(U) Essential Body of Knowledge (EBK) (U) GEOINT Professional Certification - Applied Sciences: Proficiency Level II 21 July 2021
(U) Core Competency 1 - Cartographic Analysis (10%)
(U) Uses cartographic principles and techniques for the extracting, compiling, manipulating, analyzing, and/or finishing of foundational or other data to create standardized or customized geospatial products and services. Validates the quality and accuracy of geospatial information.
(U) Terminal and Enabling Certification Objectives (TCOs & ECOs)
(U) TCO 1: Comprehend Cartographic Principles
(U) ECO 1.1: Define cartography
(U) ECO 1.2: Discuss the importance of map projections and their uses
(U) ECO 1.3: Name the three surfaces used in the map projection of data
(U) ECO 1.4: Describe the purpose and problems associated with the map projection of data
(U) ECO 1.5: Describe the properties of maps that are preserved with each type of map projection
(U) ECO 1.6: Describe the importance and uses of the two primary grid systems used by NGA and the measuring units used to define the systems
(U) ECO 1.7: Describe the importance and uses of the primary Graticule system used by NGA and the measuring units used to define the system
(U) Core Competency 2 - Coordinate System Analysis (10%)
(U) Analyzes datums, coordinate and grid systems; computes datum transformation parameters; validates geodetic information on Geospatial Intelligence (GEOINT) products. Performs datum transformations between local datums and World Geodetic System 1984 (WGS 84) and coordinate conversions between coordinate systems.
(U) Terminal and Enabling Certification Objectives (TCOs & ECOs)
(U) TCO 2: Identify Coordinate Systems
(U) ECO 2.1: Define coordinate system
(U) ECO 2.2: Understand the commonly used coordinate systems
(U) ECO 2.3: Describe the purpose of the Geographic Translator (GEOTRANS) software

(U) Core Competency 3 - Geographic Information Systems (GIS) Based Analysis (12%) (U) Utilizes GIS applications for mission planning, geo-positional data display, reconnaissance, and proximity analysis. Renders data using GIS tools. Performs static, dynamic, and predictive analysis on data. Uses GIS in data validation and modeling to answer questions of interest to the Intelligence Community (IC) and National System for Geospatial Intelligence (GEOINT) (NSG)
(U) Terminal and Enabling Certification Objectives (TCOs & ECOs)
(U) TCO 3: Apply GIS Methods
(U) ECO 3.1: Apply GIS-based grid interpolation, spatial propagation, and attribution methods
(U) ECO 3.2: Apply statistical methods to GEOINT
(U) ECO 3.3: Apply spatial data editing to GEOINT
(U) Core Competency 4 - Information Security (7%) (U) Applies knowledge of policies, procedures, and requirements established under appropriate authorities to protect information.
(U) Terminal and Enabling Certification Objectives (TCOs & ECOs)
(U) TCO 4: Apply Knowledge of Information Security
(U) ECO 4.1: Understand the handling and dissemination of classified and proprietary, or other sensitive but unclassified information
(U) ECO 4.2: Apply proper derivative classification to products or models created from data at multiple classification levels
(U) Core Competency 5 - Mathematics (14%) (U) Application of mathematical disciplines.
(U) Terminal and Enabling Certification Objectives (TCOs & ECOs)
(U) TCO 5: Apply Fundamentals of Basic Trigonometry
(U) ECO 5.1: Name and define the six trigonometric functions
(U) ECO 5.2: Convert angular measurement to radians
(U) TCO 6: Comprehend Fundamentals of Spherical Trigonometry
(U) ECO 6.1: Explain the difference between spherical and planar trigonometry
(U) ECO 6.2: Explain the use of spherical trigonometry in applied sciences
(U) TCO 7: Apply Fundamentals of Vector Analysis
(U) ECO 7.1: Identify differences between vector and scalar

