LIDAR MAPPING REPORT
v1.1

OVERVIEW

Client: Canaan Valley Institute
Project. Number: A04-CVI-004
Project. Name: Gilmer, WV
City: Gilmer
County: Gilmer County
State: West Virginia
Number of Sites: 1
Area (Acres): 83,046
Posting Interval (Spot Spacing) (mtrs): 1.4
Horizontal Accuracy: Estimated at 1/3000 of flight height
Methodology: This survey utilized the Global Positioning System (GPS), Laser Rangefinder (LiDAR) and Inertial Measurement Unit (IMU) technologies to develop a digital terrain model

PROJECT DATUMS, REFERENCE SYSTEM & BASE STATIONS

Horizontal Datum: North American Datum of 1983 (NAD83)
Epoch: 2002.00
Reference Network: High Accuracy Reference Network (HARN)
Vertical Datum: North American Vertical Datum of 1988 (NAVD88)
Reference Network: High Accuracy Reference Network (HARN) or NGS Benchmarks in the NSRS

Geoid Model Applied: Geoid99
Projection for Raw Points - UTM Zone: 17
Projection for Deliverables: NAD83/NAVD88
Units for Deliverables: meters

Flight 1: WV0804_1a

Base Stations Information

Station Name: L278
Station Identification (NGS PID): HX1559
Position Published By: NGS
Latitude & Longitude: N 38 40 52.37113 W 80 39 08.63658
Ellipsoid Height(h): 352.75 meters
Orthometric Height(H): 384.85 meters
Geoid 99 Height(N): -32.08 meters
Pseudo-Ellipsoid Height (ph=H+N): 475.48 meters
GPS Base Receiver Unit: 1
    Operator: Josh Nimetz
    Receiver Make and Model: Novatel Model Millenium DL
    Serial number: S/N#180389
    Antenna Make, Model or Production Number: Novatel Model 503 with choke ring, none
    Antenna Mount: Fixed height pole

Station Name: Nailset CVI4
Station Identification (NGS PID): N/A
Latitude & Longitude: N 38 41 05.27480 W 80 39 05.74580
Ellipsoid Height(h): 351.215
Orthometric Height(H): N/A

Geoid 99Height(N): N/A

GPS Base Receiver Unit No.: 2
    Operator: Josh Nimetz
    Receiver Make and Model: Novatel Model Millenium DL, Dual Frequency
    Serial number: S/N#180388
    Antenna Make, Model or Production Number: Novatel Model 503 with choke ring - none
    Antenna Mount: Tripod with ground planes

GPS Airborne Receiver Unit No.: 3
    Operator: Jerome Gregory
    Receiver – Make, Type: Novatel Model Millenium DL, Dual Frequency
    Serial number: S/N#00180388
    Antenna Type: Novatel Model "512" Antenna (designed for use on aircraft)
    Antenna Mount: On roof of Partenavia P68/U (high wing, twin engine) aircraft

POST PROCESSING - KINEMATIC SOLUTIONS

Data Media: Hardrive
Processing Computer & Software: Pentium-V 1Ghz PC, Windows 2000, Waypoint Grafnet 6.03; Grafnav Batch 6.03
Laser Point Computation Software: Optech's REALM 3.4

Base Station HX1559 FWD/REV
    L1 Phase (mtrs): 0.0164
    C/A Code (mtrs): 1.84
    Baseline Distances:
        Maximum (km): 79.088
        Average (km): 37.130
Base Station Nailset CVI4
    GPS Measurement RMS Values
        L1 Phase (mtrs): 0.0098
        C/A Code (mtrs): 0.63
    Baseline Distances:
        Maximum (km): 78.70
        Average (km): 33.735
Trajectories Computed From: Nailset CVI4 only
    Average vertical difference: 0.01m
    Average horizontal difference: 0.0m
    Max vertical difference: 0.04m
    Max horizontal difference: 0.02m

STATIC NETWORK ADJUSTMENTS & ANALYSIS

Performed Network Adjustment Analysis: Yes
ID of Control Station: HX1559
ID of CORS: DE9159
Names of Stations with NGS Published Position: DE9159, HX1559
Number of Processed Sessions: 4
Minimally Constrained Adjustment Results
    Station Held Fixed: DE9159
    Station Checked: HX1559
        Vertical Check (mtrs): 0.069m
        Horizontal Check (mtrs): 0.3269m

Station Checked: Nailset
Vertical Check (mtrs): 0.08
Horizontal Check (mtrs): 0.00219

Flight 2: WV08504_1A

Base Stations Information

Station Name: Nailset CVI4
Station Identification (NGS PID): N/A
Latitude & Longitude: N 38 41 05.27480 W 80 39 05.74580
Ellipsoid Height(h): 351.215
Orthometric Height(H): N/A
Geoid 99Height(N): N/A
GPS Base Receiver Unit No.: 2
    Operator: Josh Nimetz
    Receiver Make and Model: Novatel Model Millenium DL, Dual Frequency
    Serial number: S/N#180388
    Antenna Make, Model or Production Number: Novatel Model 503 with choke ring - none
    Antenna Mount: Tripod with ground planes

GPS Airborne Receiver Unit No.: 3
    Operator: Jerome Gregory
    Receiver – Make, Type: Novatel Model Millenium DL, Dual Frequency
    Serial number: S/N#00180388
    Antenna Type: Novatel Model "512" Antenna (designed for use on aircraft)
    Antenna Mount: On roof of Partenavia P68/U (high wing, twin engine) aircraft

POST PROCESSING - KINEMATIC SOLUTIONS

Data Media: Hardrive
Processing Computer & Software: Pentium-V 1Ghz PC, Windows 2000, Waypoint Grafnet 6.03; Grafnav Batch 6.03
Laser Point Computation Software: Optech's REALM 3.4

