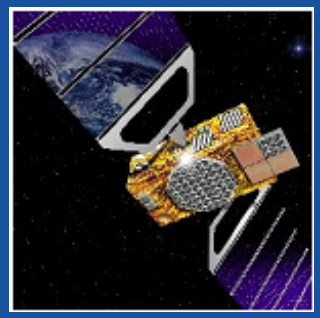
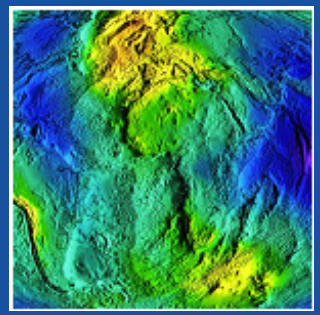


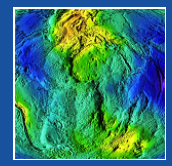


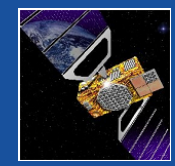
Canadian Height Modernization Study

Implementation Plan Presentation

September 19, 2006

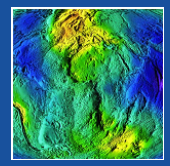
HICKLING ARTHURS LOW
TECHNOLOGY MANAGEMENT, STRATEGY, AND ECONOMICS

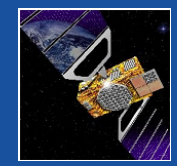




Outline

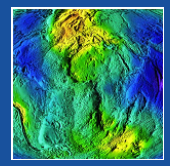
- Vision, Mission, and Objectives
- Rationale for Modernization
- Proposed Approach
- Support of the Stakeholder Community
- Mandates and Responsibilities
- Advantages and Disadvantages
- Impediments, Risks, and Mitigating Actions
- Implementation Activities
- Implementation Schedule

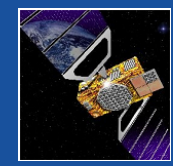




Vision and Mission

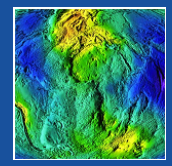
- Vision
  - The CHRS will use a geoid-based datum that allows vertical height to be easily and accurately measured at any location in order to meet the current and future needs of stakeholders for compatibility with GNSS technology and international standards.
- Mission
  - The federal government, in cooperation with the provinces and territories, will provide the models, tools, and information necessary to facilitate the transition to a geoid-based datum for the CHRS.

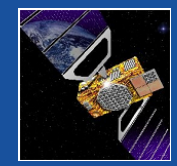




Objectives

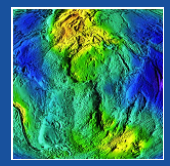
- Geoid Development and Maintenance
- Stakeholder Interaction
- Tools Development
- Education
- Infrastructure Development and Maintenance
- Data Dissemination

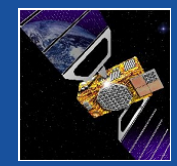




Rationale for Modernization

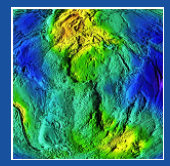
- The physical network is very expensive to maintain because of the large number and extent of benchmarks upon which it depends.
- The datum is only defined at benchmarks, leaving much of the country without access to the height standard.
- The reference system has significant inherent distortions that are further exacerbated by geodynamic movement.
- The system is not directly compatible with GPS-based measurements and therefore will not be in accord with future international standards.

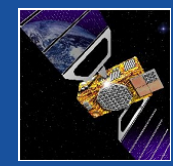




Proposed Approach

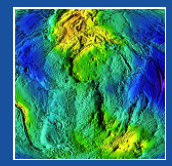
- The proposed approach will be based on a geoid model.
- The new datum will also be accessible through monumented networks:
  - Active Control Points (ACP)
  - Canadian Base Network (CBN)
  - High Precision Networks (HPN)
  - Privately established stations
- Both the traditional and space-based techniques will co-exist through a period of transition lasting decades.
- The definition of the geoid will be consistent for several decades, except for changes due to geodynamics.
- Changes will be less than one metre, but more than 10cm at most locations.

