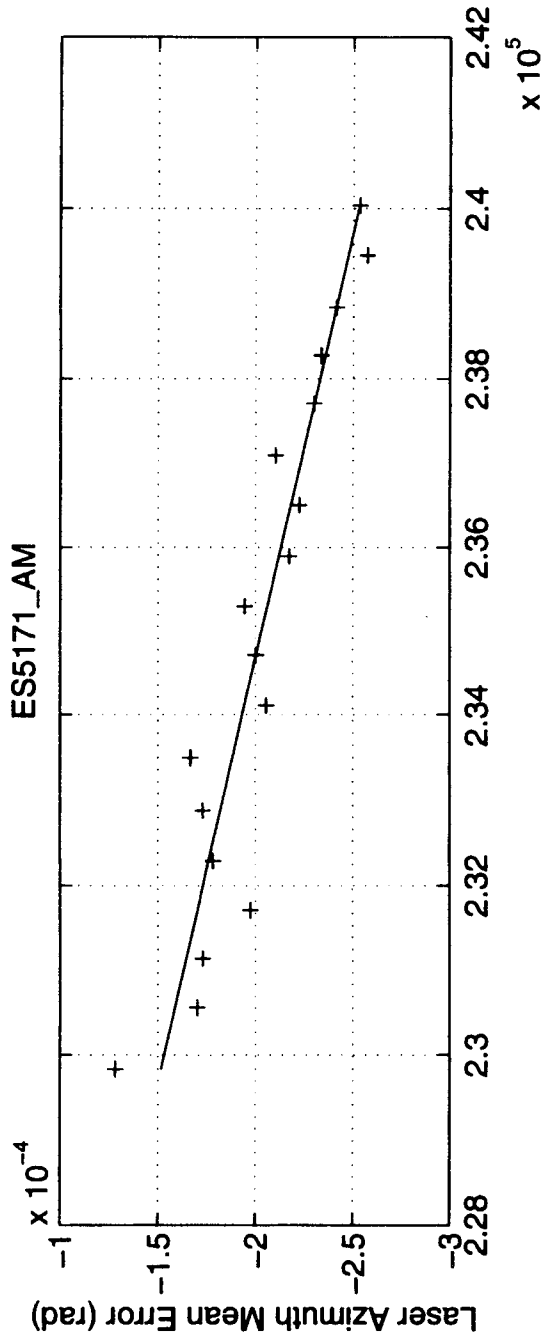


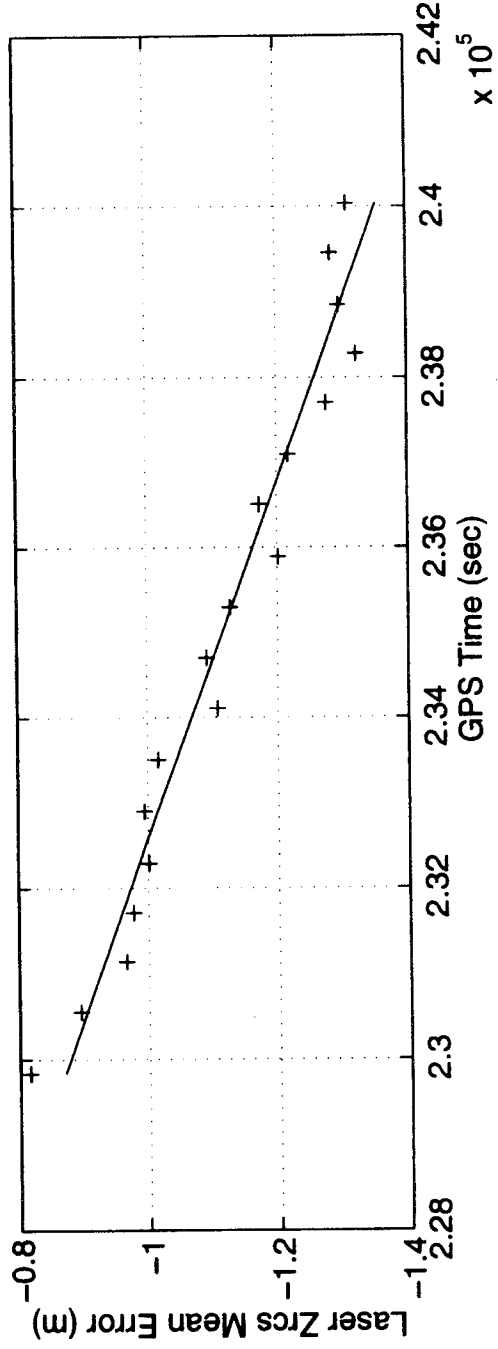
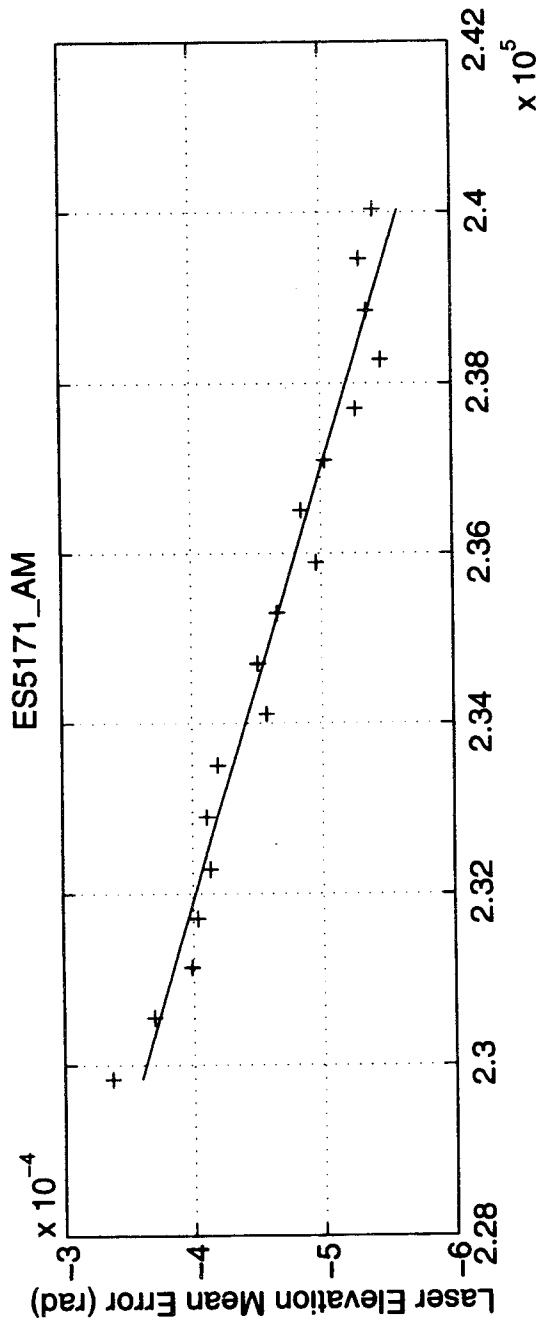




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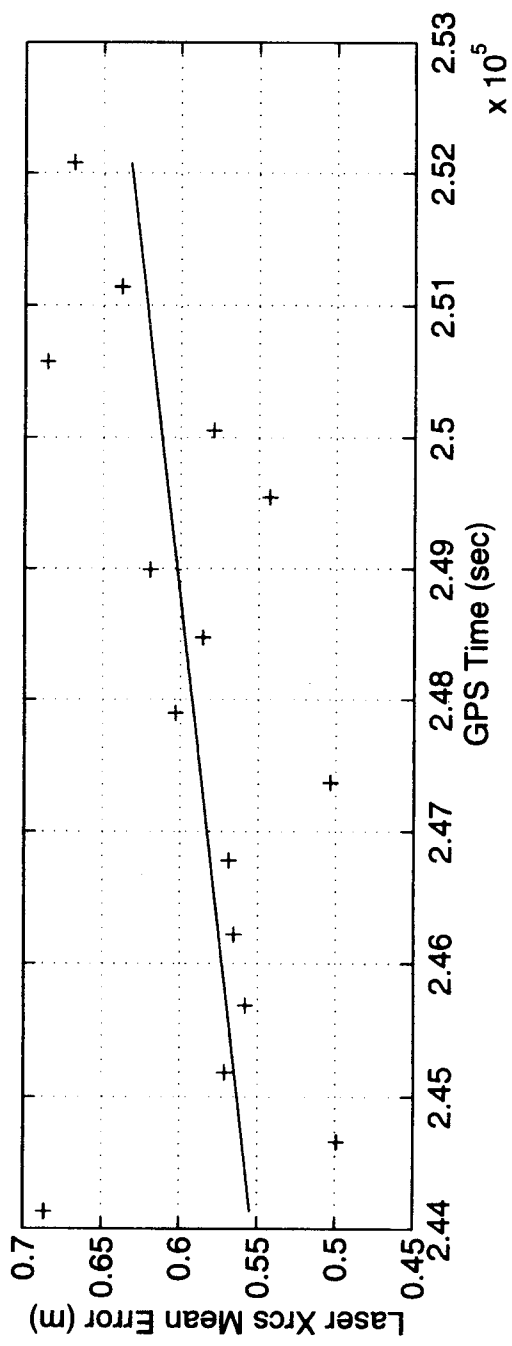
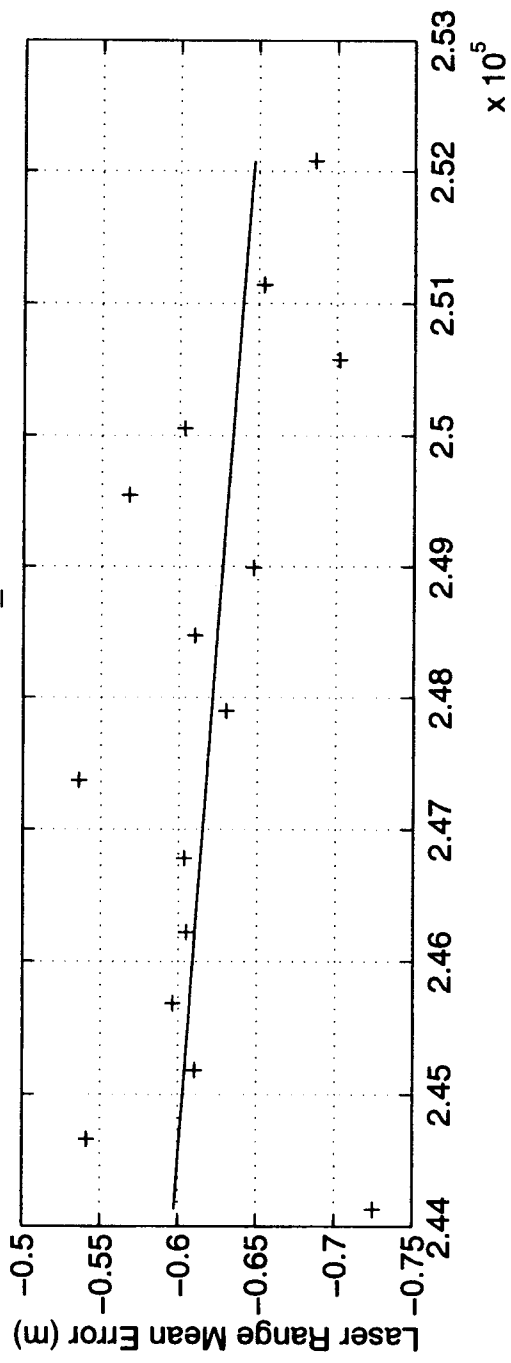