Flight: WV08504_1A
Base Station solution used: Nailset CVI4 FWD/REV
    GPS Measurement RMS Values
        L1 Phase (mtrs): 0.0133
        C/A Code (mtrs): 0.66
    Baseline Distances:
        Maximum (km): 25.394
        Average (km): 8.969
Base Station solution used: DE9159 (CORS)
    GPS Measurement RMS Values
        L1 Phase (mtrs): 0.0177
        C/A Code (mtrs): 1.67
    Baseline Distances:
        Maximum (km): 45.687
        Average (km): 36.256
Trajectories Computed From: Nailset CVI4
    Average vertical difference: 0.04m
    Average horizontal difference: -0.01m
    Max vertical difference: 0.06m
Max horizontal difference: 0.0m

STATIC NETWORK ADJUSTMENTS & ANALYSIS

Performed Network Adjustment Analysis: Yes
ID of Control Station: HX1559
ID of CORS: DE9159
Names of Stations with NGS Published Position: DE9159, HX1559
Number of Processed Sessions: 4
Minimally Constrained Adjustment Results
      Station Held Fixed: DE9159
      Station Checked: HX1559
            Vertical Check (mtrs): 0.069m
            Horizontal Check (mtrs): 0.3269m
      Station Checked: Nailset
            Vertical Check (mtrs): 0.08
            Horizontal Check (mtrs): 0.00219

Flight 3: WV08504_2A

Base Stations Information

  Station Name: Nailset CVI4
  Station Identification (NGS PID): N/A
  Latitude & Longitude: N 38 41 05.27480 W 80 39 05.74580
  Ellipsoid Height(h): 351.215
  Orthometric Height(H): N/A
  Geoid 99Height(N): N/A
  GPS Base Receiver Unit No.: 2
      Operator: Josh Nimetz
      Receiver Make and Model: Novatel Model Millenium DL, Dual Frequency
      Serial number: S/N#180388
      Antenna Make, Model or Production Number: Novatel Model 503 with choke ring - none
      Antenna Mount: Tripod with ground planes

GPS Airborne Receiver Unit No.: 3
      Operator: Jerome Gregory
      Receiver – Make, Type: Novatel Model Millenium DL, Dual Frequency
      Serial number: S/N#00180388
      Antenna Type: Novatel Model "512" Antenna (designed for use on aircraft)
Antenna Mount: On roof of Partenavia P68/U (high wing, twin engine) aircraft

POST PROCESSING - KINEMATIC SOLUTIONS

Data Media: Hardrive
Processing Computer & Software: Pentium-V 1Ghz PC, Windows 2000, Waypoint Grafnet 6.03; Grafnav Batch 6.03
Laser Point Computation Software: Optech's REALM 3.4

Flight: WV0804_2A
Base Station solution used: Nailset CVI4 fwd/rev
      GPS Measurement RMS Values
            L1 Phase (mtrs): 0.0179
            C/A Code (mtrs): 0.73
      Baseline Distances:
            Maximum (km): 84.168
            Average (km): 16.413

Base Station solution used: DE9159 (CORS)
GPS Measurement RMS Values
      L1 Phase (mtrs): 0.0174
      C/A Code (mtrs): 1.72
   Baseline Distances:
      Maximum (km): 70.827
      Average (km): 31.637
Trajectories Computed From: Nailset CVI4
   Average vertical difference: 0.03m
   Average horizontal difference: 0.01m
   Max vertical difference: 0.05m
Max horizontal difference: 0.3m

STATIC NETWORK ADJUSTMENTS & ANALYSIS

Performed Network Adjustment Analysis: Yes
ID of Control Station: HX1559
ID of CORS: DE9159
Names of Stations with NGS Published Position: DE9159, HX1559
Number of Processed Sessions: 4
Minimally Constrained Adjustment Results
   Station Held Fixed: DE9159
   Station Checked: HX1559
      Vertical Check (mtrs): 0.069m
      Horizontal Check (mtrs): 0.3269m

   Station Checked: Nailset
   Vertical Check (mtrs): 0.08
   Horizontal Check (mtrs): 0.00219

Flight 4: WV08504_3A

Base Stations Information

  Station Name: Nailset CVI4
  Station Identification (NGS PID): N/A
  Latitude & Longitude: N 38 41 05.27480 W 80 39 05.74580
  Ellipsoid Height(h): 351.215
  Orthometric Height(H): N/A
  Geoid 99Height(N): N/A
  GPS Base Receiver Unit No.: 2
      Operator: Josh Nimetz
      Receiver Make and Model: Novatel Model Millenium DL, Dual Frequency
      Serial number: S/N#180388
      Antenna Make, Model or Production Number: Novatel Model 503 with choke ring - none
      Antenna Mount: Tripod with ground planes

GPS Airborne Receiver Unit No.: 3
      Operator: Jerome Gregory
      Receiver – Make, Type: Novatel Model Millenium DL, Dual Frequency
      Serial number: S/N#00180388
      Antenna Type: Novatel Model "512" Antenna (designed for use on aircraft)
      Antenna Mount: On roof of Partenavia P68/U (high wing, twin engine) aircraft

<div align="center">**POST PROCESSING - KINEMATIC SOLUTIONS**</div>

Data Media: Hardrive
Processing Computer & Software: Pentium-V 1Ghz PC, Windows 2000, Waypoint Grafnet 6.03; Grafnav Batch 6.03
Laser Point Computation Software: Optech's REALM 3.4

Flight: WV08504_3A
Base Station solution used: Nailset CVI4 fwd/rev
    GPS Measurement RMS Values
        L1 Phase (mtrs): 0.0164
        C/A Code (mtrs): 0.67
    Baseline Distances:
        Maximum (km): 78.252
        Average (km): 45.232
Base Station solution used: DE9159 (CORS)
    GPS Measurement RMS Values
        L1 Phase (mtrs): 0.0117
        C/A Code (mtrs): 1.67
    Baseline Distances:
        Maximum (km): 45.687
        Average (km): 36.256
Trajectories Computed From: Nailset CVI4
    Average vertical difference: 0.03m
    Average horizontal difference: -0.02m
    Max vertical difference: 0.04m
Max horizontal difference: -0.01m