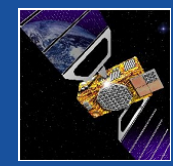




Stakeholder Support

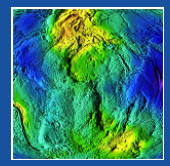
- Overall, the height reference community is supportive of the proposed changes.
- The municipalities are the most reluctant. They are concerned about the maintenance of their legacy data and the costs and confusion of conversion.
- All stakeholders will have the choice of whether to use the new datum.

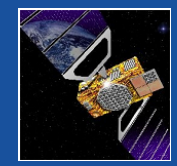




Responsibilities

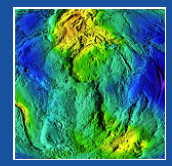
- Federal Government
  - Geoid definition and maintenance
  - Infrastructure provision (CBN, ACP)
  - Data transformation and dissemination
  - Conversion tools and guidelines
  - Stakeholder liaison and facilitation
  - Formal adoption
  - Monitor implementation progress
- Provincial Governments
  - Infrastructure provision (HPN)
  - Stakeholder liaison and facilitation
  - Data transformation and dissemination
  - Consider formal adoption
  - Data and tools dissemination
- Providers and Users
  - Become informed and consider implications
  - Invest in technology and education
  - Education institutions provide training and information

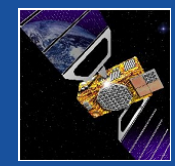




Advantages

- Lower costs for maintenance of the height reference system.
- Lower costs for determining heights, especially in remote or rugged terrain.
- Accessibility to the datum at any point.
- Compatibility with GPS.
- Better compatibility across datasets.
- Improved accuracy.
- Future compatibility with international standards.

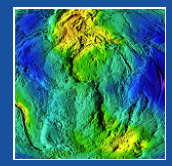


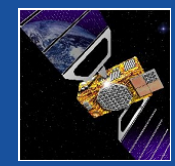


Disadvantages

- Costs of training and equipment.
- Cost of the creation and maintenance of an accurate geoid.
- Cost of communicating changes to stakeholders.
- Possible need to convert legacy databases.
- Possible confusion between the old and new datums.
- Possible need to update legal documents and legislation.

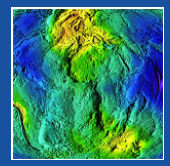
- Note: advantages and disadvantages do not impact all stakeholders equally.

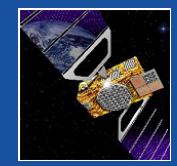




Impediments and Risks

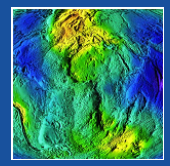
- Dependence on Satellite Technology
  - Problems with the GPS system could result in the unavailability of position data.
- Misunderstandings and Errors
  - The small changes between the old and new datums could result in errors and confusion.
- Maintenance of the New Datum
  - Stakeholders are concerned that the datum will change too often.
  - The earth is dynamic and the geoid will change.
- Resistance to change
  - Stakeholders may be wary of uncertainty and reluctant to change.

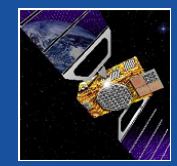




Impediments and Risks (Cont'd)

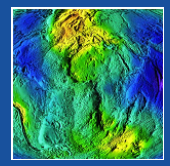
- Transformation of Legacy Data
  - Some stakeholders are concerned about the cost and difficulties of transforming legacy data to the new datum.
- Cost of Implementation
  - The transition period will require information, tools, and data dissemination.
- Implementation Management
  - Stakeholders may not support the datum change unless they feel that they have had the opportunity to guide its implementation.

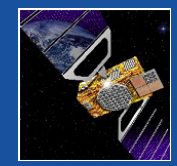




Implementation Activities

- Governance
- Geoid Development and Maintenance
- Stakeholder Interaction
- Tools Development
- Education
- Infrastructure Development and Maintenance
- Data Dissemination
- Formal Adoption
- Monitoring





Implementation Schedule

- 2008 - Anticipated publication of a new geoid model for Canada.
- 2009 - Anticipated availability of a new a vertical datum and tools to assist the transition.
- 2010 - Anticipated adoption of new vertical datum.
- 2010 to 2030 - Transition period.

	2006	2007	2008	2009	2010	…	2030
Geoid development							
Geoid maintenance						…	
Stakeholder communications							
New datum adoption							
Tools development							
Education						…	
Support							
Infrastructure development							
Infrastructure maintenance						…	
Data dissemination							
Transition period						…	