Graphical Area Forecasts

Friends and Partners of Aviation Weather

Jack May
Aviation Weather Center

October 22, 2002

Briefing Outline

- Current Product Suite
- Why the Change to a Graphical Aviation Forecast?
- New Product Recommendations Suite
- Examples
- Differences
- Production and Development Issues

Current U.S. Product Suite

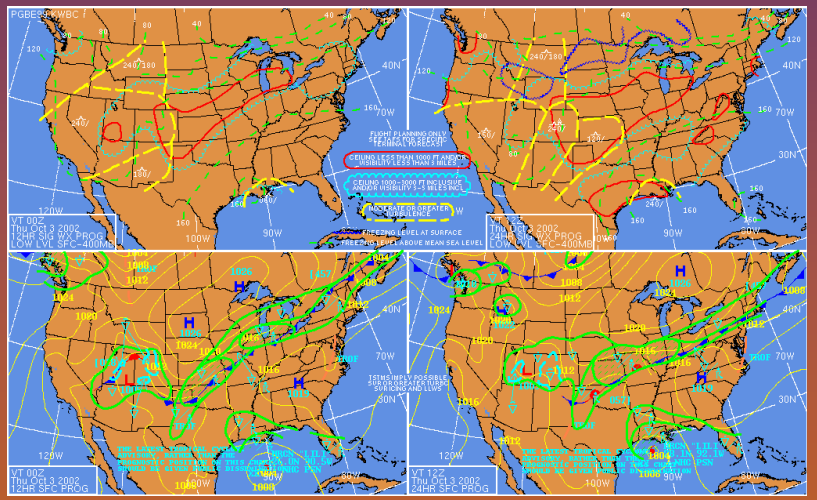
Text

- Free Text Area Forecast
  - Forecast of Visual Flight Rules (VFR) clouds and Weather
  - Location referenced by states and portions of states
  - Do not include low ceilings and visibility. User referred to AIRMET Sierra.
  - May differ from details of latest Low Level Chart.

Current Product Suite

Graphics

- Low Level Chart
  - 12 hour Snapshots
  - Features of Low Level Chart not parsable
- Temporal and Spatial Context
  - Area Forecast and LL Chart provide information SFC to FL450
  - Area Forecast is a 12 hour forecast with a 6 hour outlook
  - Area Forecast issued 3 times a day for 6 domestic regions



Examples: Current Product Suite

- Area Forecasts
- Boston FA

SYNOPSIS...AT 18Z CDFNT 100 NW NRN ME-ERN LH-NRN WI. TROF SRN ME CSTLN-CAPE COD-FAR SERN VA. BY 12Z CDFNT ME-CSTLN-SRN VT-CNTRL LE-SRN WI. LOW OVR MD CSTL WTRS WITH STNR FNT TO ERN NC..ALSO XTNDG NEWD FROMLOW. ..HENDERSON..

ME NH VT
NRN ME···BKN070 TOPS 090. 00Z SCT060. 05Z SKC.
OTLK···VFR.
NH VT SRN ME···SCT070. 23Z SKC OCNL SCT CI. OTLK···VFR
BECMG MVFR VLYS 08Z.

MA RI CT
SCT050. 23Z SCT-BKN CI. OTLK···VFR

NY LO
LO WRN/CNTRL/NERN NY···SCT060. 23Z SCT CI. OTLK···VFR

PA NJ
SCT060. 00Z SCT-BKN CI. OTLK···MVFR BR

MA DC DE VA
MD DC DE NRN VA···SCT060 SCT-BKN100 TOPS TO 150.
ISOL SHRA. OTLK···MVFR BR
SWRN/S CNTRL/SERN VA···BKN-OVC030-040 LYRD TO 150.
VIS OCNL 4-5SM SHRA. WDLY SCT TSRA SWRN VA···ISOL

Examples: Current Product Suite

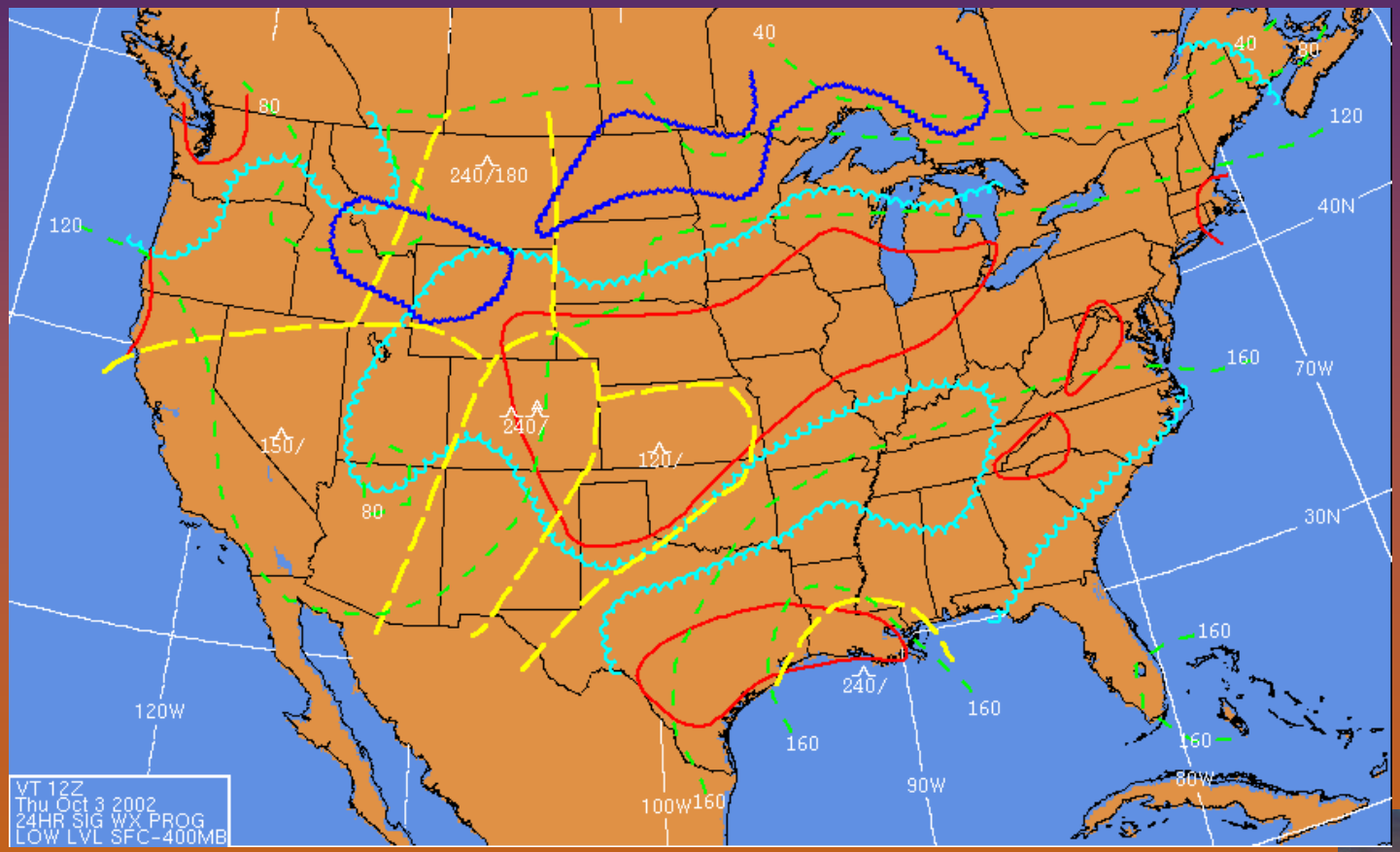
- AIRMETs
  - Sierra
  - Tango
  - Zulu

AIRMET SIERRA UPDT 4 FOR IFR AND MTN OBSN VALID UNTIL 262000
AIRMET MTN OBSCN…WV VA
FROM EKN TO CSN TO 30N GSO TO HMV TO 40 WSW BKW TO EKN…MTNS OCNL OBSCD BY CLDS/PCPN BR. CONDS END 16-18Z.
AIRMET IFR…VA
FROM RIC TO ORF TO 40NE RDU TO HMV TO PSK TO RIC OCNL CIG BLW 010/VIS BLS 3SM BR. CONDS ENDG 15-16Z. ELSW… NO WDSPRD IFR EXP.