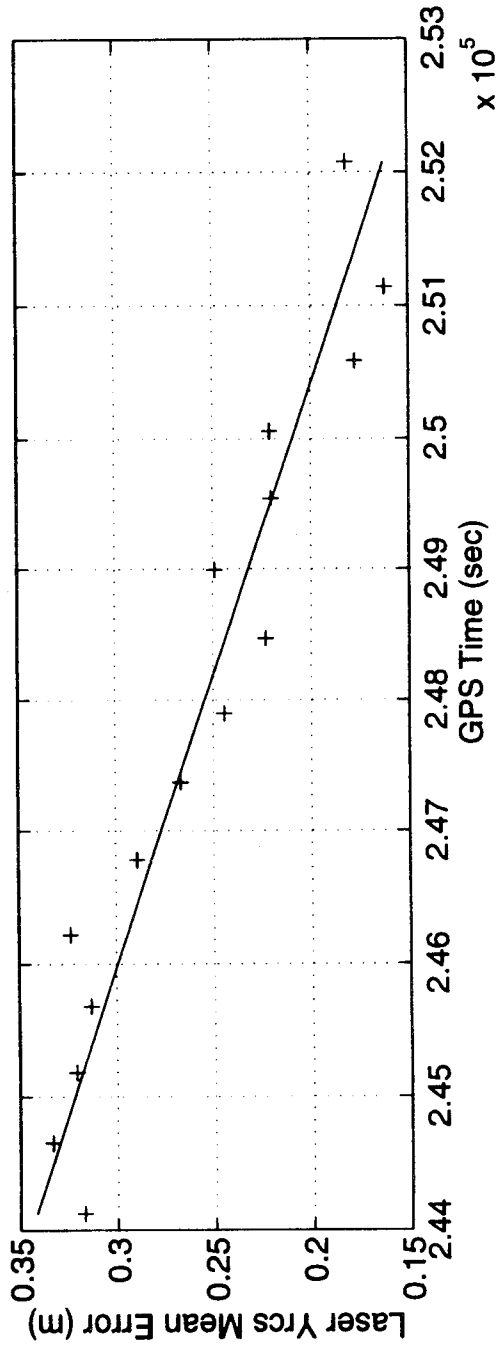
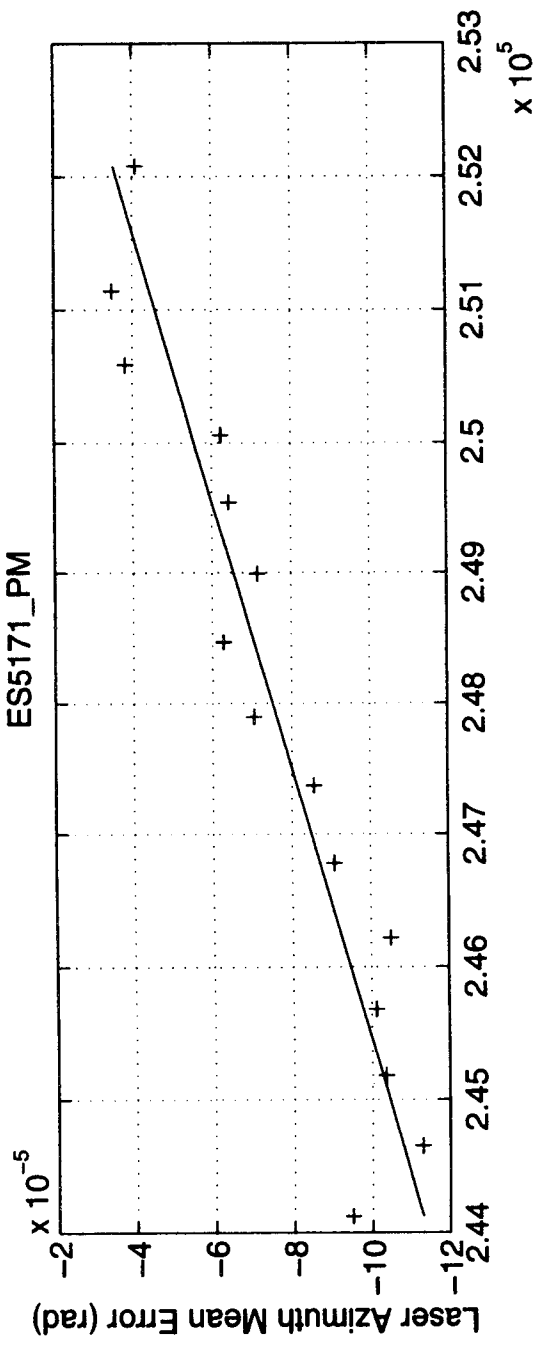


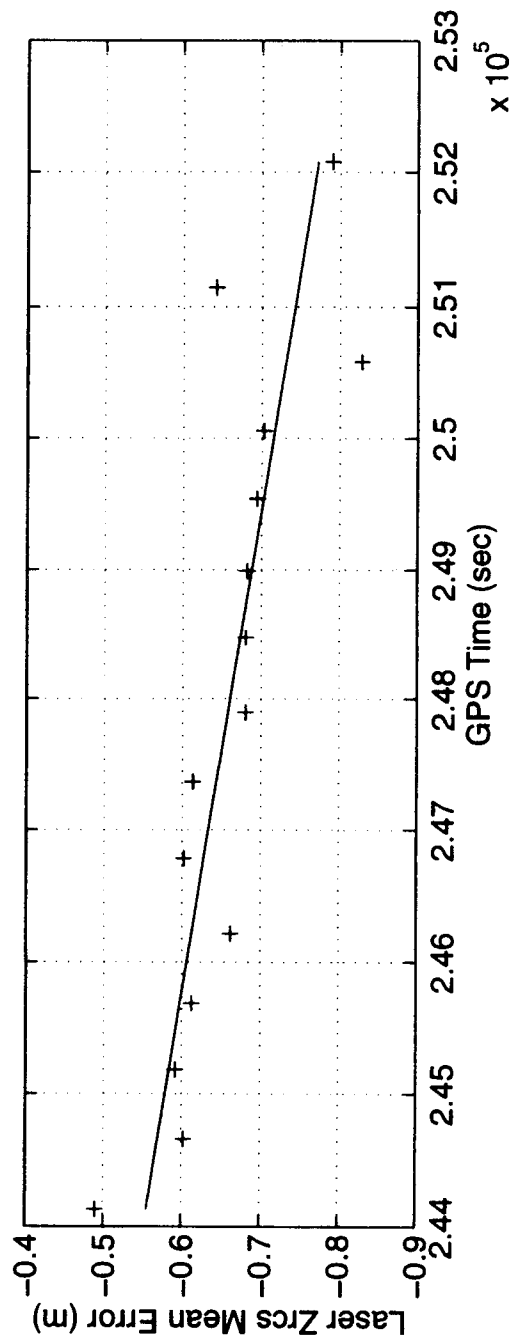
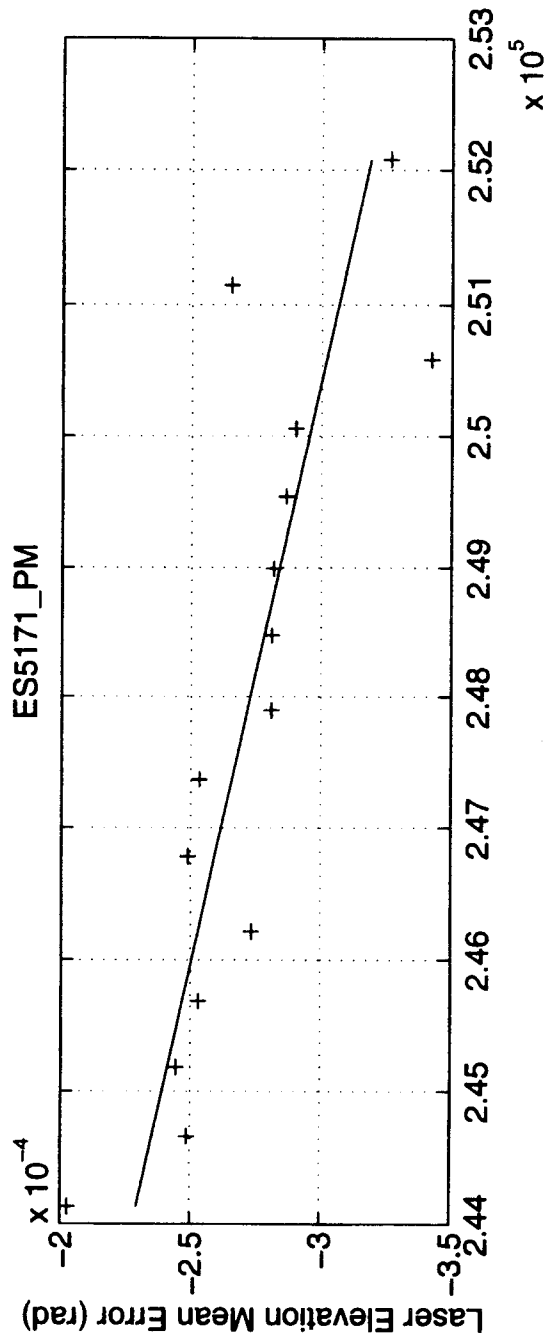


