

Updated: Aug 2004
Review: Jan 2006

**NATIONAL ICE CENTER
NAVAL ICE CENTER
ICE ANALYST
JOB QUALIFICATION REQUIREMENTS (JQR)**



Analyst Candidate: _____

Assigned Mentor: _____

Estimated Completion Date: _____

INTRODUCTION

Sea ice analysis is a task requiring the integration of multiple sources of real time environmental information with a basic understanding of the processes that influence ice formation, growth, movement and decay.

In addition to this basic knowledge, the principles of remote sensing, codes, geographic information systems, and procedures unique to the National/Naval Ice Center (NIC) all complete the core knowledge required to attain qualification as an Ice Analyst.

This Job Qualification Requirement (JQR) is intended to act as a guide in qualifying new NIC personnel as Ice Analysts. Used in conjunction with the Analyst Workbook and practical experience, it will provide you with the tools needed to interpret, analyze and map sea ice data at the NIC.

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Pre -Requisites

Required:

B.S. in Meteorology or Aerographers Mate "C" School.

OR

Aerographer's Mate "C" school, "C" school requirements, or *Meteorology Today* completed.

Complete Production Team JQR. _____
Mentor Signature Date

Mentor Signature Date

Read and review with mentor the OP's Department Directive #1.

Candidate Signature Date

Mentor Signature Date

Obtain Job Aids From Mentor:

Theoretical Ice Thickness Thresholds
Standard Egg Symbology Handout
SIGRID Handout
Temperature/Ice Growth Gouge
Satellite Handout
Information Technology Network Infrastructure Diagram
RADARSAT Interpretation Guide

Signature Date

Module 1 - Ice Physics/Terminology

References:

1. Ice Physics Computer Based Training (CBT)
2. Ice Tutor Visual Recognition CBT
3. WMO Sea Ice Nomenclature, Pub No. 259, Supplement 5, 1989, Updated 2004, Vol I, Part I and II
4. CIS MANICE

1. Complete the Ice Physics CBT and final test.

Ice Physics CBT Score: _____

2. Complete Analyst Workbook Section 1 - Ice Physics/Terminology.

Mentor Signature Date

3. Review Analyst Workbook Section 1, Ice Physics/Terminology with a qualified analyst/forecaster.

Analyst/Forecaster Signature Date

Supplementary reading/websites:

Environment Canada, 1984, Ice Observer Extension Course, *Ice Terminology/Symbology*
U. S Navy/NOAA Joint Ice Center, 1981, *Joint Ice Observation Handbook*
“Ice in the Oceans”, Peter Wadhams

Module 2 - Visual Recognition of Ice/Terminology

References:

1. Ice Tutor Visual Recognition CBT
2. WMO Sea Ice Nomenclature, Pub 259, Vol II, Illustrated Glossary
3. CIS MANICE
4. Environment Canada, 1984, Ice Observer Extension Course, *Ice Terminology/Symbology*
5. Observers Guide to Sea Ice, NOAA

1. Complete the Ice Tutor Visual Recognition CBT, Module 1 and final test.

Ice Tutor CBT Score: _____

2. Complete Analyst Workbook Section 2 - Visual Recognition of Ice/Terminology.

Mentor Signature Date

3. Review Analyst Workbook Section 2, Visual Recognition of Ice/Terminology with a qualified analyst/forecaster.

Analyst/Forecaster Signature Date

Module 3 - Egg Code/SIGRID/Ice Codes

References:

1. CIS MANICE
2. WMO Sea Ice Nomenclature Pub 259, Vol III, International System of Sea Ice Symbols
3. WMO International Meteorology Codes (WMO 306)
4. METOC Codes Manual
5. Environment Canada, 1984, Ice Observer Extension Course, *Ice Terminology/Symbology*
6. NIC Website - World Meteorological Organization (WMO) Gridded SIGRID Format for Sea Ice
7. NIC Website - Ice Code Symbology
8. Canadian Ice Service Education Page, <http://ice-glaces.ec.gc.ca>