AIRMET TANGO UPDT 2 FOR TURB VALID UNTIL 262000
AIRMET TURB…NH VT MA RI CT NY LE LO PA OH
FROM MPV TO BOS TO ACK TO SAX TO JST TO HNN TO CVG TO FWA TO DXO…OCNL MOD TURB BTN FL280 AND FL350 DUE TO WIND SHEAR ASSOCD WITH JTST. CONDS ENDG 20Z.
RMNDR…NO SGFNT TURB EXP EX INVOF CNVTV ACT.

AIRMET ZULU UPDT 2 FOR ICE AND FRZLVL VALID UNTIL 262000.
NO SGFNT ICE EXP OUTSIDE OF CNVTV ACT.
FRZLVL…120-130 E OF YYZ-ERI-AIR-GSO LN..110-130 NRN ME..RMNDR 130-150.

LOW LEVEL WEATHER CHART



Disadvantages of Current Suite

- Constructed with words and contractions
  - Difficult to 'draw a picture' with words.
  - Character limitation of ~3900 characters
    - Further reduces detail, compromises accurate description
  - AIRMETs are time smeared and defined with simple polygons.
    - Results in advisories where forecaster never intended.
    - Results in advisories when forecaster never intended.

Aviation Weather Center (AWC) - Graphical Possibilities - Netscape

File Edit View Go Communicator Help

Back Forward Reload Home Search Netscape Print Security Shop Stop

Bookmarks Location: http://aviationweather.noaa.gov/test/possibilities.html What's Related

Instant Message WebMail Radio People Yellow Pages Download Calendar Channels RealPlayer

AWC

Graphical Possibilities:

Maps:

- [x] Terrain
- [ ] VORs
- [ ] States
- [ ] Airports
- [ ] ARTCC
- [ ] TWEB

Area Forecast:

- [ ] Icing
- [ ] IFR

Turbulence:

- [ ] Hi
- [ ] Lo

AIRMETs:

- [ ] Icing
- [ ] IFR
- [ ] MTOS
- [ ] Turb

SIGMETs:

- [ ] WS
- [ ] WST

PIREPs:

- [ ] Icing
- [ ] Turb

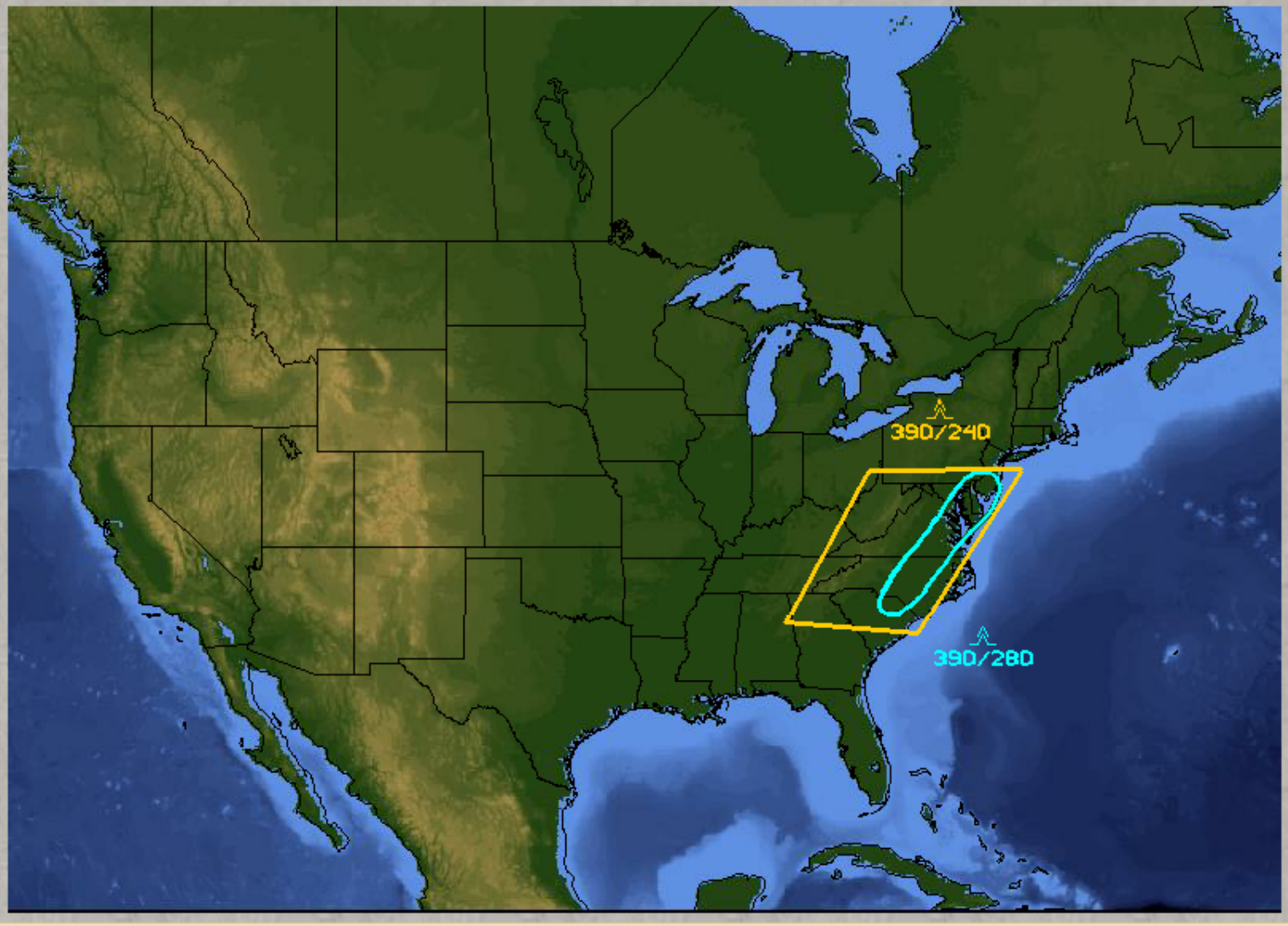
Misc:

- [ ] METARs no Wind
- [ ] Radar Reflectivity

4 km Satellite:

- [ ] Vis/Fog
- [ ] IR
- [ ] Water Vapor

RESET



Graphical Possibilities

Aviation Weather Center (AWC) - Graphical Possibilities - Netscape

File Edit View Go Communicator Help

Back Forward Reload Home Search Netscape Print Security Shop Stop

Bookmarks Location: http://aviationweather.noaa.gov/test/possibilities.html

Instant Message WebMail Radio People Yellow Pages Download Calendar Channels RealPlayer