<div align="center">**STATIC NETWORK ADJUSTMENTS & ANALYSIS**</div>

Performed Network Adjustment Analysis: Yes
ID of Control Station: HX1559
ID of CORS: DE9159
Names of Stations with NGS Published Position: DE9159, HX1559
Number of Processed Sessions: 4
Minimally Constrained Adjustment Results
    Station Held Fixed: DE9159
    Station Checked: HX1559
        Vertical Check (mtrs): 0.069m
        Horizontal Check (mtrs): 0.3269m

    Station Checked: Nailset
    Vertical Check (mtrs): 0.08
    Horizontal Check (mtrs): 0.00219

Flight 5: WV08604_1A

Base Stations Information

  Station Name: Nailset CVI4
  Station Identification (NGS PID): N/A
  Latitude & Longitude: N 38 41 05.27480 W 80 39 05.74580

Ellipsoid Height(h): 351.215
Orthometric Height(H): N/A
Geoid 99Height(N): N/A
GPS Base Receiver Unit No.: 2
        Operator: Josh Nimetz
        Receiver Make and Model: Novatel Model Millenium DL, Dual Frequency
        Serial number: S/N#180388
        Antenna Make, Model or Production Number: Novatel Model 503 with choke ring - none
        Antenna Mount: Tripod with ground planes

GPS Airborne Receiver Unit No.: 3
        Operator: Jerome Gregory
        Receiver – Make, Type: Novatel Model Millenium DL, Dual Frequency
        Serial number: S/N#00180388
        Antenna Type: Novatel Model "512" Antenna (designed for use on aircraft)
Antenna Mount: On roof of Partenavia P68/U (high wing, twin engine) aircraft

POST PROCESSING - KINEMATIC SOLUTIONS

Data Media: Hardrive
Processing Computer & Software: Pentium-V 1Ghz PC, Windows 2000, Waypoint Grafnet 6.03; Grafnav Batch 6.03
Laser Point Computation Software: Optech's REALM 3.4

Flight: WV08604_1A
Base Station solution used: Nailset CVI4 fwd/rev
        GPS Measurement RMS Values
                L1 Phase (mtrs): 0.0127
                C/A Code (mtrs): 0.81
        Baseline Distances:
                Maximum (km): 35.774
                Average (km): 14.021
Base Station solution used: DE9159 (CORS)
        GPS Measurement RMS Values
                L1 Phase (mtrs): 0.0129
                C/A Code (mtrs): 1.73
        Baseline Distances:
                Maximum (km): 45.816
                Average (km): 32.378
Trajectories Computed From: Nailset CVI4
        Average vertical difference: -0.05m
        Average horizontal difference: 0.00m
        Max vertical difference: -0.02m
Max horizontal difference: -0.01m

STATIC NETWORK ADJUSTMENTS & ANALYSIS

Performed Network Adjustment Analysis: Yes
ID of Control Station: HX1559
ID of CORS: DE9159
Names of Stations with NGS Published Position: DE9159, HX1559
Number of Processed Sessions: 4
Minimally Constrained Adjustment Results
        Station Held Fixed: DE9159

Station Checked: HX1559
       Vertical Check (mtrs): 0.069m
       Horizontal Check (mtrs): 0.3269m

Station Checked: Nailset
Vertical Check (mtrs): 0.08
Horizontal Check (mtrs): 0.00219

Flight 6: WV08604_2A

Base Stations Information

  Station Name: Nailset CVI4
  Station Identification (NGS PID): N/A
  Latitude & Longitude: N 38 41 05.27480 W 80 39 05.74580
  Ellipsoid Height(h): 351.215
  Orthometric Height(H): N/A
  Geoid 99Height(N): N/A
  GPS Base Receiver Unit No.: 2
       Operator: Josh Nimetz
       Receiver Make and Model: Novatel Model Millenium DL, Dual Frequency
       Serial number: S/N#180388
       Antenna Make, Model or Production Number: Novatel Model 503 with choke ring - none
       Antenna Mount: Tripod with ground planes

GPS Airborne Receiver Unit No.: 3
       Operator: Jerome Gregory
       Receiver – Make, Type: Novatel Model Millenium DL, Dual Frequency
       Serial number: S/N#00180388
       Antenna Type: Novatel Model "512" Antenna (designed for use on aircraft)
       Antenna Mount: On roof of Partenavia P68/U (high wing, twin engine) aircraft

POST PROCESSING - KINEMATIC SOLUTIONS

Data Media: Hardrive
Processing Computer & Software: Pentium-V 1Ghz PC, Windows 2000, Waypoint Grafnet 6.03; Grafnav Batch 6.03
Laser Point Computation Software: Optech's REALM 3.4

Flight: WV08604_2A
Base Station solution used: Nailset CVI4 fwd/rev
       GPS Measurement RMS Values
           L1 Phase (mtrs): 0.0161
           C/A Code (mtrs): 0.74
       Baseline Distances:
           Maximum (km): 78.013
           Average (km): 22.903
Base Station solution used: DE9159 (CORS)
       GPS Measurement RMS Values
           L1 Phase (mtrs): 0.0160
           C/A Code (mtrs): 1.65
       Baseline Distances:
           Maximum (km): 64.714
           Average (km): 29.598

Trajectories Computed From: Nailset CVI4
       Average vertical difference: -0.02m
       Average horizontal difference: 0.01m
       Max vertical difference: 0.03m
Max horizontal difference: 0.03m