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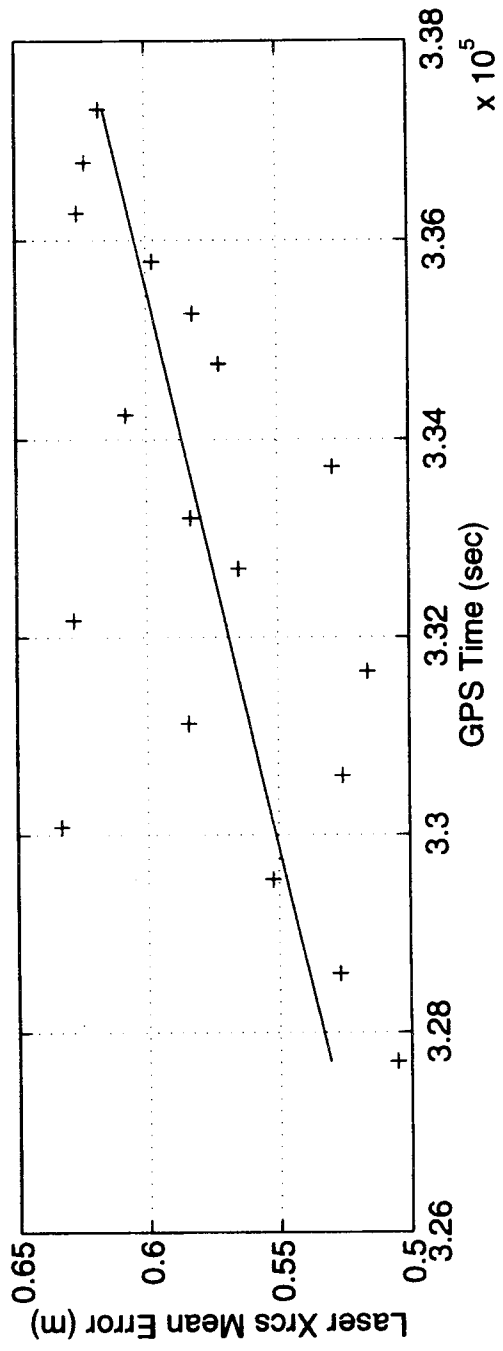
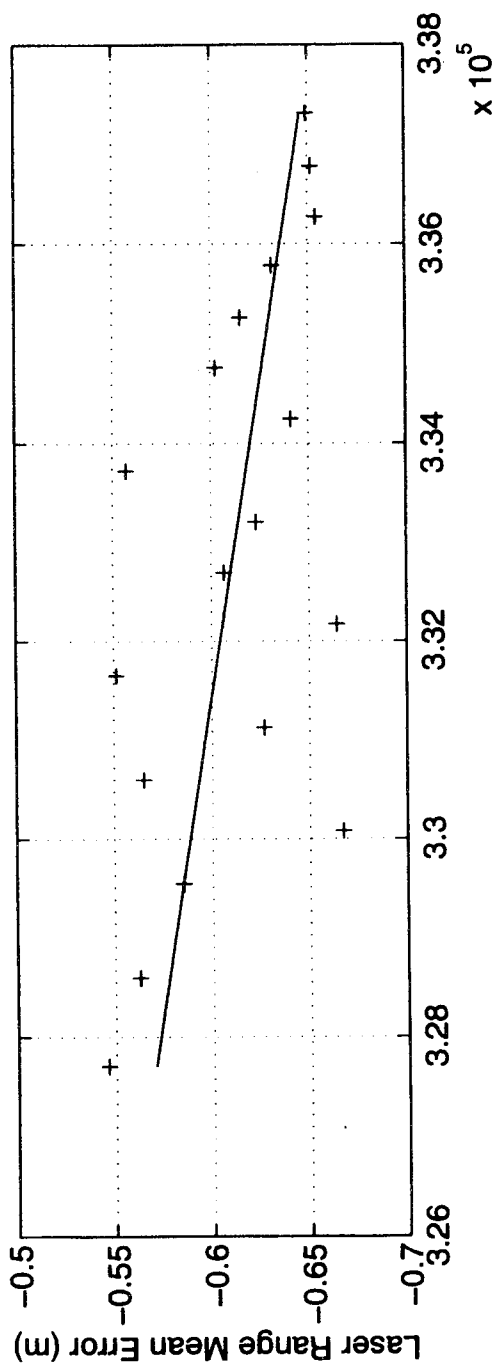


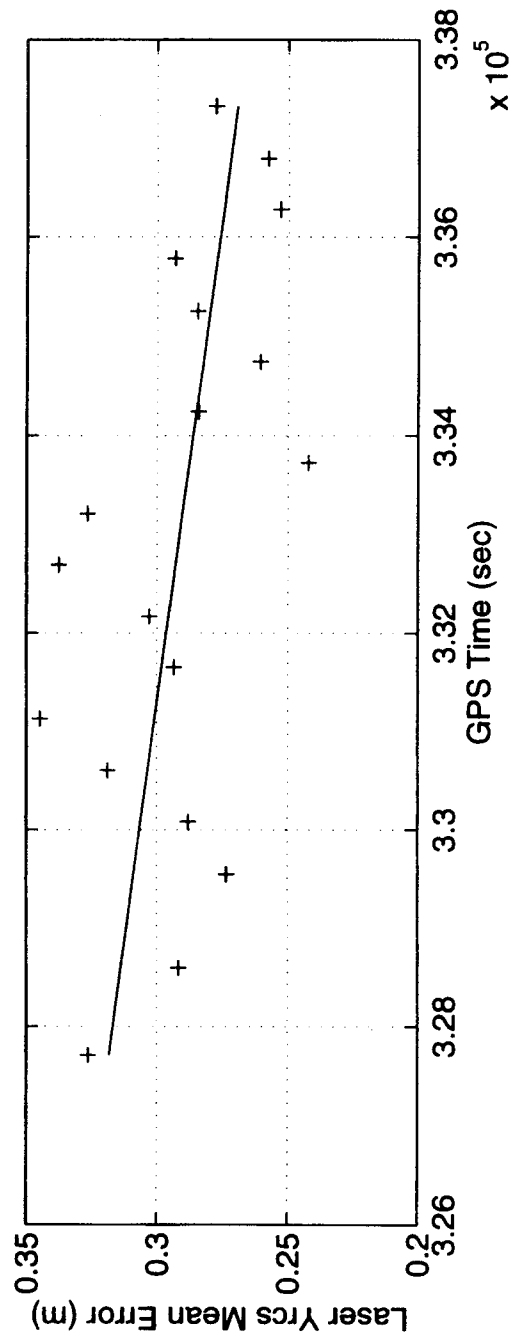
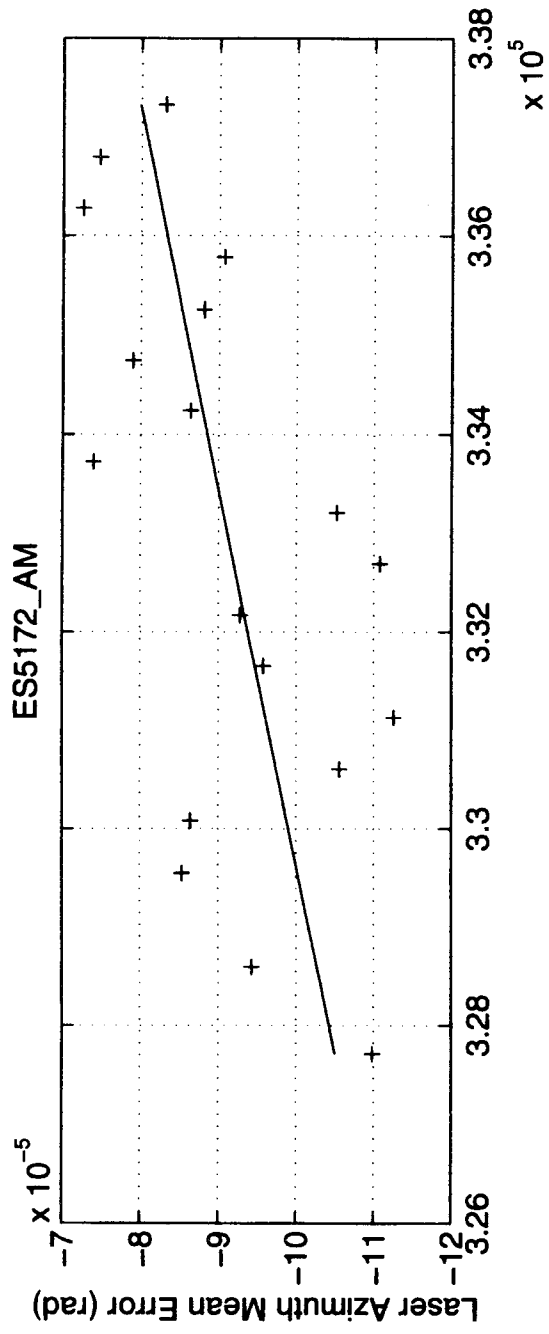
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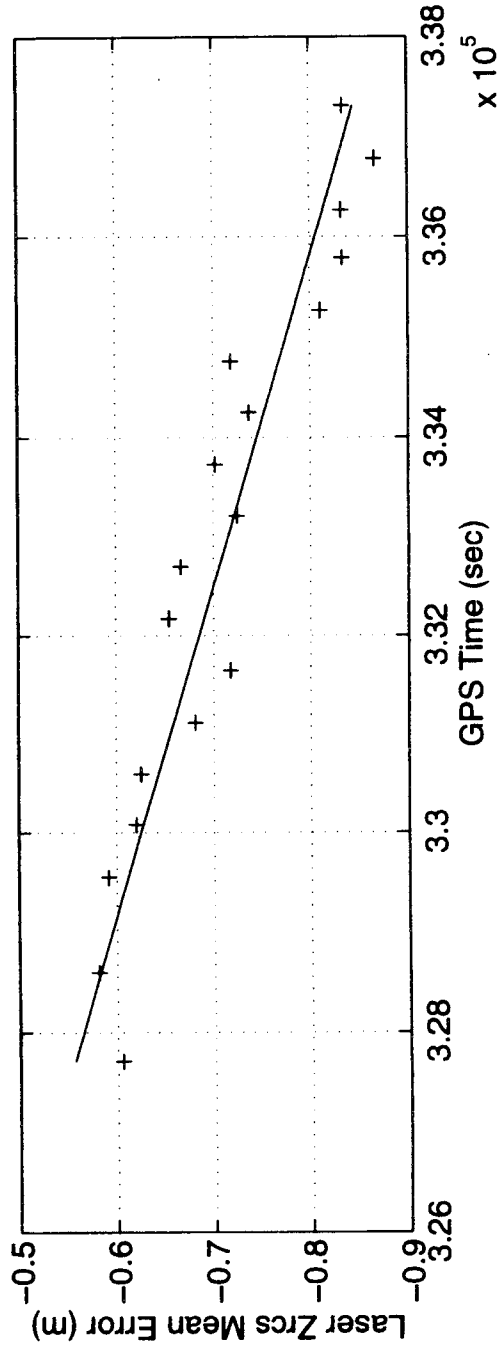
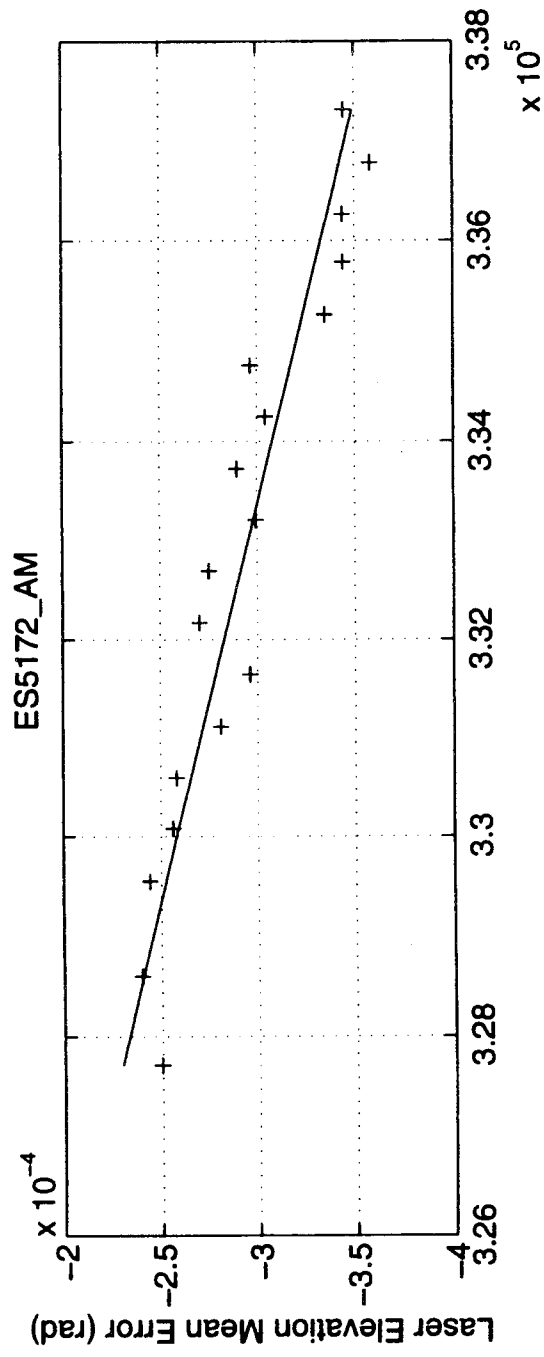