AWC

Graphical Possibilities:

Maps:

- [x] Terrain
- [ ] VORs
- [ ] States
- [ ] Airports
- [ ] ARTCC
- [ ] TWEB

Area Forecast:

- [ ] Icing
- [ ] IFR

Turbulence:

- [ ] Hi
- [ ] Lo

AIRMETs:

- [ ] Icing
- [ ] IFR
- [ ] MTOS
- [ ] Turb

SIGMETs:

- [ ] WS
- [ ] WST

PIREPs:

- [ ] Icing
- [ ] Turb

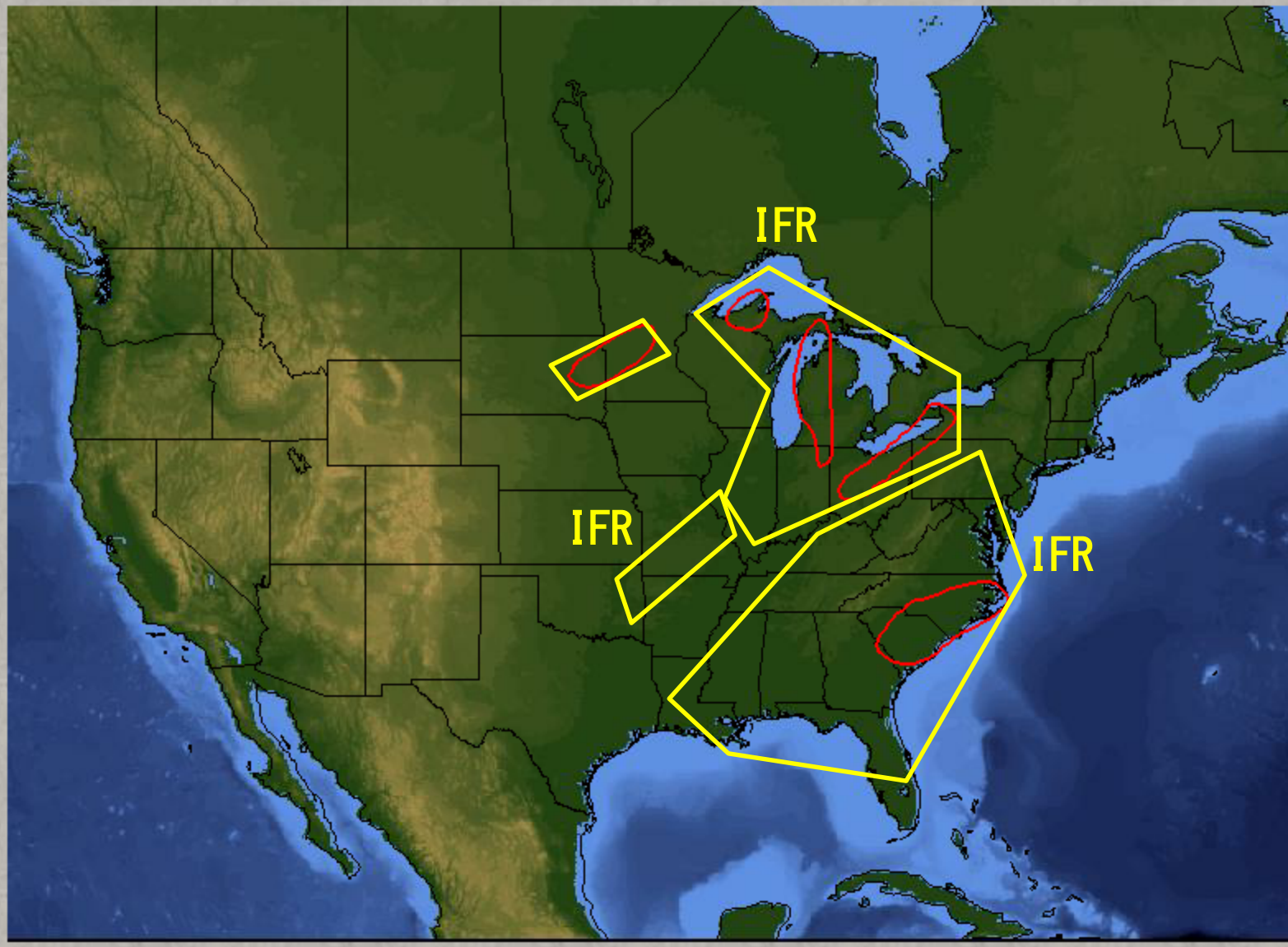
Misc:

- [ ] METARs no Wind
- [ ] Radar Reflectivity

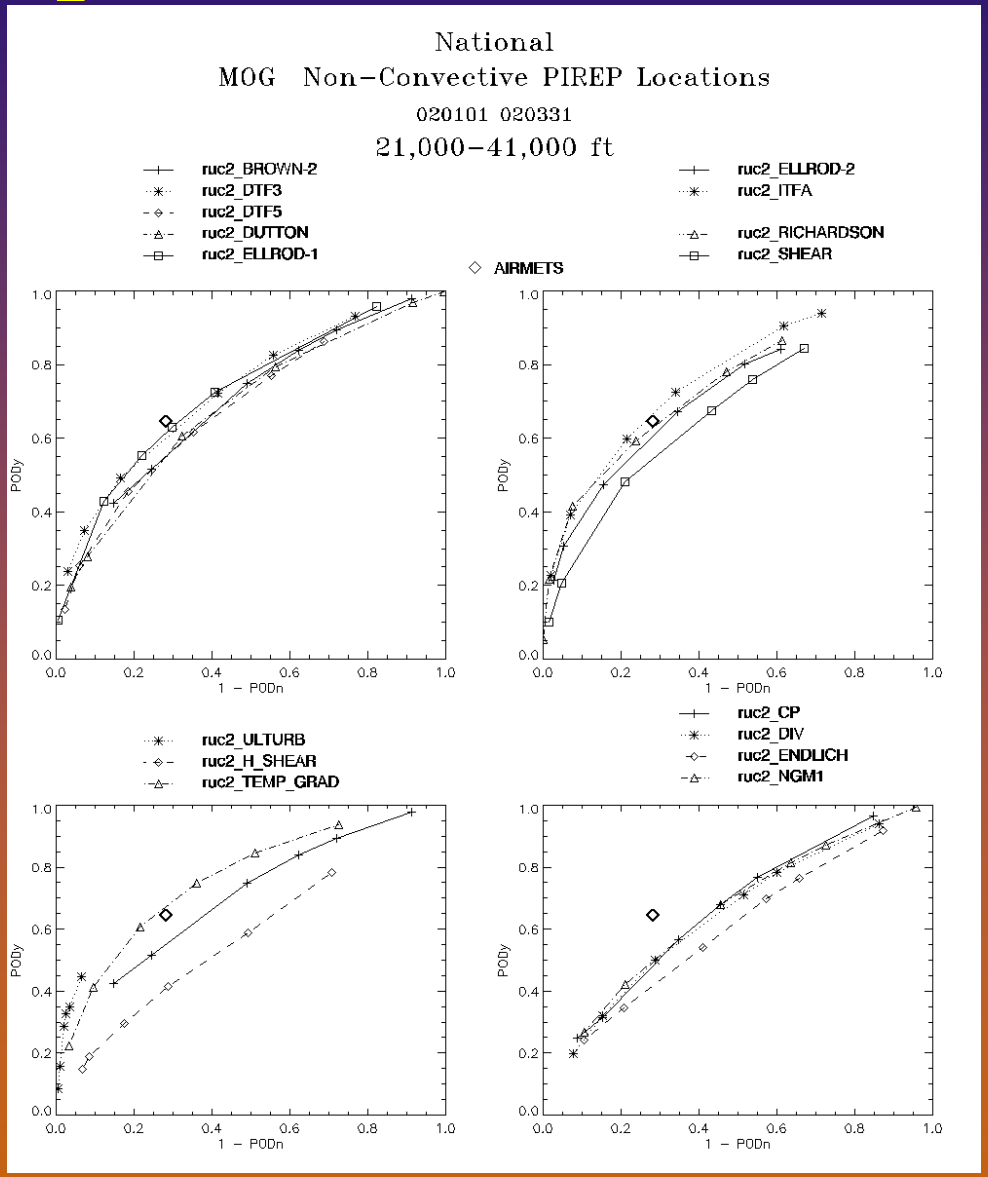
4 km Satellite:

- [ ] Vis/Fog
- [ ] IR
- [ ] Water Vapor

RESET



Comparisons with AIRMET



Disadvantages of Current Suite

- Different rules from Annex 3 description for SWL.
  - Text based. Graphics are simple pictorial representations of official text product.
  - Hinder use of forecast information systems across international boundaries.
  - Will hinder improvement of graphical forecast imaging.
  - U.S. is style is alone in the world.

Why Change?

- Graphical Forecasts contain more information.
  - "A picture is worth a thousand words… a graphical FA is worth a thousand contractions pilots don't understand."
  - Features and their spatial variability are pictured, not *articulated*.
    - Can be selectable.
    - Can be zoomed
    - Can be detailed
  - Weather evolution better communicated through higher time resolution of graphical information.
- Graphical Forecasts are *more accurate* over time and space.

Why Change?

- The time is right.
  - Producers have capability to create graphical products (latest changes in NMAP production capability).
    - Alaska interested in NMAP
    - Canada interested in NMAP
  - Users have capability to view:
    - Honeywell WINN system
    - Experimental Aircraft Association Oshkosh
    - Aviation Digital Data Service
    - OASIS
    - COBOR, Morcom, etc.
  - Break Ground for new graphical products

Change to *What*?

- ICAO Annex 3 Prescription: BUFR
  - BUFR (Binary Universal Form for the Representation of Meteorological Data)
    - *Object* Oriented
    - Rules are *international*
    - NOT a picture, but a coded, earth-oriented description of weather info that can be made into a graphic!
  - *International* Description of Weather Information. A single system is needed.
    - Important in *weather in the cockpit* era.
    - The prescription already exists in Annex 3.

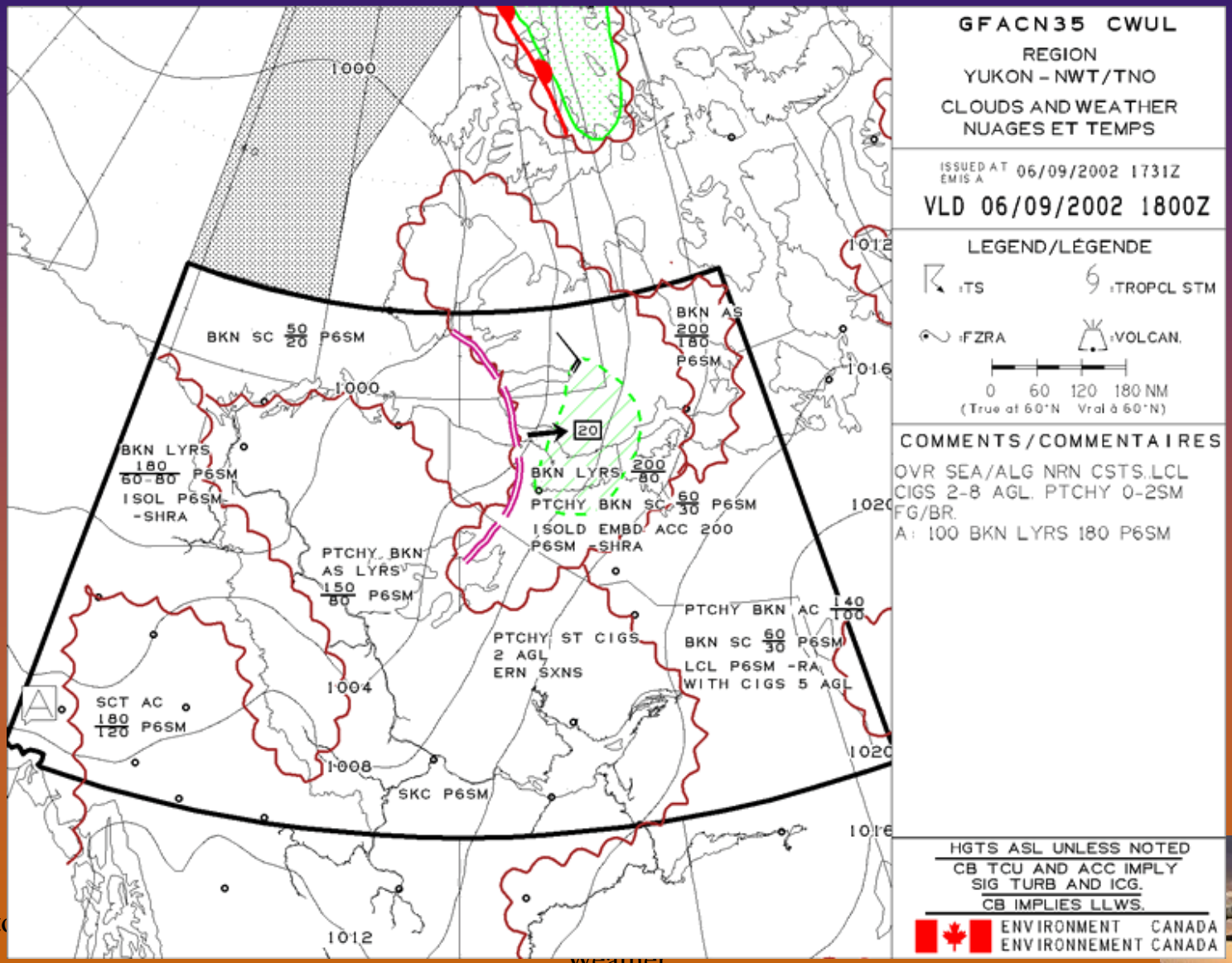
Change to *What*?

- AWC recommends international standards be followed as international communication and graphic display systems evolve:
  - AWC producing High Level Significant Weather Charts SWH in BUFR in next few months, matching the UK.
  - BUFR code for SIGMETs under development *now.*
  - WAFS SWM products and charts produced in BUFR.
  - SWL is next logical step for the US.