STATIC NETWORK ADJUSTMENTS & ANALYSIS

Performed Network Adjustment Analysis: Yes
ID of Control Station: HX1559
ID of CORS: DE9159
Names of Stations with NGS Published Position: DE9159, HX1559
Number of Processed Sessions: 4
Minimally Constrained Adjustment Results
       Station Held Fixed: DE9159
       Station Checked: HX1559
           Vertical Check (mtrs): 0.069m
           Horizontal Check (mtrs): 0.3269m

       Station Checked: Nailset
       Vertical Check (mtrs): 0.08
       Horizontal Check (mtrs): 0.00219

Flight 7: WV08604_3A

Base Stations Information

 Station Name: Nailset CVI4
 Station Identification (NGS PID): N/A
 Latitude & Longitude: N 38 41 05.27480 W 80 39 05.74580
 Ellipsoid Height(h): 351.215
 Orthometric Height(H): N/A
 Geoid 99Height(N): N/A
 GPS Base Receiver Unit No.: 2
       Operator: Josh Nimetz
       Receiver Make and Model: Novatel Model Millenium DL, Dual Frequency
       Serial number: S/N#180388
       Antenna Make, Model or Production Number: Novatel Model 503 with choke ring - none
       Antenna Mount: Tripod with ground planes

GPS Airborne Receiver Unit No.: 3
       Operator: Jerome Gregory
       Receiver – Make, Type: Novatel Model Millenium DL, Dual Frequency
       Serial number: S/N#00180388
       Antenna Type: Novatel Model "512" Antenna (designed for use on aircraft)
       Antenna Mount: On roof of Partenavia P68/U (high wing, twin engine) aircraft

POST PROCESSING - KINEMATIC SOLUTIONS

Data Media: Hardrive
Processing Computer & Software: Pentium-V 1Ghz PC, Windows 2000, Waypoint Grafnet 6.03; Grafnav Batch 6.03
Laser Point Computation Software: Optech's REALM 3.4

Flight: WV08604_3A
Base Station solution used: Nailset CVI4 fwd/rev
      GPS Measurement RMS Values
         L1 Phase (mtrs): 0.0164
         C/A Code (mtrs): 0.62
      Baseline Distances:
         Maximum (km): 78.252
         Average (km): 43.749
Base Station solution used: DE9159 (CORS)
      GPS Measurement RMS Values
         L1 Phase (mtrs): 0.022
         C/A Code (mtrs): 1.45
      Baseline Distances:
         Maximum (km): 65.646
         Average (km): 24.256
Trajectories Computed From: Nailset CVI4
      Average vertical difference: 0.03m
      Average horizontal difference: 0.01m
      Max vertical difference: 0.09m
Max horizontal difference: 0.04m

STATIC NETWORK ADJUSTMENTS & ANALYSIS

Performed Network Adjustment Analysis: Yes
ID of Control Station: HX1559
ID of CORS: DE9159
Names of Stations with NGS Published Position: DE9159, HX1559
Number of Processed Sessions: 4
Minimally Constrained Adjustment Results
      Station Held Fixed: DE9159
      Station Checked: HX1559
         Vertical Check (mtrs): 0.069m
         Horizontal Check (mtrs): 0.3269m

      Station Checked: Nailset
      Vertical Check (mtrs): 0.08
      Horizontal Check (mtrs): 0.00219

Flight 8: WV08804_1A

Base Stations Information

 Station Name: Nailset CVI4
 Station Identification (NGS PID): N/A
 Latitude & Longitude: N 38 41 05.27480 W 80 39 05.74580
 Ellipsoid Height(h): 351.215
 Orthometric Height(H): N/A
 Geoid 99Height(N): N/A
 GPS Base Receiver Unit No.: 2
      Operator: Josh Nimetz
      Receiver Make and Model: Novatel Model Millenium DL, Dual Frequency
      Serial number: S/N#180388
      Antenna Make, Model or Production Number: Novatel Model 503 with choke ring - none
      Antenna Mount: Tripod with ground planes

GPS Airborne Receiver Unit No.: 3
    Operator: Jerome Gregory
    Receiver – Make, Type: Novatel Model Millenium DL, Dual Frequency
    Serial number: S/N#00180388
    Antenna Type: Novatel Model "512" Antenna (designed for use on aircraft)
    Antenna Mount: On roof of Partenavia P68/U (high wing, twin engine) aircraft

POST PROCESSING - KINEMATIC SOLUTIONS

Data Media: Hardrive
Processing Computer & Software: Pentium-V 1Ghz PC, Windows 2000, Waypoint Grafnet 6.03; Grafnav Batch 6.03
Laser Point Computation Software: Optech's REALM 3.4

Flight: WV08804_1A
Base Station solution used: Nailset CVI4 fwd/rev
    GPS Measurement RMS Values
        L1 Phase (mtrs): 0.0180
        C/A Code (mtrs): 0.73
    Baseline Distances:
        Maximum (km): 78.258
        Average (km): 30.818
Base Station solution used: DE9159 (CORS)
    GPS Measurement RMS Values
        L1 Phase (mtrs): 0.0150
        C/A Code (mtrs): 1.51
    Baseline Distances:
        Maximum (km): 65.656
        Average (km): 26.620
Trajectories Computed From: Nailset CVI4
    Average vertical difference: -0.05m
    Average horizontal difference: 0.02m
    Max vertical difference: 0.05m
Max horizontal difference: 0.06m

STATIC NETWORK ADJUSTMENTS & ANALYSIS

Performed Network Adjustment Analysis: Yes
ID of Control Station: HX1559
ID of CORS: DE9159
Names of Stations with NGS Published Position: DE9159, HX1559
Number of Processed Sessions: 4
Minimally Constrained Adjustment Results
    Station Held Fixed: DE9159
    Station Checked: HX1559
        Vertical Check (mtrs): 0.069m
        Horizontal Check (mtrs): 0.3269m