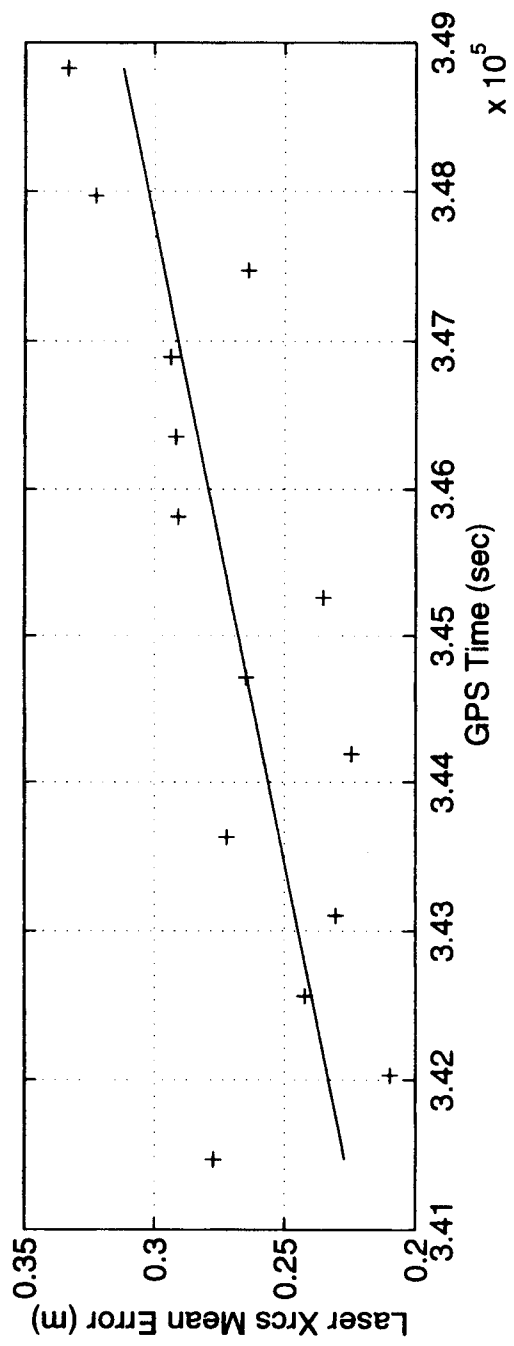
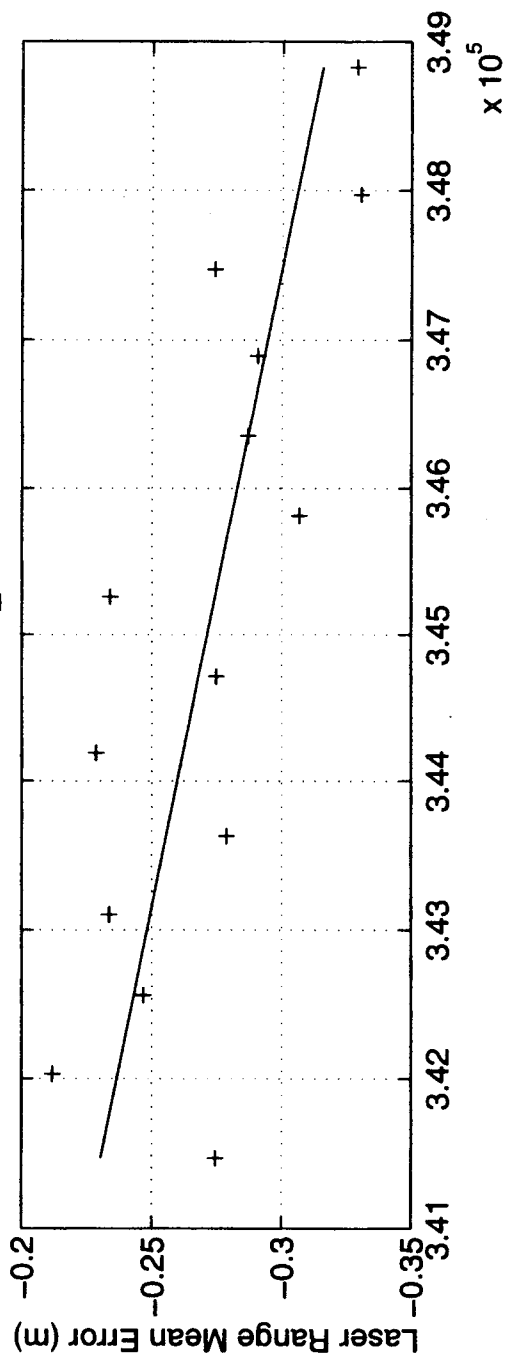
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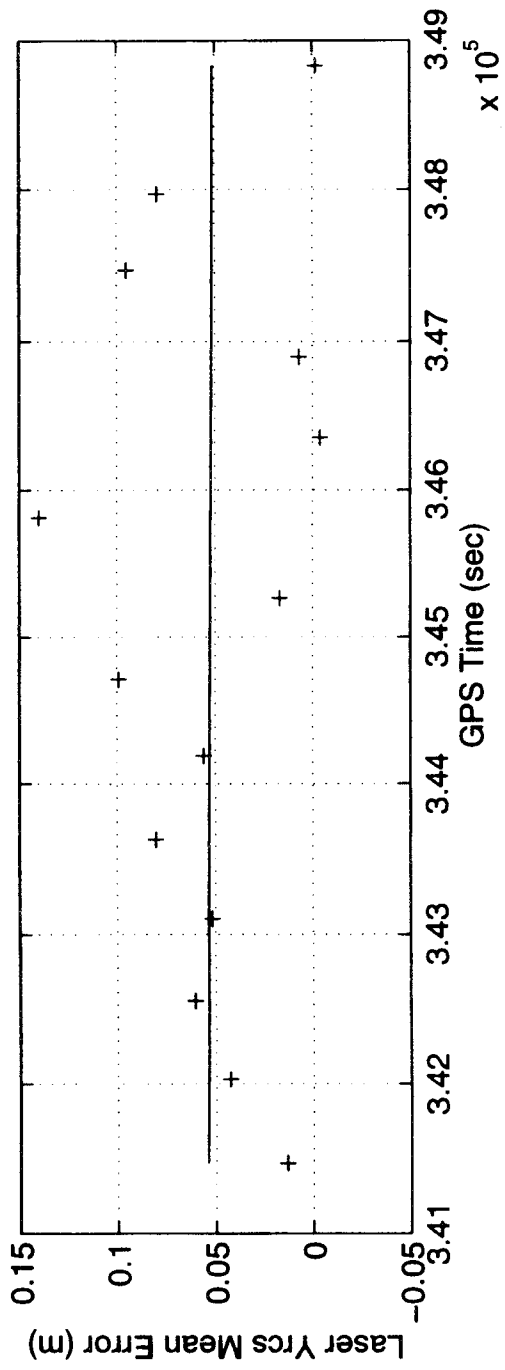
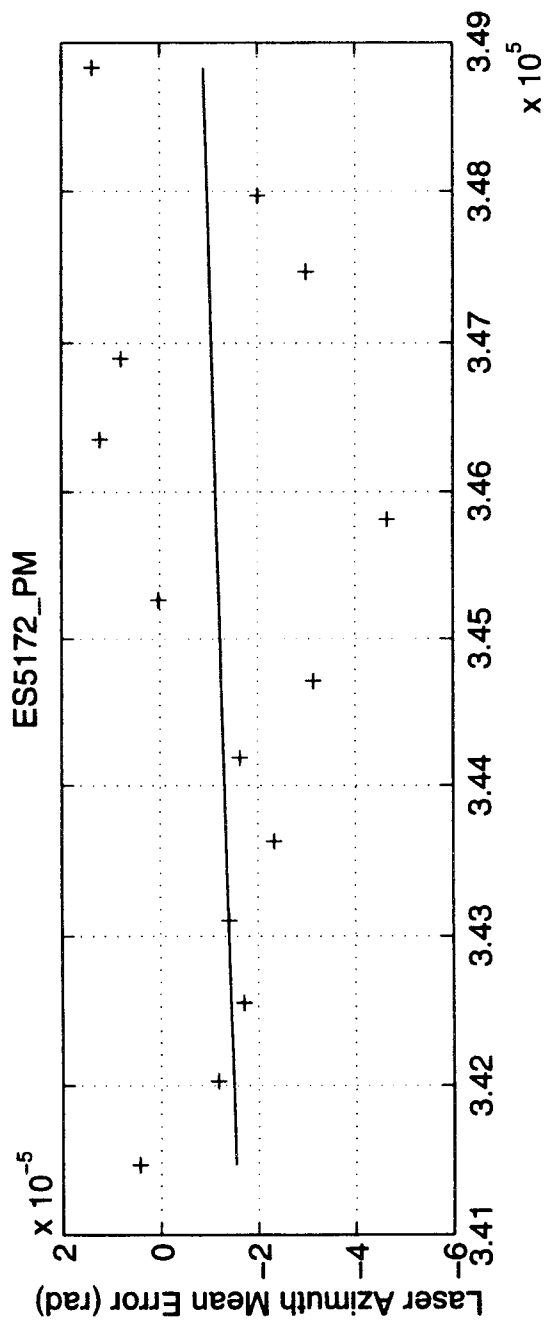