1. Review Canadian Ice Services Web Site Education Page - Ice Codes at <http://ice-glaces.ec.gc.ca>.

Signature Date

2. Review Ship Synoptic Code - Ice Code in METOC Codes Manual.

Signature Date

3. Review WMO Sea Ice Nomenclature Pub 259, Vol III, International System of Sea Ice Symbols.

Signature Date

4. Complete Analyst Workbook Section 3 - Egg Code/SIGRID/Ice Codes.

5. Review Analyst Workbook Section 3, Egg Code/SIGRID/Ice Codes with a qualified analyst/forecaster.

Analyst/Forecaster Signature Date

Module 4 - Remote Sensing

A. RADARSAT

References:

1. Ice Tutor CBT, Module 2, SAR Imagery Interpretation, Chapter 1
2. NIC Satellite Handout
3. Information Technology Network Infrastructure Diagram
4. RADARSAT SOP

1. Review Ice Tutor CBT- Module 2: SAR Imagery Interpretation, Chapter 1, SAR Imagery Interpretation and complete section test.

Signature Date

2. Complete Analyst Workbook Section 4A - Remote Sensing- RADARSAT.

3. Review Analyst Workbook Section 4A, Remote Sensing with a qualified analyst/forecaster.

Analyst/Forecaster Signature

Date

Supplementary readings/websites:

Satellite Active Archive Website, www.saa.noaa.gov
RADARSAT Geology Handbook- JQR Library
RADARSAT Illuminated - JQR Library
Sabins Jr., F., 2000, *Remote Sensing: Principles and Interpretation*
RADARSAT International <website> <http://www.rsi.ca/>. (Resources/Ice).
Canada Centre for Remote Sensing <website> <http://www.ccrs.nrcan.gc.ca>
Environment Canada, *SAR Ice Interpretation Guide*. (Binder)

**B. Defense Meteorological Satellite Program (DMSP)
OPERATIONAL LINE SCAN (OLS)
SPECIAL SENSOR MICROWAVE IMAGING (SSM/I)**

References:

1. DMSP Satellite and OLS Sensor CBT
2. SSM/I CBT/Storyboards
2. NIC Information Technology Network Infrastructure Diagram
3. NIC Satellite Handout
4. DMSP User's Guide

1. Review OLS CBT, Chapter 1 OLS Satellite and Sensors and complete chapter test.

Signature

Date

2. Review SSM/I CBT, Chapter 1, DMSP Satellite and SSM/I Sensor. Complete chapter test.

Signature

Date

3. Complete Analyst Workbook Section 4B - Remote Sensing- DMSP OLS/SSMI.

5. Review Analyst Workbook Section 4B, Remote Sensing-DMSP OLS/SSMI with a qualified analyst/forecaster.

Analyst/Forecaster Signature

Date

Supplementary readings/websites:

1. Air Force Space Command Website: www.spacecom.af.mil/HQAFSPC/Library/FactSheets
2. National Geophysical Data Center <website> <http://dmsp.ngdc.noaa.gov/dmsp.html>
3. *Microwave Remote Sensing of Sea Ice*, Frank D. Carsey, editor
4. Sabins Jr., F., 2000, *Remote Sensing: Principles and Interpretation*. (Chapter 6)
5. Special Sensor Microwave/Imager (SSM/I) User's Interpretation Guide, April 1991
6. Satellite Active Archive Website, <http://www.saa.noaa.gov>
7. FNMOC Website, www.fnoc.navy.mil

C. Television and Infrared Observation Satellite (TIROS) Advanced Very High Resolution Radiometer (AVHRR)

References:

1. AVHRR CBT, Chapter 1 NOAA Satellite and AVHRR Sensor
2. Information Technology Network Infrastructure Diagram
3. NIC Satellite Handout

1. Review AVHRR CBT, Chapter 1 AVHRR Satellite and Sensors and complete chapter test.

Signature

Date

2. Complete Analyst Workbook Section 4C - Remote Sensing- AVHRR.
3. Review Analyst Workbook Section 4C, Remote Sensing-AVHRR with a qualified analyst/forecaster.