    Station Checked: Nailset
    Vertical Check (mtrs): 0.08
    Horizontal Check (mtrs): 0.00219

Flight 10: WV08804_2A

Base Stations Information

  Station Name: Nailset CVI4
  Station Identification (NGS PID): N/A
  Latitude & Longitude: N 38 41 05.27480 W 80 39 05.74580
  Ellipsoid Height(h): 351.215
  Orthometric Height(H): N/A
  Geoid 99Height(N): N/A
  GPS Base Receiver Unit No.: 2
      Operator: Josh Nimetz
      Receiver Make and Model: Novatel Model Millenium DL, Dual Frequency
      Serial number: S/N#180388
      Antenna Make, Model or Production Number: Novatel Model 503 with choke ring - none
      Antenna Mount: Tripod with ground planes

GPS Airborne Receiver Unit No.: 3
      Operator: Jerome Gregory
      Receiver – Make, Type: Novatel Model Millenium DL, Dual Frequency
      Serial number: S/N#00180388
      Antenna Type: Novatel Model "512" Antenna (designed for use on aircraft)
      Antenna Mount: On roof of Partenavia P68/U (high wing, twin engine) aircraft

POST PROCESSING - KINEMATIC SOLUTIONS

Data Media: Hardrive
Processing Computer & Software: Pentium-V 1Ghz PC, Windows 2000, Waypoint Grafnet 6.03; Grafnav Batch 6.03
Laser Point Computation Software: Optech's REALM 3.4

Flight: WV08804_2A
Base Station solution used: Nailset CVI4 fwd/rev
    GPS Measurement RMS Values
        L1 Phase (mtrs): 0.0173
        C/A Code (mtrs): 0.73
    Baseline Distances:
        Maximum (km): 58.759
        Average (km): 32.074
Base Station solution used: DE9159 (CORS)
    GPS Measurement RMS Values
        L1 Phase (mtrs): 0.0185
        C/A Code (mtrs): 1.56
    Baseline Distances:
        Maximum (km): 64.670
        Average (km): 22.599
Trajectories Computed From: Nailset CVI4
    Average vertical difference: 0.08m
    Average horizontal difference: 0.01m
    Max vertical difference: 0.12m
Max horizontal difference: 0.03m

STATIC NETWORK ADJUSTMENTS & ANALYSIS

Performed Network Adjustment Analysis: Yes
ID of Control Station: HX1559
ID of CORS: DE9159

Names of Stations with NGS Published Position: DE9159, HX1559
Number of Processed Sessions: 4
Minimally Constrained Adjustment Results
        Station Held Fixed: DE9159
        Station Checked: HX1559
                Vertical Check (mtrs): 0.069m
                Horizontal Check (mtrs): 0.3269m

        Station Checked: Nailset
        Vertical Check (mtrs): 0.08
        Horizontal Check (mtrs): 0.00219

Flight 11: WV08904_1A

Base Stations Information

  Station Name: Nailset CVI4
  Station Identification (NGS PID): N/A
  Latitude & Longitude: N 38 41 05.27480 W 80 39 05.74580
  Ellipsoid Height(h): 351.215
  Orthometric Height(H): N/A
  Geoid 99Height(N): N/A
  GPS Base Receiver Unit No.: 2
        Operator: Josh Nimetz
        Receiver Make and Model: Novatel Model Millenium DL, Dual Frequency
        Serial number: S/N#180388
        Antenna Make, Model or Production Number: Novatel Model 503 with choke ring - none
        Antenna Mount: Tripod with ground planes

GPS Airborne Receiver Unit No.: 3
        Operator: Jerome Gregory
        Receiver – Make, Type: Novatel Model Millenium DL, Dual Frequency
        Serial number: S/N#00180388
        Antenna Type: Novatel Model "512" Antenna (designed for use on aircraft)
        Antenna Mount: On roof of Partenavia P68/U (high wing, twin engine) aircraft

POST PROCESSING - KINEMATIC SOLUTIONS

Data Media: Hardrive
Processing Computer & Software: Pentium-V 1Ghz PC, Windows 2000, Waypoint Grafnet 6.03; Grafnav Batch 6.03
Laser Point Computation Software: Optech's REALM 3.4

Ephemeris used:

Flight: WV08904_1A
Base Station solution used: Nailset CVI4 fwd/rev
        GPS Measurement RMS Values
                L1 Phase (mtrs): 0.0138
                C/A Code (mtrs): 0.74
        Baseline Distances:
                Maximum (km): 43.472
                Average (km): 20.130
Base Station solution used: DE9159 (CORS)
        GPS Measurement RMS Values
                L1 Phase (mtrs): 0.0120
                C/A Code (mtrs): 1.72

Baseline Distances:
      Maximum (km): 42.085
      Average (km): 29.382
Trajectories Computed From: Nailset CVI4
      Average vertical difference: 0.02m
      Average horizontal difference: -0.02m
      Max vertical difference: 0.04m
Max horizontal difference: 0.01m

STATIC NETWORK ADJUSTMENTS & ANALYSIS

Performed Network Adjustment Analysis: Yes
ID of Control Station: HX1559
ID of CORS: DE9159
Names of Stations with NGS Published Position: DE9159, HX1559
Number of Processed Sessions: 4
Minimally Constrained Adjustment Results
      Station Held Fixed: DE9159
      Station Checked: HX1559
          Vertical Check (mtrs): 0.069m
          Horizontal Check (mtrs): 0.3269m

      Station Checked: Nailset
      Vertical Check (mtrs): 0.08
      Horizontal Check (mtrs): 0.00219