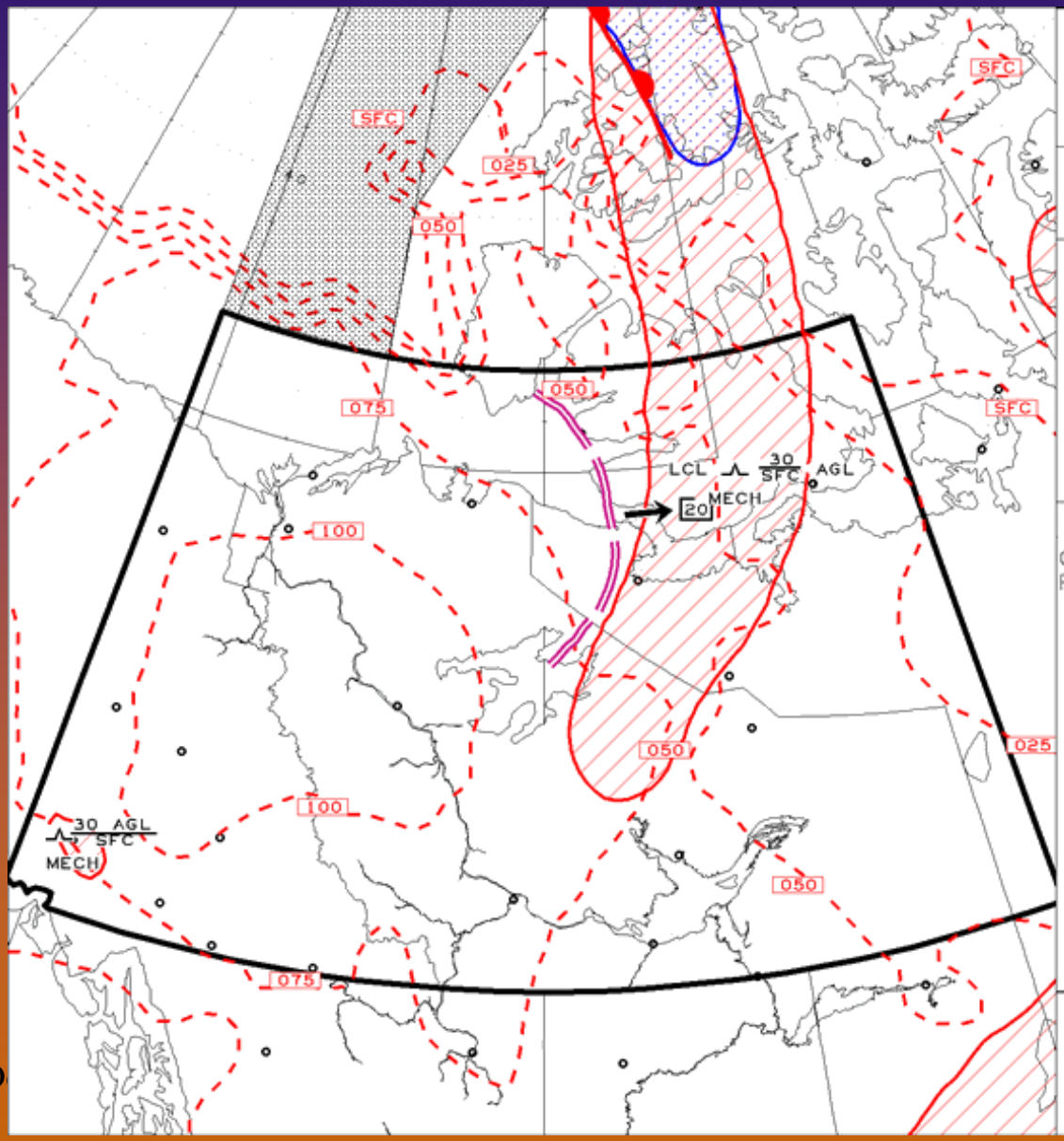
Demo Site

http://aviationweather.gov/demo

Canadian Area Forecast Graphic



Canadian Area Forecast Graphic



GFACN35 CWUL

REGION
YUKON – NWT/TNO

ICG TURB & FZLVL

ISSUED AT 06/09/2002 1741Z
EMIS A

VLD 06/09/2002 1800Z

LEGEND/LÉGENDE

FZLVL

MDT ICG
MDT TURB
SEV ICG
SEV TURB

0 60 120 180 NM
(True at 60°N Vrai à 60°N)

COMMENTS/COMMENTAIRES

OTWZ LGT RIME ICGIC ABV FZLVL.

HGTS ASL UNLESS NOTED
CB TCU AND ACC IMPLY SIG TURB AND ICG.
CB IMPLIES LLWS.

ENVIRONMENT CANADA
ENVIRONNEMENT CANADA

COROBOR - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Search Favorites Media

Address http://www.corobor.com/ Go Links RUSH Yahoo! Mail SOTR2002 Car Items Genealogy Weather

COROBOR Systèmes
Certified ISO9001

MESSIR INFORMATION SYSTEMS for Meteorology and Aviation

MOODY M CERTIFICATION FRANCE ISO 9001-2000

Version française

NEWS ! *August 2002 : MESSIR-COMM installed in the Met Office (UK) click for mo*

MESSIR-Systems **MESSIR-COMM, MESSIR-VISION, MESSIR-AERO, MESSIR-MEDIA, MESSIR-NET,** the Heart of your Meteorological Centre

MESSIR-COMM **World Leader** for **GTS Message Switching** and Meteorological Telecommunications

MESSIR-VISION **World Leader** for Wintel-based **Forecaster Workstations**

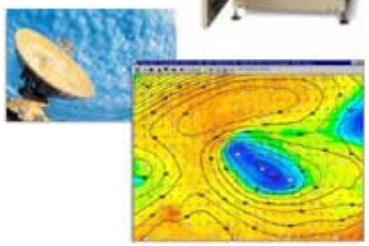
MESSIR-AERO **World Leader** for **SADIS, ISCS,** Pilot Met Briefing systems

MESSIR-AFTN **AFTN** Message Switching System (databases for **NOTAM**, FlightPlans, **OPMET**)

MESSIR-MEDIA Weather shows for **TV/Media**

MESSIR-NET For Automated **Web Services**

References Check out our **400 reference** sites in 70 countries



Internet

Morcom International, Inc. - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Search Favorites Media

Address http://www.morcom.com/produ_wea.htm Go Links RUSH Yahoo! Mail SOTR2002 Car Items Genealogy Weather

MORCOM INTERNATIONAL, INC.

...Your Dependable **Connection**

search GO

Airport Communications | Radio Communications | Weather Systems

Dealers Only

En Español

Weather Systems

Morcom International, Inc. is one of the best known suppliers of advanced weather systems for use by meteorological institutions, research organizations, aviation authorities, and schools. We supply the most modern systems and software for receiving images from all NOAA satellites like GOES and TIROS/POES and other weather satellites like GMS and METEOSAT. If your needs include TERRA/MODIS capabilities, we can also help you.

The World Area Forecast System (WAFS) is a system designed to make globally available the data that is produced at the World Area Forecast Center (WAFC) as a support service for flight operations to aviation users worldwide. Morcom offers a complete WAFS/ISCS receiving system specifically designed for aviation authorities and airport operators.

Our company specializes in complete turn-key systems that offer a cost-effective professional solution to the user. From our satellite image receiving systems to our aeronautical display terminals Morcom products are dependable and easy to operate.