(U) ECO 7.2: Compute distances and angles between vectors
(U) TCO 8: Know Fundamentals of Linear Algebra and its Applications to Geodetic, Bathymetric, and Photogrammetric Data
(U) ECO 8.1: Define matrix, matrix addition, multiplication, transpose, and inverse
(U) ECO 8.2: State applications of matrices in processing geodetic, bathymetric, and photogrammetric data
(U) TCO 9: Understand derivatives, partial derivatives, and their importance to Geodetic, Bathymetric, and Photogrammetric Data
(U) ECO 9.1: Define derivative and partial derivatives
(U) ECO 9.2: Describe applications of derivatives and partial derivatives to computing geodetic, bathymetric, and photogrammetric data
(U) Core Competency 6 - Statistical Analysis (17%) (U) Identify and apply appropriate statistical tools and techniques to examine data, reach conclusions, gain insights, and determine trends.
(U) Terminal and Enabling Certification Objectives (TCOs & ECOs)
(U) TCO 10: Identify Fundamentals of Statistics and Their Applications to Geodetic, Bathymetric, and Photogrammetric Data
(U) ECO 10.1: Define descriptive statistics (e.g. mean, median, mode, range, variance and standard deviation)
(U) ECO 10.2: List applications of statistics to geodetic, bathymetric, and photogrammetric data
(U) TCO 11: Comprehend Fundamentals of Least Squares Adjustments and Their Applications to Geodetic and Photogrammetric Data
(U) ECO 11.1: Define least squares curve fitting and residual values
(U) ECO 11.2: Define types of errors
(U) ECO 11.3: Explain applications of least squares adjustments to geodetic and photogrammetric data
(U) TCO 12: Comprehend Fundamentals of Precision and Accuracy
(U) ECO 12.1: Describe the difference between precision and accuracy
(U) ECO 12.2: Describe the sample statistics for precision and accuracy

(U) Core Competency 7 - Tools and Methods (30%) (U) Apply tools and methods to substantive discipline, domain, or area of work. Adapt existing tools or methods or employ new methodological approaches required for substantive discipline, domain, or area of work.
(U) Terminal and Enabling Certification Objectives (TCOs & ECOs)
(U) TCO 13: Comprehend Fundamental Geodetic Principles
(U) ECO 13.1: Name three different types of latitude used in geodesy
(U) ECO 13.2: Define a geodesic curve
(U) ECO 13.3: State the four defining parameters of the World Geodetic System 1984 (WGS 84) ellipsoid
(U) ECO 13.4: Describe the significance and complex nature of datum mismatches and transformations
(U) ECO 13.5: Describe the three fundamental surfaces of geodesy
(U) ECO 13.6: Describe positioning, navigation, and timing as they relate to applied sciences
(U) ECO 13.7: Describe Earth's magnetic field and its impacts on navigation
(U) ECO 13.8: Discuss the importance of geodetic principles (e.g. datums, map projections) in mapping
(U) TCO 14: Comprehend Geodetic Surveying Principles
(U) ECO 14.1: List reasons for conducting a geodetic survey
(U) ECO 14.2: Describe the difference between geodetic and plane surveying
(U) ECO 14.3: Describe horizontal and vertical control
(U) ECO 14.4: Describe triangulation, trilateration, and traverse surveying methods
(U) ECO 14.5: Define vertical surveying techniques
(U) ECO 14.6: Define astronomic latitude and longitude
(U) ECO 14.7: Describe the principles of gravity surveying
(U) ECO 14.8: Describe the importance of pre-testing survey instruments prior to deployment
(U) TCO 15: Comprehend Physical Geodesy Principles
(U) ECO 15.1: Describe gravity and gravitational theory
(U) ECO 15.2: Describe gravitational potential and acceleration
(U) ECO 15.3: Define different types of gravity anomalies
(U) ECO 15.4: Describe gravimetric analysis and modeling
(U) ECO 15.5: Explain causes of variations in the Earth's gravity field