Flight 12: WV08904_2A

Base Stations Information

  Station Name: Nailset CVI4
  Station Identification (NGS PID): N/A
  Latitude & Longitude: N 38 41 05.27480 W 80 39 05.74580
  Ellipsoid Height(h): 351.215
  Orthometric Height(H): N/A
  Geoid 99Height(N): N/A
  GPS Base Receiver Unit No.: 2
      Operator: Josh Nimetz
      Receiver Make and Model: Novatel Model Millenium DL, Dual Frequency
      Serial number: S/N#180388
      Antenna Make, Model or Production Number: Novatel Model 503 with choke ring - none
      Antenna Mount: Tripod with ground planes

GPS Airborne Receiver Unit No.: 3
      Operator: Jerome Gregory
      Receiver – Make, Type: Novatel Model Millenium DL, Dual Frequency
      Serial number: S/N#00180388
      Antenna Type: Novatel Model "512" Antenna (designed for use on aircraft)
      Antenna Mount: On roof of Partenavia P68/U (high wing, twin engine) aircraft

POST PROCESSING - KINEMATIC SOLUTIONS

Data Media: Hardrive
Processing Computer & Software: Pentium-V 1Ghz PC, Windows 2000, Waypoint Grafnet 6.03; Grafnav Batch 6.03

Laser Point Computation Software: Optech's REALM 3.4

Flight: WV08904_2A
Base Station solution used: Nailset CVI4 fwd/rev
      GPS Measurement RMS Values
          L1 Phase (mtrs): 0.0166
          C/A Code (mtrs): 0.80
      Baseline Distances:
          Maximum (km): 51.150
          Average (km): 26.823
Base Station solution used: DE9159 (CORS)
      GPS Measurement RMS Values
          L1 Phase (mtrs): 0.0162
          C/A Code (mtrs): 1.71
      Baseline Distances:
          Maximum (km): 41.861
          Average (km): 23.367
Trajectories Computed From: Nailset CVI4
      Average vertical difference: 0.06m
      Average horizontal difference: -0.02m
      Max vertical difference: 0.12m
Max horizontal difference: 0.01m

STATIC NETWORK ADJUSTMENTS & ANALYSIS

Performed Network Adjustment Analysis: Yes
ID of Control Station: HX1559
ID of CORS: DE9159
Names of Stations with NGS Published Position: DE9159, HX1559
Number of Processed Sessions: 4
Minimally Constrained Adjustment Results
      Station Held Fixed: DE9159
      Station Checked: HX1559
          Vertical Check (mtrs): 0.069m
          Horizontal Check (mtrs): 0.3269m

      Station Checked: Nailset
      Vertical Check (mtrs): 0.08
      Horizontal Check (mtrs): 0.00219

Flight 13: WV09604_1A

Base Stations Information

 Station Name: Nailset CVI4
 Station Identification (NGS PID): N/A
 Latitude & Longitude: N 38 41 05.27480 W 80 39 05.74580
 Ellipsoid Height(h): 351.215
 Orthometric Height(H): N/A
 Geoid 99Height(N): N/A
 GPS Base Receiver Unit No.: 2
      Operator: Josh Nimetz
      Receiver Make and Model: Novatel Model Millenium DL, Dual Frequency

Serial number: S/N#180388
Antenna Make, Model or Production Number: Novatel Model 503 with choke ring - none
Antenna Mount: Tripod with ground planes

GPS Airborne Receiver Unit No.: 3
Operator: Jerome Gregory
Receiver – Make, Type: Novatel Model Millenium DL, Dual Frequency
Serial number: S/N#00180388
Antenna Type: Novatel Model "512" Antenna (designed for use on aircraft)
Antenna Mount: On roof of Partenavia P68/U (high wing, twin engine) aircraft

POST PROCESSING - KINEMATIC SOLUTIONS

Data Media: Hardrive
Processing Computer & Software: Pentium-V 1Ghz PC, Windows 2000, Waypoint Grafnet 6.03; Grafnav Batch 6.03
Laser Point Computation Software: Optech's REALM 3.4

Flight: WV09604_1A
Base Station solution used: Nailset CVI4 fwd/rev
    GPS Measurement RMS Values
        L1 Phase (mtrs): 0.0133
        C/A Code (mtrs): 0.73
    Baseline Distances:
        Maximum (km): 78.250
        Average (km): 32.684
Base Station solution used: DE9159 (CORS)
    GPS Measurement RMS Values
        L1 Phase (mtrs): 0.0144
        C/A Code (mtrs): 1.79
    Baseline Distances:
        Maximum (km): 65.641
        Average (km): 28.904
Trajectories Computed From: Nailset CVI4
    Average vertical difference: 0.04m
    Average horizontal difference: 0.01m
    Max vertical difference: 0.08m
Max horizontal difference: 0.01m

STATIC NETWORK ADJUSTMENTS & ANALYSIS

Performed Network Adjustment Analysis: Yes
ID of Control Station: HX1559
ID of CORS: DE9159
Names of Stations with NGS Published Position: DE9159, HX1559
Number of Processed Sessions: 4
Minimally Constrained Adjustment Results
    Station Held Fixed: DE9159
    Station Checked: HX1559
        Vertical Check (mtrs): 0.069m
        Horizontal Check (mtrs): 0.3269m

    Station Checked: Nailset
    Vertical Check (mtrs): 0.08
    Horizontal Check (mtrs): 0.00219

Flight 14: WV09604_3A

Base Stations Information

  Station Name: Nailset CVI4
  Station Identification (NGS PID): N/A
  Latitude & Longitude: N 38 41 05.27480 W 80 39 05.74580
  Ellipsoid Height(h): 351.215
  Orthometric Height(H): N/A
  Geoid 99Height(N): N/A
  GPS Base Receiver Unit No.: 2
      Operator: Josh Nimetz
      Receiver Make and Model: Novatel Model Millenium DL, Dual Frequency
      Serial number: S/N#180388
      Antenna Make, Model or Production Number: Novatel Model 503 with choke ring - none
      Antenna Mount: Tripod with ground planes