For more details on these systems select a link below:

- Direct Readout Weather Satellite Receiving Systems
- WAFS/ISCS Satellite Receiving and Pilot Briefing System
- Weather Stations and Instruments

If your interest is in marine weather products, Morcom also has products to serve your needs. We carry the "Alden Weather Systems" line of products from the world famous AE-900 Navtex receiver, to state of the art EPIRBs and SARTs for safety at sea. Click on the link below for more details:

Home
About Morcom
Products
Services
Projects
Links
Contact Morcom
Special Offers
Job Opportunities
Site Map

ALDEN WeatherSystems

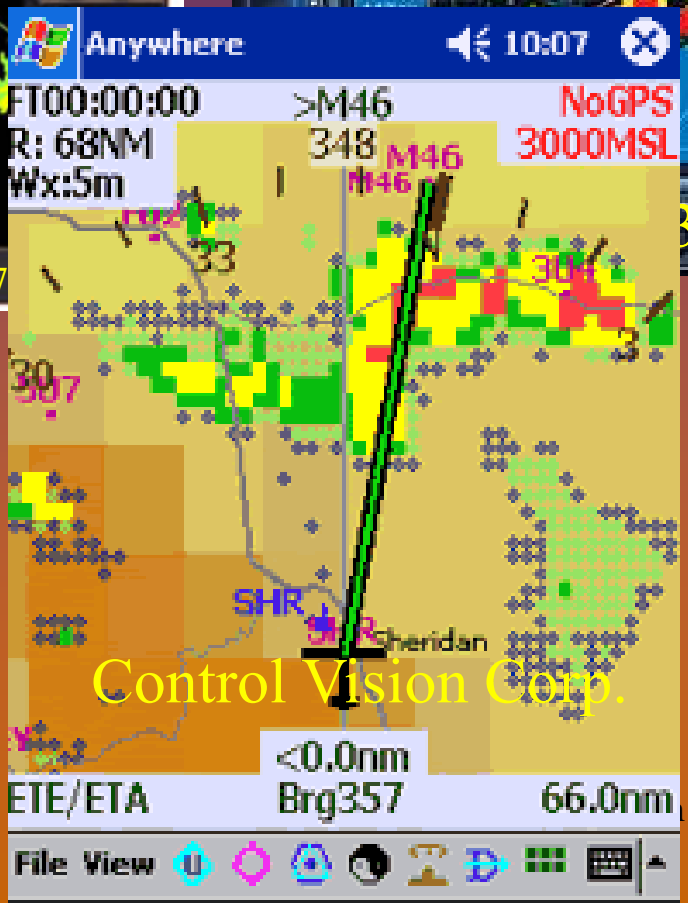
weatherexperts.com
We Measure Weather

MORCOM INTERNATIONAL, INC.
14210-B Sullyfield Circle
Chantilly, VA 20151, USA
Phone: (703) 263-9305
Fax: (703) 263-9308
E-mail: info@morcom.com

Internet

“Will hinder improvement of graphical ging.”

Echo Flight Cheetah FL27



Control Vision Corp.

Avidyne Flightmax 850

GFA Issuance Times and Valid Times

VT / Issuance	00HR	03HR	06HR	09HR	12HR	18HR	24HR
2345Z	00Z	03Z	06Z	09Z	12Z	18Z	00Z
0245Z	03Z	06Z	09Z	12Z			
0545Z	06Z	09Z	12Z	15Z	18Z	00Z	06Z
0845Z	09Z	12Z	15Z	18Z			
1145Z	12Z	15Z	18Z	21Z	00Z	06Z	12Z
1445Z	15Z	18Z	21Z	00Z			
1745Z	18Z	21Z	00Z	03Z	06Z	12Z	18Z
2045Z	21Z	00Z	03Z	06Z			

Issuance Time Concept Becoming Obsolete??

"What if…"

Is happening now.

- What if products were continually updated to ensure users got the latest when they asked?
- NWS Office in Pleasant Hill Example

The latest forecast when you need it.

NEW BOSTON, MISSOURI

This Afternoon (10/4): Mostly cloudy skies, with a high around 69. Breezy, with a west northwest wind between 15 and 22 mph.

Tonight (10/4-10/5): A few clouds, with a low around 46. Northwest wind 18 to 21 mph decreasing to between 7 and 10 mph.

Saturday (10/5): Abundant sunshine, with a high around 66. Calm wind becoming South Southwest around 6 mph.

Saturday Night (10/5-10/6): Mostly cloudy skies, with a low around 47. South Southwest wind between 6 and 12 mph.

Sunday (10/6): Mostly sunny skies, with a high near 65. South wind 12 to 18 mph becoming Northwest.

Sunday Night (10/6-10/7): A few clouds, with a low near 45.

Monday (10/7): Sunny skies, with a high around 66.

Monday Night (10/7-10/8): A few clouds, with a low around 42.

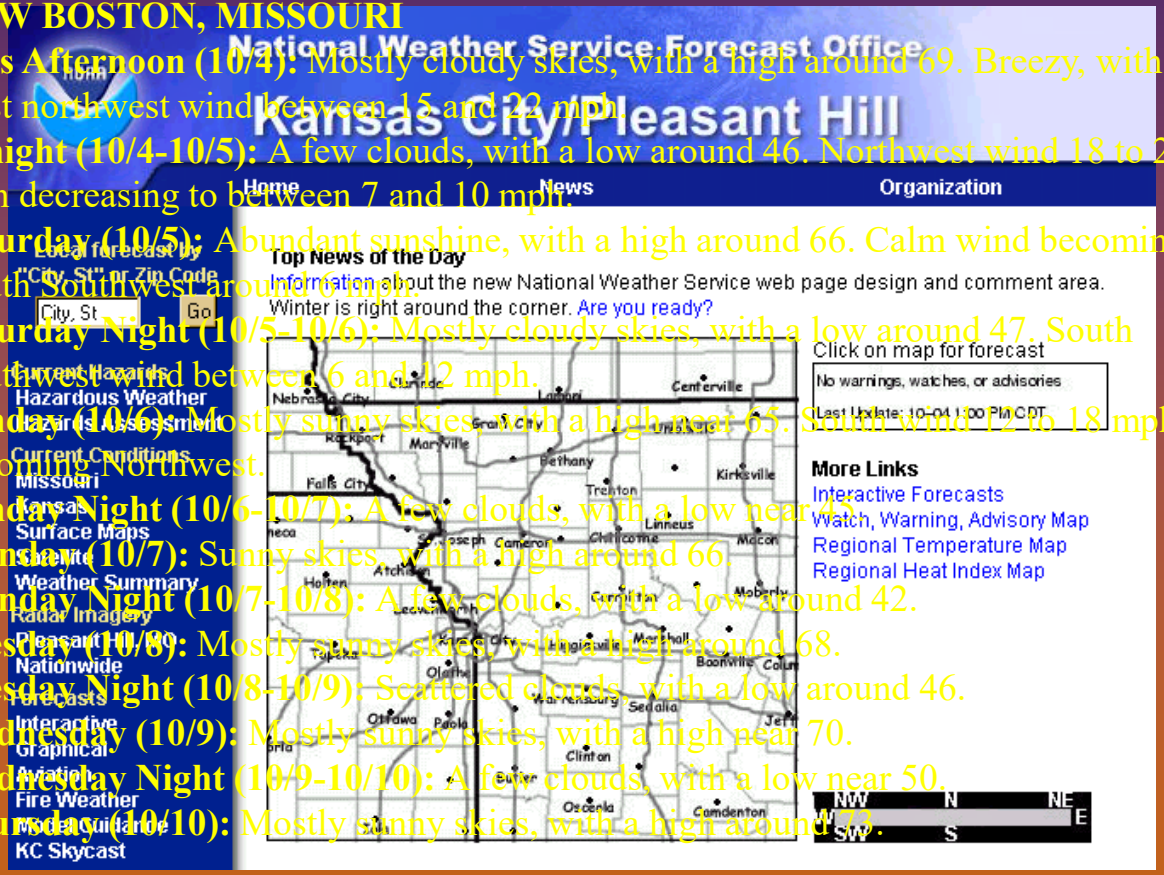
Tuesday (10/8): Mostly sunny skies, with a high around 68.