(U) ECO 15.6: Describe how gravity affects various weapon and navigation systems
(U) ECO 15.7: Name the types of gravity measurements
(U) ECO 15.8: Define an equipotential surface
(U) ECO 15.9: Define the term geoid
(U) ECO 15.10: Describe deflection of the vertical and its importance
(U) TCO 16: Comprehend Satellite Geodesy Principles
(U) ECO 16.1: Define satellite geodesy and list its applications to Geospatial Intelligence (GEOINT)
(U) ECO 16.2: Describe the purpose and methods of satellite altimetry
(U) ECO 16.3: Explain how satellite altimetry data can be used to derive gravity values
(U) TCO 17: Comprehend Geotechnical Principles
(U) ECO 17.1: Describe climate and meteorological factors influencing geotechnical analysis
(U) ECO 17.2: Describe basic soil & geology characteristics that influence geotechnical analysis
(U) ECO 17.3: Describe weathering processes and their effects on terrain
(U) ECO 17.4: Describe basic coastal processes
(U) ECO 17.5: Describe basic fluvial hydrology
(U) ECO 17.6: Describe the processes influencing geohazards
(U) TCO 18: Comprehend Bathymetric Principles
(U) ECO 18.1: Define bathymetry and hydrography
(U) ECO 18.2: Describe marine surveying techniques
(U) ECO 18.3: Explain the causes and characteristics of tides, and the determining factors in their vertical ranges
(U) ECO 18.4: Identify U.S. Government and non-U.S. Government bathymetric survey data sources
(U) ECO 18.5: Describe the integration of hydrographic survey data (e.g. sound speed, motion)
(U) ECO 18.6: Explain tidal datums and their relationship to a chart datum
(U) ECO 18.7: Describe NGA's responsibility as a charting authority
(U) ECO 18.8 Explain missions of international standard-producing bodies (e.g. International Maritime Organization, International Hydrographic Organization)
(U) ECO 18.9 Describe the effects of ocean properties on sound propagation
(U) ECO 18.10 List reasons for conducting a hydrographic survey

(U) TCO 19: Comprehend Orbital Mechanics and Global Navigation Satellite System (GNSS) Principles
(U) ECO 19.1: Describe orbital motion and the fundamentals of orbital mechanics
(U) ECO 19.2: Describe orbital effects on ground tracks
(U) ECO 19.3: Describe satellite perturbation
(U) ECO 19.4: Describe the principles of orbital maneuvering
(U) ECO 19.5: Explain NGA's role in GNSS operations
(U) ECO 19.6: Describe the methods used to estimate orbits for GNSS
(U) ECO 19.7: Explain how GNSS computes a position and velocity on the ground
(U) ECO 19.8: Define Earth Orientation and associated parameters
(U) ECO 19.9: Explain how and why Earth Orientation Parameters are used to determine the Earth Orientation Parameter Predictions
(U) TCO 20: Comprehend Photogrammetric Principles
(U) ECO 20.1: Describe the difference between a physical sensor model and a replacement sensor model (RSM) (e.g. Rational Polynomial Coefficients (RPC))
(U) ECO 20.2: Identify the types of imagery sensors
(U) ECO 20.3: Describe the role of convergence angle in stereo collection and viewing
(U) ECO 20.4: Describe the purpose of triangulation and its applications (e.g. derive 3D coordinates)
Scale (NIIRS)
(U) ECO 20.6: Describe the steps and inputs required for image orthorectification
(U) ECO 20.7: Define Digital Elevation Model (DEM)
(U) ECO 20.8: Understand standard DEM types, NGA DEM products, and their uses
(U) ECO 20.9: Explain the concept of spatial resolution/post spacing as it relates to a DEM
(U) ECO 20.10: Describe how remotely sensed data sources are used to generate a digital elevation model (DEM) (e.g. radar, LiDAR, electro-optical)