GPS Airborne Receiver Unit No.: 3
      Operator: Jerome Gregory
      Receiver – Make, Type: Novatel Model Millenium DL, Dual Frequency
      Serial number: S/N#00180388
      Antenna Type: Novatel Model "512" Antenna (designed for use on aircraft)
      Antenna Mount: On roof of Partenavia P68/U (high wing, twin engine) aircraft

POST PROCESSING - KINEMATIC SOLUTIONS

Data Media: Hardrive
Processing Computer & Software: Pentium-V 1Ghz PC, Windows 2000, Waypoint Grafnet 6.03; Grafnav Batch 6.03
Laser Point Computation Software: Optech's REALM 3.4

Flight: WV09604_3A
Base Station solution used: Nailset CVI4 fwd/rev
      GPS Measurement RMS Values
          L1 Phase (mtrs): 0.0155
          C/A Code (mtrs): 0.67
      Baseline Distances:
          Maximum (km): 51.466
          Average (km): 32.635
Base Station solution used: DE9159 (CORS)
      GPS Measurement RMS Values
          L1 Phase (mtrs): 0.0262
          C/A Code (mtrs): 1.45
      Baseline Distances:
          Maximum (km): 69.451
          Average (km): 24.053
Trajectories Computed From: Nailset CVI4
      Average vertical difference: -0.05m
      Average horizontal difference: 0.01m
      Max vertical difference: 0.03m
Max horizontal difference: 0.02m

STATIC NETWORK ADJUSTMENTS & ANALYSIS

Performed Network Adjustment Analysis: Yes
ID of Control Station: HX1559
ID of CORS: DE9159
Names of Stations with NGS Published Position: DE9159, HX1559
Number of Processed Sessions: 4
Minimally Constrained Adjustment Results
      Station Held Fixed: DE9159
      Station Checked: HX1559
            Vertical Check (mtrs): 0.069m
            Horizontal Check (mtrs): 0.3269m

      Station Checked: Nailset
      Vertical Check (mtrs): 0.08
      Horizontal Check (mtrs): 0.00219

Flight 15: WV09604_4A

Base Stations Information

  Station Name: Nailset CVI4
  Station Identification (NGS PID): N/A
  Latitude & Longitude: N 38 41 05.27480 W 80 39 05.74580
  Ellipsoid Height(h): 351.215
  Orthometric Height(H): N/A
  Geoid 99Height(N): N/A
  GPS Base Receiver Unit No.: 2
      Operator: Josh Nimetz
      Receiver Make and Model: Novatel Model Millenium DL, Dual Frequency
      Serial number: S/N#180388
      Antenna Make, Model or Production Number: Novatel Model 503 with choke ring - none
      Antenna Mount: Tripod with ground planes

GPS Airborne Receiver Unit No.: 3
      Operator: Jerome Gregory
      Receiver – Make, Type: Novatel Model Millenium DL, Dual Frequency
      Serial number: S/N#00180388
      Antenna Type: Novatel Model "512" Antenna (designed for use on aircraft)
      Antenna Mount: On roof of Partenavia P68/U (high wing, twin engine) aircraft

POST PROCESSING - KINEMATIC SOLUTIONS

Data Media: Hardrive
Processing Computer & Software: Pentium-V 1Ghz PC, Windows 2000, Waypoint Grafnet 6.03; Grafnav Batch 6.03
Laser Point Computation Software: Optech's REALM 3.4

Flight: WV09604_4A
Base Station solution used: Nailset CVI4 fwd/rev
      GPS Measurement RMS Values
            L1 Phase (mtrs): 0.0151
            C/A Code (mtrs): 0.68
      Baseline Distances:
            Maximum (km): 53.057
            Average (km): 29.214

Base Station solution used: DE9159 (CORS)
GPS Measurement RMS Values
L1 Phase (mtrs): 0.0221
C/A Code (mtrs): 1.40
Baseline Distances:
Maximum (km): 64.641
Average (km): 26.180
Trajectories Computed From: Nailset CVI4
Average vertical difference: 0.02m
Average horizontal difference: 0.01m
Max vertical difference: 0.06m
Max horizontal difference: 0.03m

STATIC NETWORK ADJUSTMENTS & ANALYSIS

Performed Network Adjustment Analysis: Yes
ID of Control Station: HX1559
ID of CORS: DE9159
Names of Stations with NGS Published Position: DE9159, HX1559
Number of Processed Sessions: 4
Minimally Constrained Adjustment Results
Station Held Fixed: DE9159
Station Checked: HX1559
Vertical Check (mtrs): 0.069m
Horizontal Check (mtrs): 0.3269m

Station Checked: Nailset
Vertical Check (mtrs): 0.08
Horizontal Check (mtrs): 0.00219

Flight 16: WV09704_1A

Base Stations Information

Station Name: Nailset CVI4
Station Identification (NGS PID): N/A
Latitude & Longitude: N 38 41 05.27480 W 80 39 05.74580
Ellipsoid Height(h): 351.215
Orthometric Height(H): N/A
Geoid 99Height(N): N/A
GPS Base Receiver Unit No.: 2
Operator: Josh Nimetz
Receiver Make and Model: Novatel Model Millenium DL, Dual Frequency
Serial number: S/N#180388
Antenna Make, Model or Production Number: Novatel Model 503 with choke ring - none
Antenna Mount: Tripod with ground planes

GPS Airborne Receiver Unit No.: 3
Operator: Jerome Gregory
Receiver – Make, Type: Novatel Model Millenium DL, Dual Frequency
Serial number: S/N#00180388
Antenna Type: Novatel Model "512" Antenna (designed for use on aircraft)
Antenna Mount: On roof of Partenavia P68/U (high wing, twin engine) aircraft