Tuesday Night (10/8-10/9): Scattered clouds, with a low around 46.

Wednesday (10/9): Mostly sunny skies, with a high near 70.

Wednesday Night (10/9-10/10): A few clouds, with a low near 50.

Thursday (10/10): Mostly sunny skies, with a high around 73.



Need for Text

- There are not enough resources at AWC to prepare both SWL graphics and area forecast text.
- If text is necessary, produced through automated means.
  - Automating text, if necessary, will take 12 to 18 months to develop, depending on format of text.

Need for Text

- Text Format Choices
  - Current Format
    - Very Descriptive, segmented by states or portions of states. Six sections in the CONUS.
    - Character limit continues to exist.
  - GAMET (General Aviation Meteorology)
    - ICAO Annex 3, Section 6.6
    - Very structured.
    - Abbreviated, contractions, issued by FIR.
    - Two parts: Hazards & Other Weather
    - AIRMET definition changes.
      - An update to scheduled forecast
  - Modified GAMET as defined by Met Authority (FAA).

GAMET Example… section 1

```
GAMET
KZDC GAMET VALID 261800/230300 KKCI-
LEESBURG FIR BLW FL250
SECN I:
SFC WSPD: 21/23  35KT N OF 37N AND E OF 80W
SFC VIS : 18/20 1-2SM BR N OF 41N
SIGWX: ISOL TS S OF 38N AND E OF 80W
SIG CLD: ISOL TCU 3000/12000FT AGL
ICE: MOD 050/080
TURB: MOD ABV 090
SIGMETS: UNIFORM 2
```

GAMET Example… section 2

```
SECN  II
PSYS: 18 L 1014 MB  N37.1 W76.3  MOV NE 10KT WKN
WIND/T:
2000FT 070/15 KT PS18
5000FT 09010 KT PS11
10000FT L/V PS08
15000FT 210/10 KT MS04
20000FT 220/10KT MS10
25000FT 220/30KT MS19
CLD: BKN CU 3500/15000 FT S OF 38N AND E OF 80W; SCT
   SC 6000FT BKN
AC 10000/15000 FT ELSW
FZLVL: 13000-15000 AGL
```

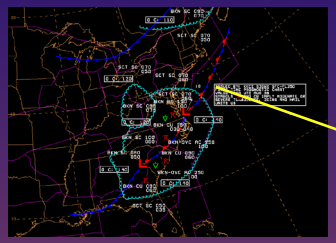
Content Defined by Regional Air Navigation Plan

Need for Text

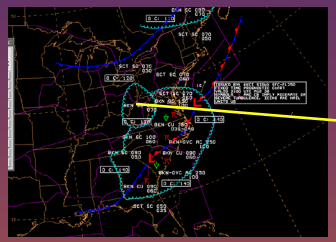
- If graphical area forecast, who needs text?
  - Can AFSS briefers brief directly off graphics?
  - Can HIWAS be prepared directly from graphics?
  - Can DUATs print applicable graphics (as Corobor and Morcom do today?)
  - What text products are required by ICAO Annex 3?
  - Is text necessary to get us “over the hump”?