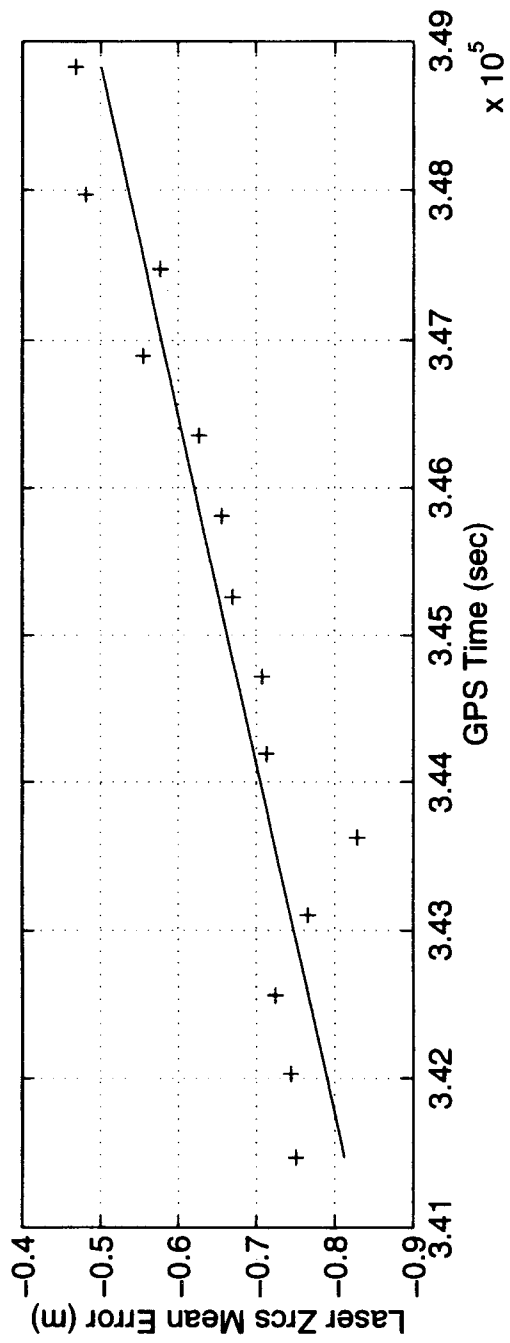
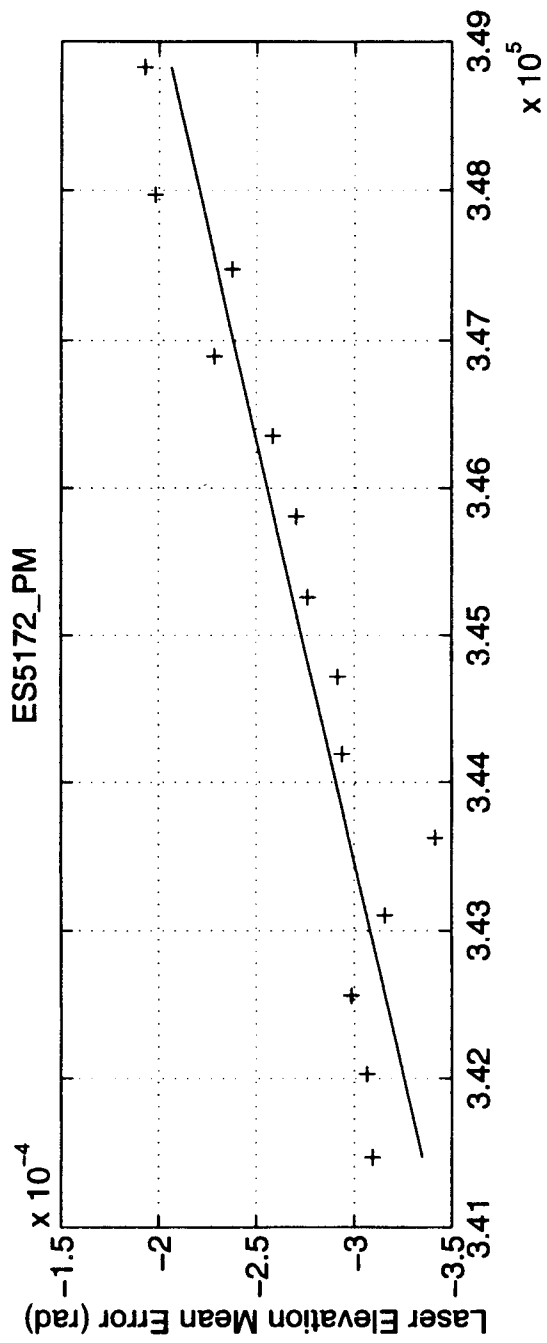