POST PROCESSING - KINEMATIC SOLUTIONS

Data Media: Hardrive
Processing Computer & Software: Pentium-V 1Ghz PC, Windows 2000, Waypoint Grafnet 6.03; Grafnav Batch 6.03
Laser Point Computation Software: Optech's REALM 3.4

Flight: WV09704_1A
Base Station solution used: Nailset CVI4 fwd/rev
 GPS Measurement RMS Values
  L1 Phase (mtrs): 0.0171
  C/A Code (mtrs): 0.68
  Baseline Distances:
  Maximum (km): 65.728
  Average (km): 33.742
Base Station solution used: DE9159 (CORS)
 GPS Measurement RMS Values
  L1 Phase (mtrs): 0.0230
  C/A Code (mtrs): 1.36
  Baseline Distances:
   Maximum (km): 46.436
   Average (km): 23.932
Trajectories Computed From: Nailset CVI4
 Average vertical difference: 0.01m
 Average horizontal difference: 0.01m
 Max vertical difference: 0.03m
Max horizontal difference: 0.03m

STATIC NETWORK ADJUSTMENTS & ANALYSIS

Performed Network Adjustment Analysis: Yes
ID of Control Station: HX1559
ID of CORS: DE9159
Names of Stations with NGS Published Position: DE9159, HX1559
Number of Processed Sessions: 4
Minimally Constrained Adjustment Results
 Station Held Fixed: DE9159
 Station Checked: HX1559
  Vertical Check (mtrs): 0.069m
  Horizontal Check (mtrs): 0.3269m

 Station Checked: Nailset
 Vertical Check (mtrs): 0.08
 Horizontal Check (mtrs): 0.00219

Flight 15: WV09704_2A

Base Stations Information

 Station Name: Nailset CVI4
 Station Identification (NGS PID): N/A
 Latitude & Longitude: N 38 41 05.27480 W 80 39 05.74580
 Ellipsoid Height(h): 351.215
 Orthometric Height(H): N/A
 Geoid 99Height(N): N/A

GPS Base Receiver Unit No.: 2
    Operator: Josh Nimetz
    Receiver Make and Model: Novatel Model Millenium DL, Dual Frequency
    Serial number: S/N#180388
    Antenna Make, Model or Production Number: Novatel Model 503 with choke ring - none
    Antenna Mount: Tripod with ground planes

GPS Airborne Receiver Unit No.: 3
    Operator: Jerome Gregory
    Receiver – Make, Type: Novatel Model Millenium DL, Dual Frequency
    Serial number: S/N#00180388
    Antenna Type: Novatel Model "512" Antenna (designed for use on aircraft)
    Antenna Mount: On roof of Partenavia P68/U (high wing, twin engine) aircraft

POST PROCESSING - KINEMATIC SOLUTIONS

Data Media: Hardrive
Processing Computer & Software: Pentium-V 1Ghz PC, Windows 2000, Waypoint Grafnet 6.03; Grafnav Batch 6.03
Laser Point Computation Software: Optech's REALM 3.4

Flight: WV09704_2A
Base Station solution used: Nailset CVI4 fwd/rev
    GPS Measurement RMS Values
        L1 Phase (mtrs): 0.0171
        C/A Code (mtrs): 0.68
    Baseline Distances:
        Maximum (km): 65.728
        Average (km): 33.742
Base Station solution used: DE9159 (CORS)
    GPS Measurement RMS Values
        L1 Phase (mtrs): 0.0230
        C/A Code (mtrs): 1.36
    Baseline Distances:
        Maximum (km): 46.436
        Average (km): 23.932
Trajectories Computed From: Nailset CVI4
    Average vertical difference: 0.01m
    Average horizontal difference: 0.01m
    Max vertical difference: 0.03m
Max horizontal difference: 0.03m

STATIC NETWORK ADJUSTMENTS & ANALYSIS

Performed Network Adjustment Analysis: Yes
ID of Control Station: HX1559
ID of CORS: DE9159
Names of Stations with NGS Published Position: DE9159, HX1559
Number of Processed Sessions: 4
Minimally Constrained Adjustment Results
    Station Held Fixed: DE9159
    Station Checked: HX1559
        Vertical Check (mtrs): 0.069m
        Horizontal Check (mtrs): 0.3269m

Station Checked: Nailset
    Vertical Check (mtrs): 0.08
    Horizontal Check (mtrs): 0.00219

DATA COLLECTION: AIRBORNE & FIELD SURVEYS

Lidar System: Optech ALTM-2025
Serial number: 99D120
Laser wavelength: 1064 nm (near infrared)
Laser Pulse Rate (Hz): 25
Mirror Scan Angle +/- (degrees): 20
Swath Width (mtrs): 1218
Mirror Scanner Frequency (Hz): 18
Positioning of ALTM: IMU provides additional positioning at 50 hertz adjusted to the 1 hertz GPS positions

Airport of Operations: Sutton Airfield
Flight Line Swath Overlap (%): 50
Flight Line Swath Overlap (mtrs): 609
Aircraft Airspeed (mtrs/second): 61.7
Altitude Above Ground: 1676
Maximum Bank of Aircraft Turns (degrees): 20
Conditions Affecting Progress: none

GPS Survey Criteria:
    Epoch Rate (seconds): 1.0
    Minimum Satellites: 6
    Elevation Mask (degrees): 15
    GPS Observables: L1 & L2 Carrier wave, C/A Code and P-Code

Equipment Failures: None
GPS Ground Receivers (Base Stations): 2
Occupied by: Airborne 1

CLASSIFICATION – FEATURE EXTRACTION

Software: Terrascan running in Microstation
Parameters: on file with Airborne 1

ALTM SYSTEM CALIBRATION

Calibration Date: 03/21/04
Calibration Location: Ashland, OR

APPENDICES

Appendix A: Lidar Mapping Report Addendum