CHART TO TEXT CONVERSION PROCESS

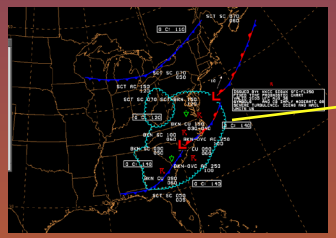
26/18Z



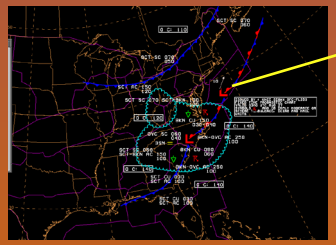
26/21Z

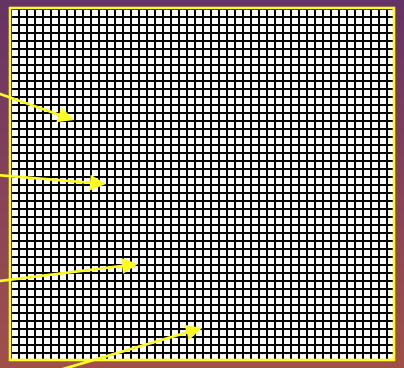


27/00Z



27/03Z

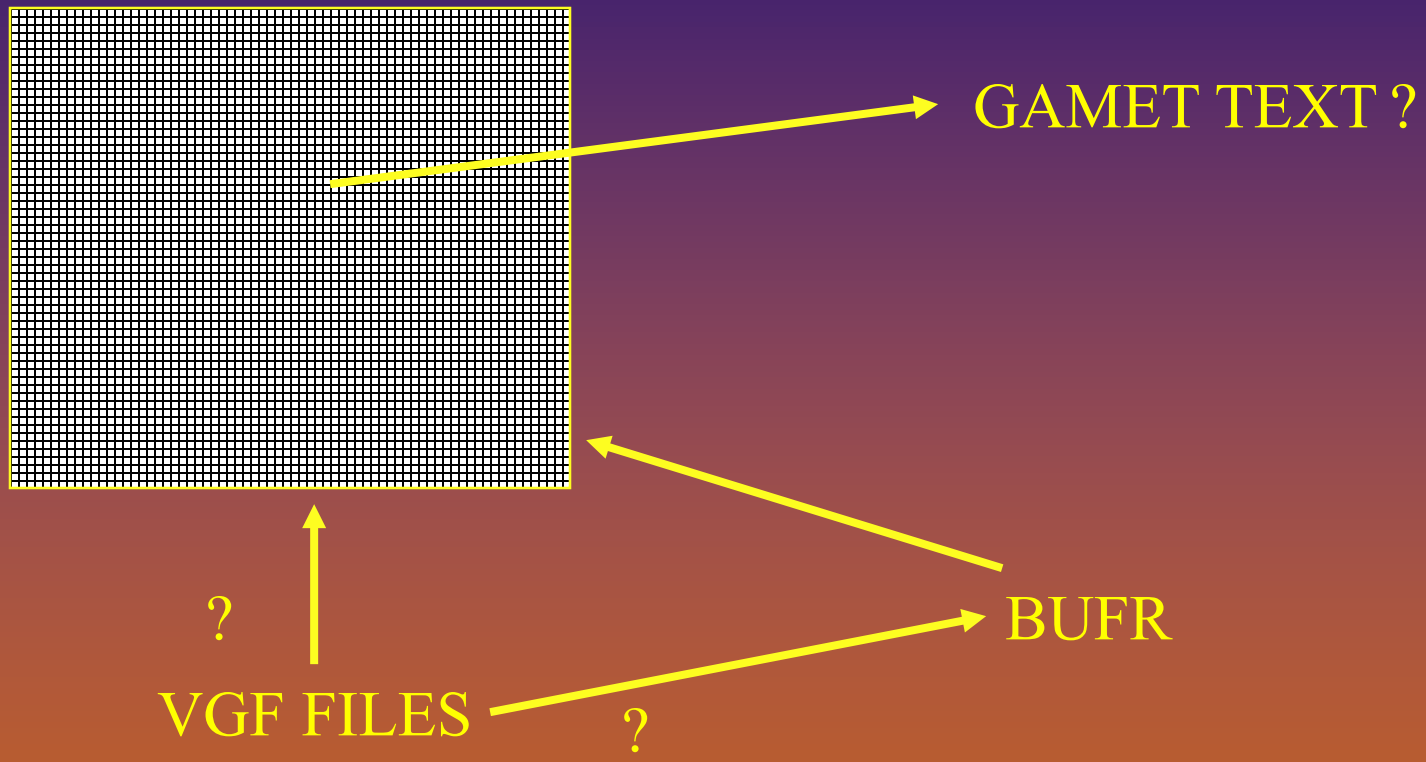




INFORMATION TRANSFER BETWEEN VG FILES AND GRID GENERATION PROGRAM

VGF FILES

CHART TO TEXT CONVERSION PROCESS CONTINUED



DIFFERENCES between SWL and US Area Forecast

US Area Forecast	SWL & GAMET
⌘ By 6 Regions	⌘ By ARTCC FIR
⌘ AIRMET Definition: Description of hazardous weather.	⌘ Amendment of SWL/GAMET if hazardous weather not forecast.
⌘ Official Forecast is the text with simple graphic description.	⌘ Official Forecasts are the graphic and simple text description (if necessary).

Graphical Forecast Experiment GFAX

- January 15-February 14
- Determine if AWC can produce 3-hourly GFA charts for the CONUS.
- Refine BUFR production/output requirements for NCEP Computer Development.
- Refine GAMET production requirements for Meteorological Development Laboratory.
- Collect BUFR forecasts to use for auto-text software development.

GFAX Development Issues

- Confident we can provide internet accessible charts similar to http://aviationweather.gov/demo/
- Test if we can provide 3 hour updates.
- Measure difficulty issuing text AIRMETs for updates. Develop requirements to produce efficiency tools.
- Looking for user comments on utility of product from internet display.
- Test GFA tool under development
  - ASOS Observations in MSL
  - MOS Ceilings in MSL
  - Mountain Obscuration Tool
- Retool creation of BUFR files to meet developing standards

GFAX Development Issues

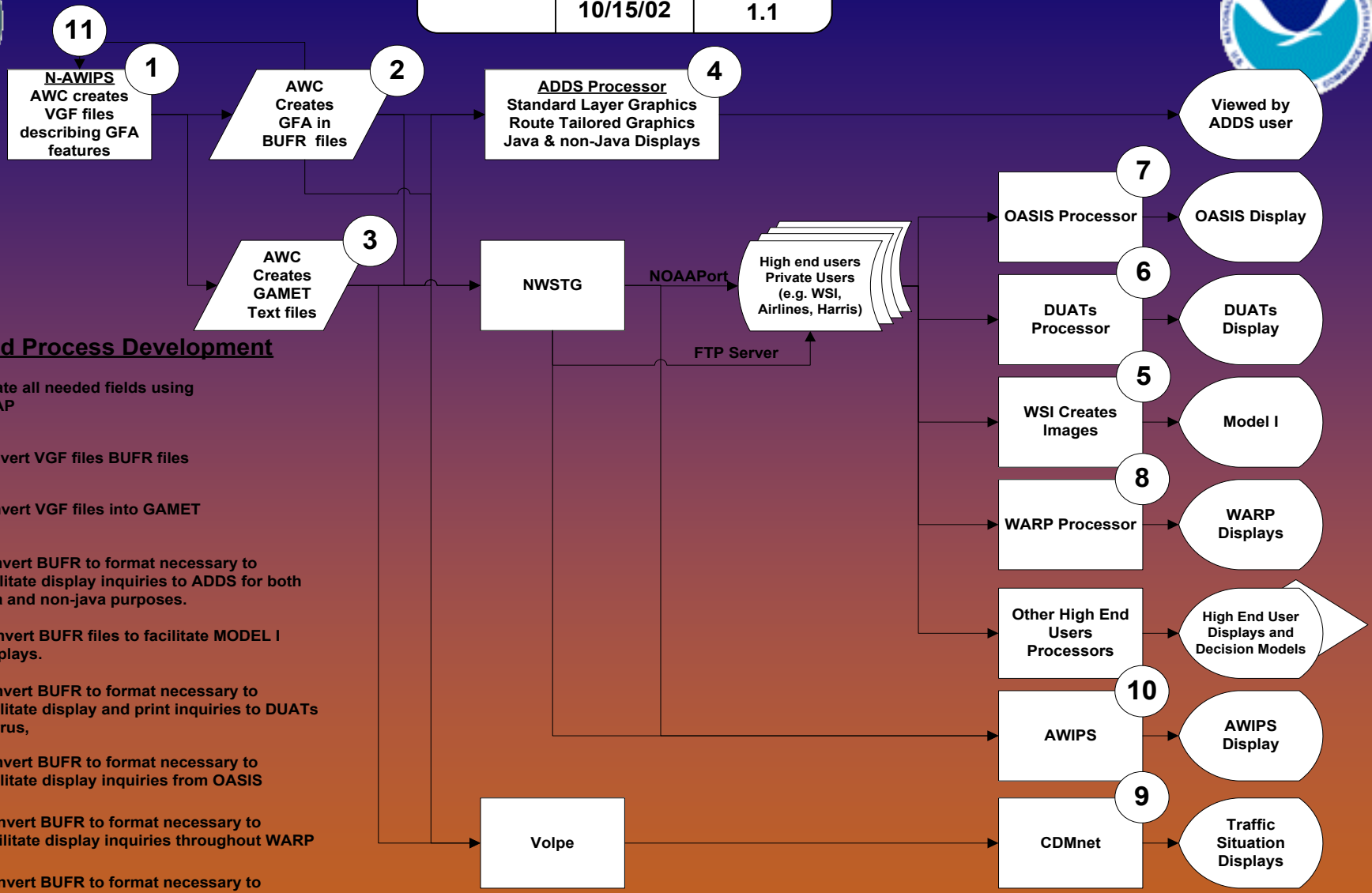
- Questionable:
  - Ability to create and distribute "user-ready" BUFR files.
  - Ability to create GAMET from VG Files and/or BUFR files.
    - What can Meteorological Development Laboratory do before mid-November? (Nothing, according to Bob Glahn, given current resources and priorities.)
    - Can HPC provide 3 hourly fronts? (No. Requirement for 3 hourly forecast fronts will be put on resource list.)

After the GFAX

- Refining Text Requirements
- User Feedback
  - Pilots, Dispatchers, FSS
- Refine BUFR Requirements
  - WSI provides FSS workstation displays.
  - WSI already into BUFR.
    - Hmmmmmmmm…….
- ICAO Approval

GFA Distribution Draft

10/15/02 | 1.1



Required Process Development

1. Create all needed fields using NMAP
2. Convert VGF files BUFR files
3. Convert VGF files into GAMET text
4. Convert BUFR to format necessary to facilitate display inquiries to ADDS for both java and non-java purposes.
5. Convert BUFR files to facilitate MODEL I displays.
6. Convert BUFR to format necessary to facilitate display and print inquiries to DUATs (Cirrus,
7. Convert BUFR to format necessary to facilitate display inquiries from OASIS
8. Convert BUFR to format necessary to facilitate display inquiries throughout WARP
9. Convert BUFR to format necessary to facilitate display inquiries on TSDs.
10. Convert BUFR to format necessary to facilitate display inquiries on AWIPS
11. Convert BUFR to format necessary to facilitate display inquiries on N-AWIPS