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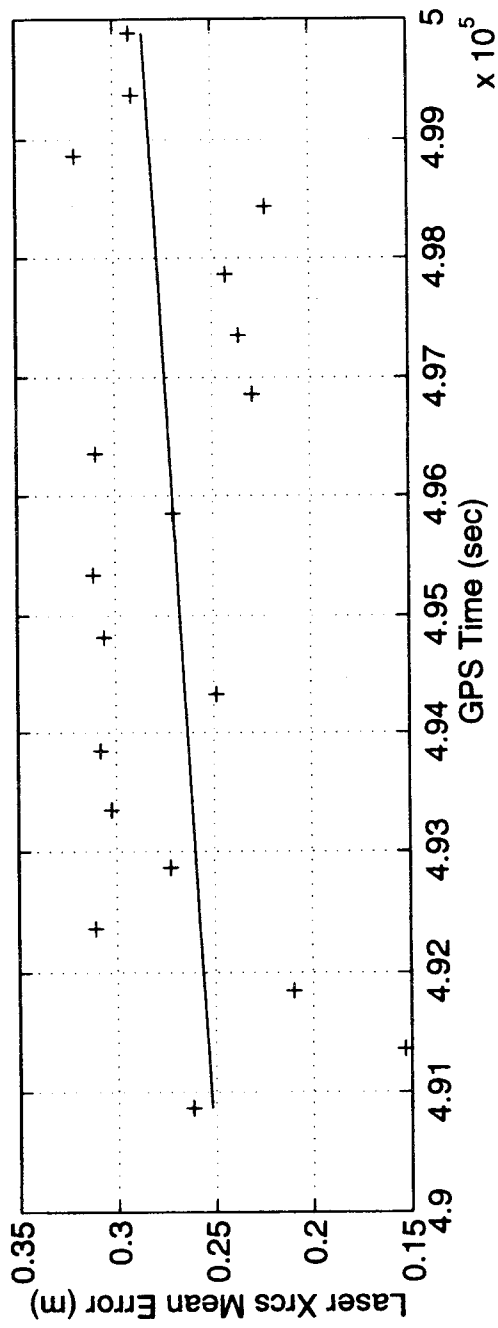
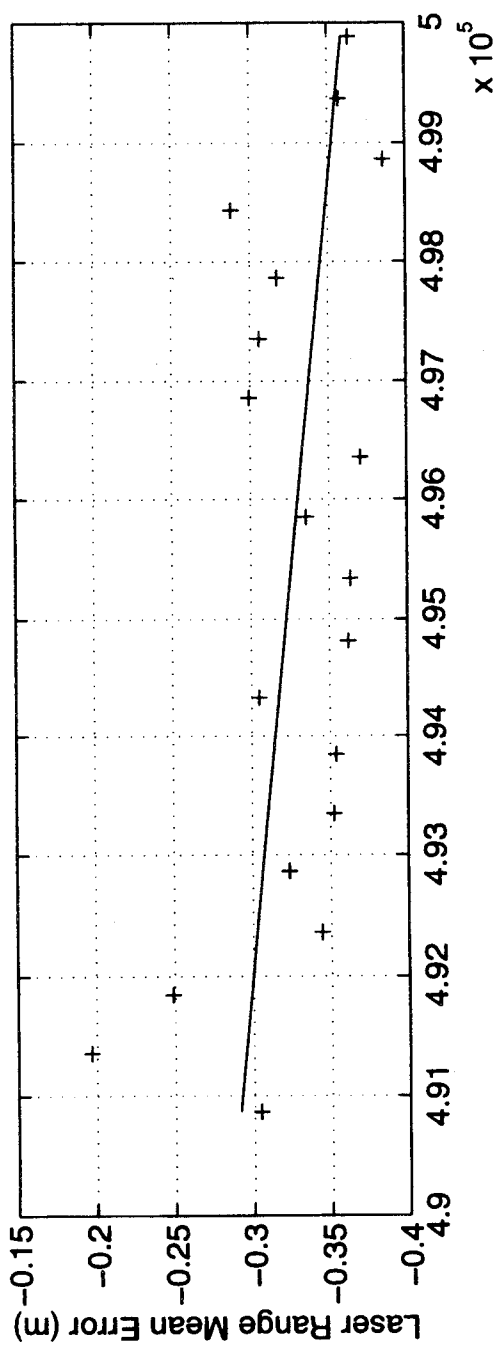


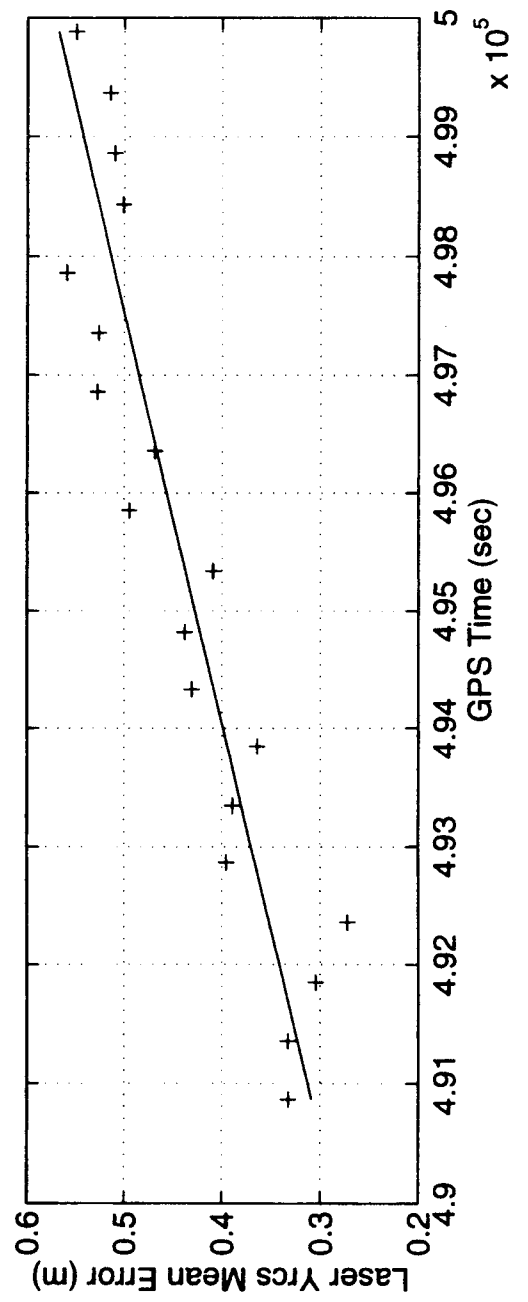
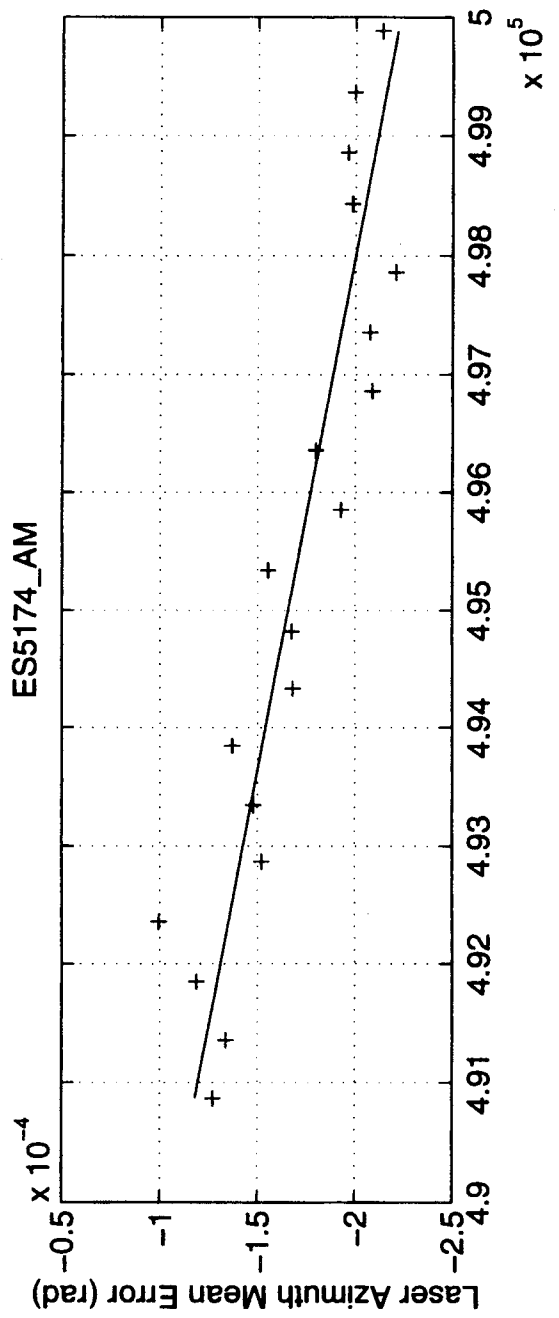


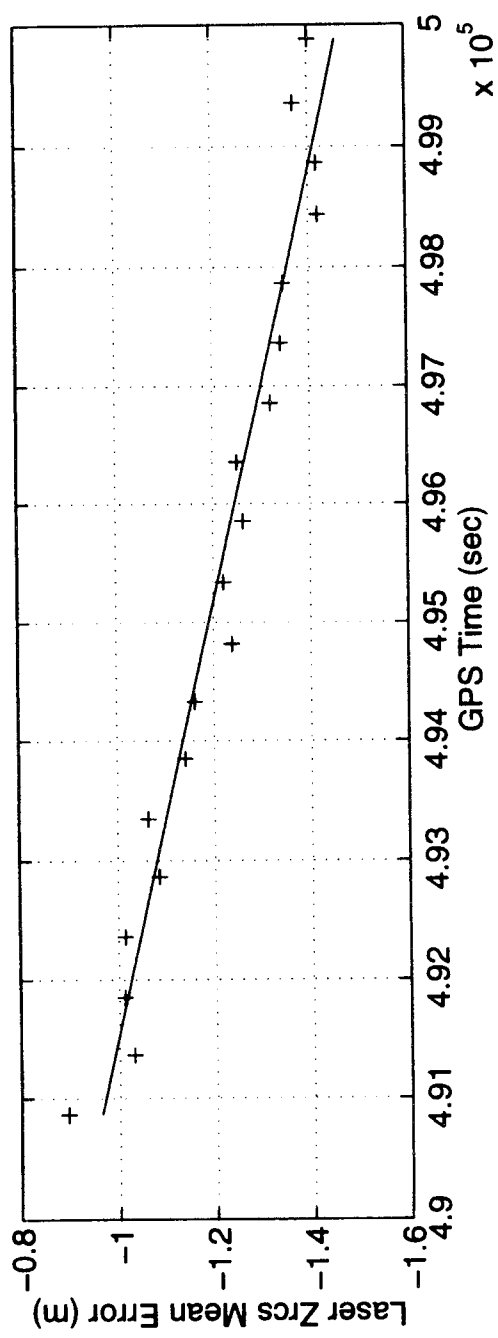
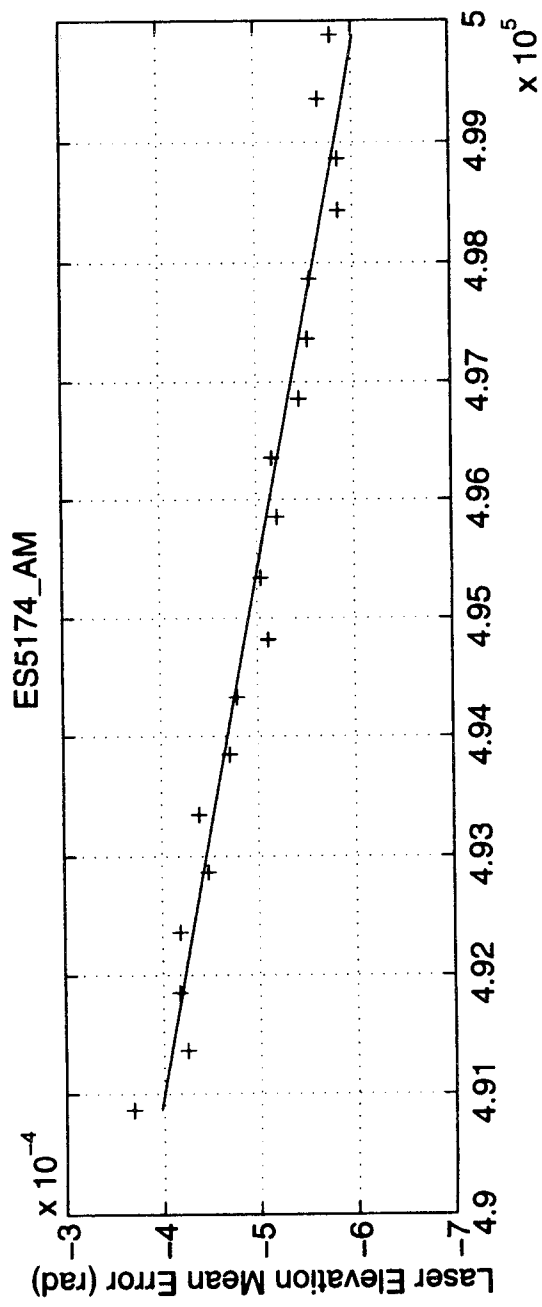