Analyst/Forecaster Signature

Date

Supplementary readings/websites:

NOAA Website, <http://www.oso.noaa.gov>

Sabins Jr., F., 2000, *Remote Sensing: Principles and Interpretation*

Satellite Active Archive Website, <http://www.saa.noaa.gov>

D. Supplemental Satellite Sensors/Data

References:

1. NIC Satellite Handout
2. Catch the Wind: The QuikScat Story Video
3. Satellite Active Archive Website , <http://www.saa.noaa.gov>
4. Information Technology Network Infrastructure Diagram
5. European Space Agency, <http://www.esa.int>
6. MODIS Website, <http://modarch.gsfc.nasa.gov>
7. NIC Reference Binders - QuikScat, ESA, Modis

1. Review *Catch the Wind: The QuikScat Story Video*.

Signature

Date

2. Complete Analyst Workbook Section 4D - Remote Sensing- Supplemental Satellite Sensors/Data.
3. Review Analyst Workbook Section 4D, Remote Sensing- Supplemental Satellite Sensors/Data with qualified analyst/forecaster.

Analyst/Forecaster Signature

Date

Supplementary Readings/websites:

Jet Propulsion Laboratory Website, <http://www.jpl.nasa.gov>

Module 5 - Imagery Interpretation

References:

1. RADARSAT Interpretation Guide (JQR Handout)
2. Ice Tutor CBT, Module 2, Chapter 2 and 3, SAR Imagery Interpretation
3. AVHRR CBT, Chapter 2 AVHRR Interpretation
4. OLS CBT, Chapter 2, OLS Interpretation
5. SSM/I CBT/Storyboards, Chapter 2 SSM/I Sea Ice Products
6. Local Directives and Standard Operating Procedures (SOP)

1. Review Ice Tutor CBT- Module 2: SAR Imagery Interpretation, Chapter 2 and 3, SAR Imagery Interpretation and complete section test.

Signature Date

2. Review OLS CBT, Chapter 2, OLS Interpretation and complete chapter test.

Signature Date

3. Review SSM/I CBT, Chapter 2, SSM/I Sea Ice Products and complete chapter test.

Signature Date

4. Review AVHRR CBT, Module 2, AVHRR Interpretation and complete chapter test.

Signature Date

5. Complete Analyst Workbook Section 5 - Imagery Interpretation.

6. Review Analyst Workbook Section 5, Imagery Interpretation with a qualified analyst/forecaster.

Analyst/Forecaster Signature Date

Supplementary readings/websites:

SAR Imaging of Sea Ice and Image Interpretation Techniques
Canada Centre for Remote Sensing, <http://www.ccrs.nrcan.gc.ca/ccrs/learn/tutorials>
Sabins Jr., F., 2000, Remote Sensing: Principles and Interpretation
RADARSAT Geology Handbook

MODULE 6 - Analysis Procedures

References:

1. SIPAS SOP
2. Remote View Professional User Manual and Student Workbook
3. METADATA SOP
4. General Analysis Procedures SOP

1. Review SIPAS Operating Procedures SOP.

Signature Date

2. Review Remote View Professional User Guide

Signature Date

3. Complete Analyst Workbook Section 6 - Analysis Procedures.

4. Review Analyst Workbook Section 6, Analyst Procedures with a qualified analyst/forecaster.

Analyst/Forecaster Signature Date

MODULE 7 - Analysis Tools

References:

1. FNMOC Home Page www.fnoc.navy.mil
2. PIPS Reference Binder
3. WISIF Reference Binder
4. NOGAPS Reference Binder
5. IABP Reference Binder
6. Local Directives and Standard Operating Procedures (SOP)
7. NIC Reference Binders
8. International Ice Products

1. Complete Analyst Workbook Section 7, Analysis Tools with a qualified analyst/forecaster.

Analyst/Forecaster Signature Date

Module 8 - Polar Meteorology

References:

1. Forecasters Handbook for the Arctic
2. Forecasters Handbook for McMurdo Station
3. Arctic Climatology and Meteorology Primer for Newcomers to the North Binder
4. *Essentials of Oceanography*, Chapter 6 and 7
5. *Aerographer's Mate 1 & C*
6. *Antarctic Meteorology and Climatology*, J.C. King and J. Turner
7. *Ice in the Oceans*, Peter Wadhams
8. Antarctic Weather Reference Binder

1. Review the Arctic Climatology and Meteorology reference binder.

Signature Date

2. Review the Antarctic weather reference binder.

Signature

Date

3. Complete Analyst Workbook Section 8 - Polar Meteorology.
4. Review Analyst Workbook Section 8, Polar Meteorology with a qualified analyst/forecaster.

Analyst/Forecaster Signature

Date

Module 9 - Climatology

References:

1. Climatology CBT/Storyboards
2. 11 Year Climatology
3. Forecasters Handbook for the Arctic
4. NIMA Sailing Direction Series
5. Arctic Climatology and Meteorology Primer for Newcomers to the North Binder
6. Essentials of Oceanography, Chapter 6 and 7
7. Aerographer's Mate 1 & C
8. Antarctic Meteorology and Climatology, J.C. King and J. Turner
9. EWG
10. Pass Down Binders
11. Compendium of Arctic Information,
12. General Analysis Procedures SOP

1. Review Climatology CBT/Storyboards and complete final tests.

Signature

Date

5. Complete Analyst Workbook Section 9 - Climatology.
6. Review Analyst Workbook Section 9, Climatology with a qualified analyst/forecaster.

Analyst/Forecaster Signature

Date

Module 10 - Special Support

References:

1. NIC Standard Operating Procedures; FLAP, SPAROS, ICEHAZ, ANNOTATED IMAGERY, OTSR
2. US Navy Meteorological and Oceanographic Support Manual, NAVMETOCINST 3140.1 Series
3. On-the-Job Training (OJT)

1. Review Chapter 2 and Chapter 4 of NAVMETOCINST 3140.1

Signature Date

2. Complete Analyst Workbook Section 10 - Special Support.

3. Review Analyst Workbook Section 10, Special Support with a qualified analyst/forecaster.

Analyst/Forecaster Signature Date

Module 11 - Duty Ice Procedures

References:

1. NIC Standard Operating Procedures for Duty Ice
2. Duty Ice Check-Off Sheet

1. Review Duty Ice SOP. and Check-Off Sheet.

Signature Date

2. Complete Analyst Workbook Section 11 - Duty Ice Procedures .

3. Review Analyst Workbook Section 11, Duty Ice Procedures with a qualified Duty Ice watchstander.

Duty Ice Signature Date

Module 12 - Naval Meteorology and Oceanography Command/Liaison

References:

1. NAVMETOCCOMINST 3140.1(Series)
2. International Ice Patrol Website, <http://www.uscg.mil/lantarea/iip/home>
3. NIC Standard Operating Procedures
4. NIC Web Page

1. Review Chapter 1 of NAVMETOCINST 3140.1

Signature Date

2. Complete Analyst Workbook Section 12 - Naval Meteorology Command/Liaison.

3. Review Analyst Workbook Section 12, CNMOC/Liaison with a qualified analyst/forecaster.

Analyst/Forecaster Signature Date

QUALIFICATION AS ICE ANALYST

Name: _____

JQR requirements for Ice Analyst have been completed. Date: _____

Ice Analyst Qualification Test has been completed. Date: _____

Ice Analyst Workbook has been completed. Date: _____

Ice Analyst Practical Exercises has been completed. Date: _____

Ice Analyst board completed. Date: _____

Training Officer Signature: _____

RECOMMENDED: _____ DATE: _____
(Department Head)

RECOMMENDED: _____ DATE: _____
(Executive Officer)

QUALIFIED: _____ DATE: _____
(Commanding Officer)

SERVICE RECORD ENTRY DATE: _____