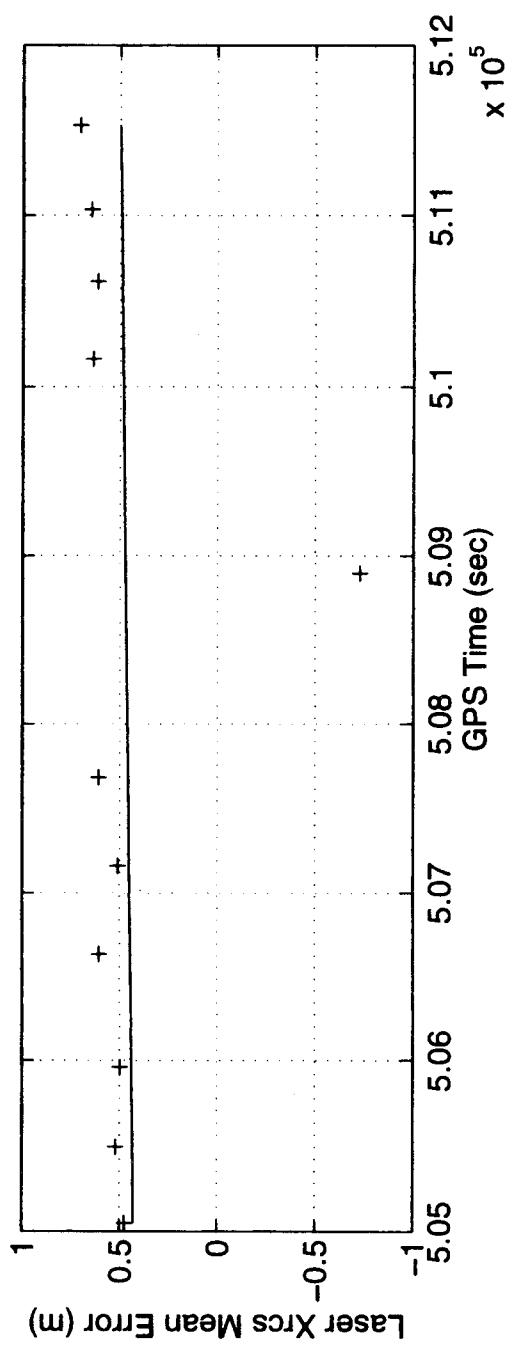
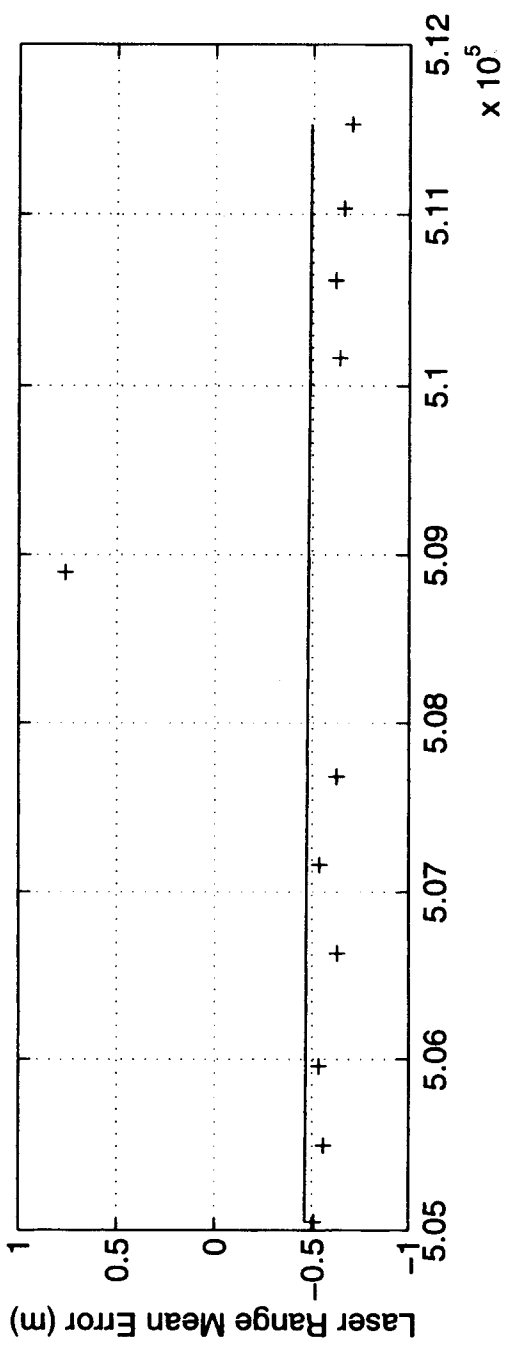
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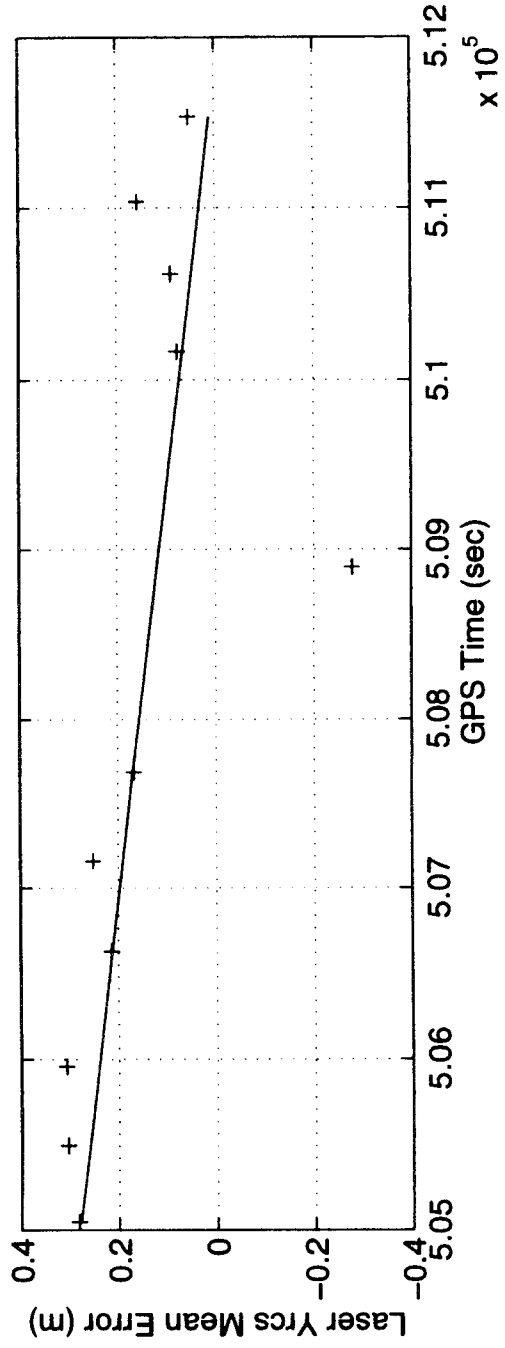
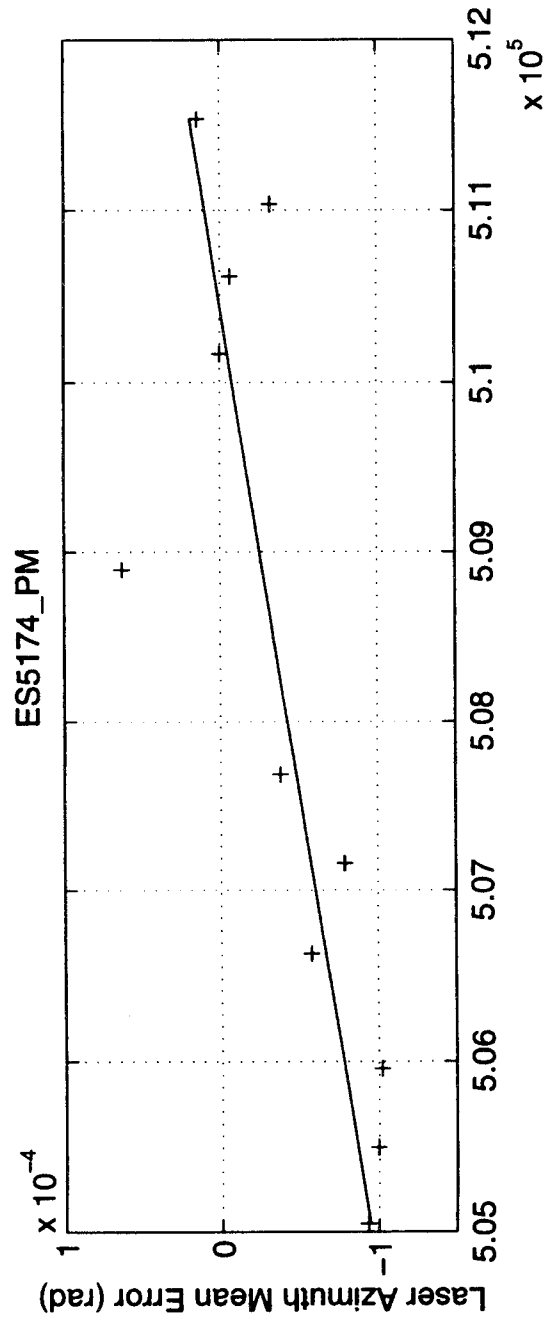


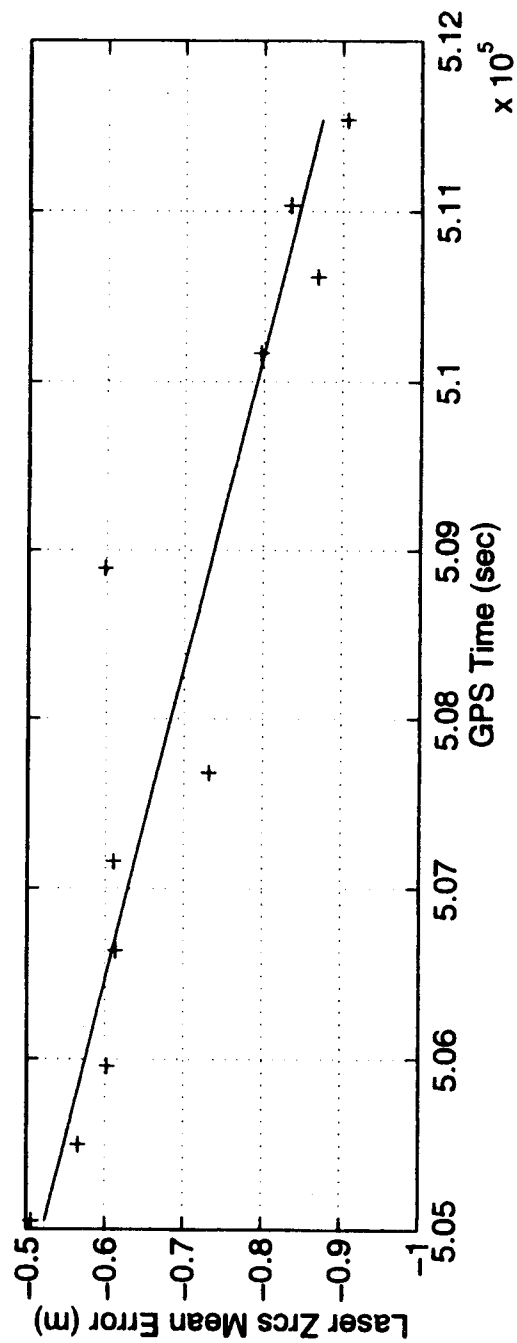
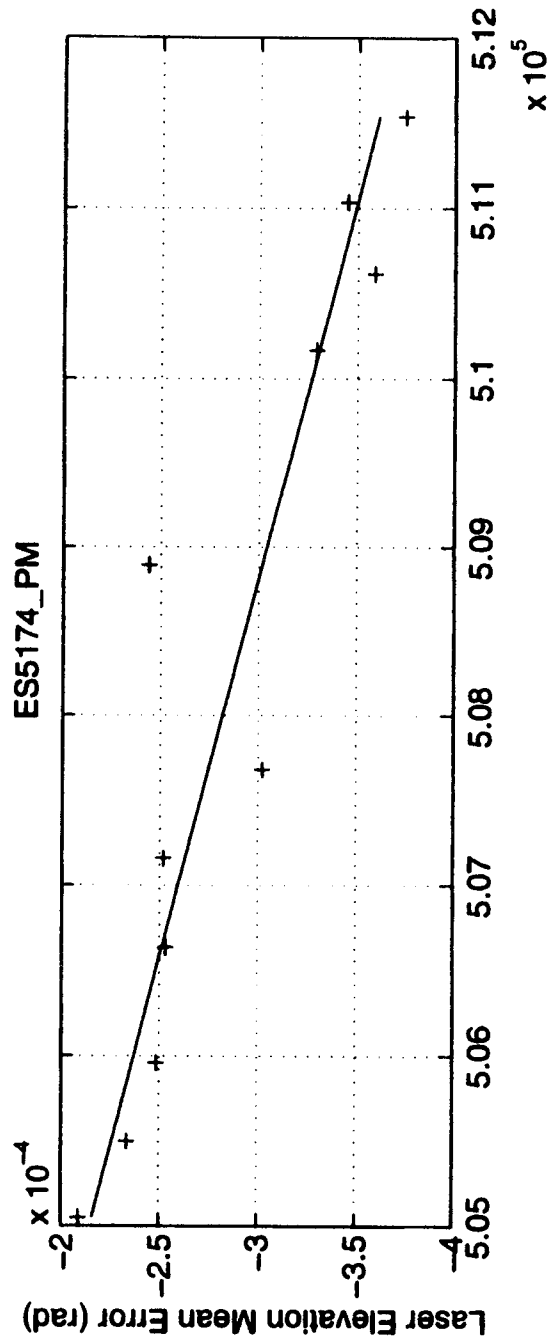




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## **GLOSSARY**

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## GLOSSARY

AP	Aim Point
CAT	Category
CG	Center of Gravity
CMN	Control Motion Noise
CTOL	Conventional Take-Off and Landing Aim Point
DGPS	Differential Global Positioning System
EOR	End of Runway
FAA	Federal Aviation Administration
FAF	Final Approach Fix
GS	Glide Slope
HAT	Height Above Threshold
HDOP	Horizontal Dilution of Precision
IAF	Initial Approach Fix
ICAO	International Civil Aviation Organization
ILS	Instrument Landing System
Intcp	Intercept Location
LCMN	Lateral Control Motion Noise
LGRP	Landing Gear Reference Point
LPFE	Lateral Path Following Error
LSE	Lateral Sensor Error
MLS	Microwave Landing System
MOS	Measure of Success
MSL	Mean Sea Level
NRP	Navigation Reference Point
N <sub>MAG</sub>	Magnetic North
N <sub>TRUE</sub>	True North
PFE	Path Following Error
RCS	Runway Coordinate System
SV	Satellite Vehicle
TD	Touch Down
ULE	Unfiltered Lateral Error
UVE	Unfiltered Vertical Error
VCMN	Vertical Control Motion Noise
VDOP	Vertical Dilution of Precision
VMC	Visual Meteorological Conditions
VPFE	Vertical Path Following Error
VSE	Vertical Sensor Error
X <sub>rCS</sub>	Runway Coordinate System X Direction
Y <sub>rCS</sub>	Runway Coordinate System Y Direction
Y <sub>diff</sub>	Runway Coordinate System Y Direction Position Difference
Z <sub>rCS</sub>	Runway Coordinate System Z Direction
Z <sub>diff</sub>	Runway Coordinate System Z Direction Position Difference
1σ+2SIG	Mean Absolute Value + Two Sigma Standard Deviation
2RMS	Two Root Mean Square
2SIGUCL	Two Sigma Standard Deviation Upper Confidence Level
95P	95 <sup>th</sup> Percentile

492-493-494

# REPORT DOCUMENTATION PAGE

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David N. Kaufmann and B. David McNally

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Ames Research Center  
Moffett Field, CA 94035-1000

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Point of Contact: David N. Kaufmann, Ames Research Center, MS N210-9, Moffett Field, CA 94035-1000; (415) 604-5440

12a. DISTRIBUTION/AVAILABILITY STATEMENT

Unclassified -- Unlimited  
Subject Category 02

12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

Test flights were conducted to evaluate the capability of Differential Global Positioning System (DGPS) to provide the accuracy and integrity required for International Civil Aviation Organization (ICAO) Category (CAT) III precision approach and landings. These test flights were part of a Federal Aviation Administration (FAA) program to evaluate the technical feasibility of using DGPS based technology for CAT III precision approach and landing applications.

A IAI Westwind 1124 aircraft (N24RH) was equipped with DGPS receiving equipment and additional computing capability provided by E-Systems. The test flights were conducted at NASA Ames Research Center's Crows Landing Flight Facility, Crows Landing, California. The flight test evaluation was based on completing 100 approaches and landings. The navigation sensor error accuracy requirements were based on ICAO requirements for the Microwave Landing System (MLS).

All of the approaches and landings were evaluated against ground truth reference data provided by a laser tracker. Analysis of these approaches and landings shows that the E-Systems DGPS system met the navigation sensor error requirements for a successful approach and landing 98 out of 100 approaches and landings, based on the requirements specified in the FAA CAT III Level 2 Flight Test Plan [1]. In addition, the E-Systems DGPS system met the integrity requirements for a successful approach and landing or stationary trial for all 100 approaches and landings and all ten stationary trials, based on the requirements specified in the FAA CAT III Level 2 Flight Test Plan.

14. SUBJECT TERMS

DGPS Automatic Landing System

15. NUMBER OF PAGES

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16. PRICE CODE

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18. SECURITY CLASSIFICATION OF THIS PAGE

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19. SECURITY CLASSIFICATION OF ABSTRACT

20. LIMITATION OF ABSTRACT

