

EASA/NETWORK MANAGER SPACE WEATHER WORKSHOP UAL POLAR OPERATIONS

MIKE STILLS
SENIOR MANAGER INTERNATIONAL OPERATIONS
UNITED AIRLINES FLIGHT DISPATCH
KOLN, GERMANY
20 MARCH 2013

B747



B777



B787



B767



B757



A320/319 & B737



CODE OF FEDERAL REGULATIONS

Sec. 121.535

Responsibility for operational control: Flag operations.

(a) Each certificate holder conducting flag operations is responsible for operational control.

(b) The pilot in command and the aircraft dispatcher are jointly responsible for the preflight planning, delay, and dispatch release of a flight in compliance with this chapter and operations specifications.

(c) The aircraft dispatcher is responsible for--

(1) Monitoring the progress of each flight;

(2) Issuing necessary instructions and information for the safety of the flight; and

(3) Cancelling or redispersing a flight if, in his opinion or the opinion of the pilot in command, the flight cannot operate or continue to operate safely as planned or released.

(d) Each pilot in command of an aircraft is, during flight time, in command of the aircraft and crew and is responsible for the safety of the passengers, crewmembers, cargo, and airplane.

(e) Each pilot in command has full control and authority in the operation of the aircraft, without limitation, over other crewmembers and their duties during flight time, whether or not he holds valid certificates authorizing him to perform the duties of those crewmembers.

CODE OF FEDERAL REGULATIONS

Sec. 121.627

Continuing flight in unsafe conditions.

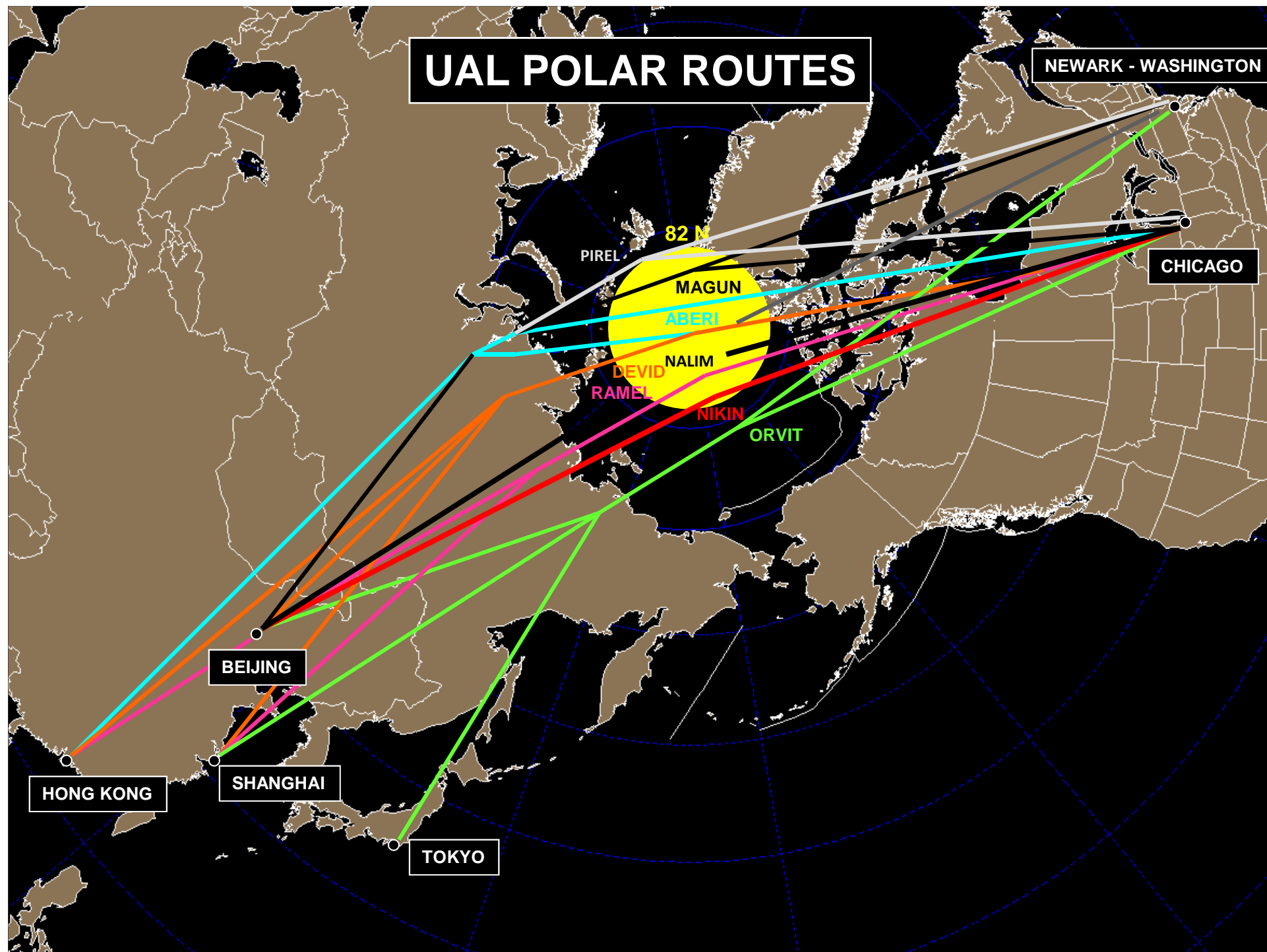
(a) No pilot in command may allow a flight to continue toward any airport to which it has been dispatched or released if, in the opinion of the pilot in command or dispatcher (domestic and flag operations only), the flight cannot be completed safely; unless, in the opinion of the pilot in command, there is no safer procedure. In that event, continuation toward that airport is an emergency situation as set forth in Sec. 121.557.

CODE OF FEDERAL REGULATIONS

121.101 Weather reporting facilities.

- (d) Each certificate holder conducting domestic or flag operations shall adopt and put into use an approved system for obtaining forecasts and reports of adverse weather phenomena, such as clear air turbulence, thunderstorms, and low altitude wind shear, that may affect safety of flight on each route to be flown and at each airport to be used.

UAL POLAR ROUTES



UAL POLAR TRAFFIC

•	1999	12	POLAR ACFT
•	2000	25	B747 & B777
•	2001	466	(B787 certified)
•	2002	461	
•	2003	578	
•	2004	1096	
•	2005	1402	
•	2006	1484	
•	2007	1832	
•	2008	1565	
•	2009	1411	
•	2010	1231	
•	2011	1370	
•	2012	1179	

CURRENT TOTAL 14,423
(Feb 20th 2013 for s-UA)
(s-CO 1200 per year)

MARCH 2006 COMPARISON

- FLIGHT 829 ORD-HKG – POLAR
316 PSGRS AND 5000LBS CARGO (14:32)
- FLIGHT 829 ORD-HKG – RUSSIA ROUTE
246 PSGRS AND NO CARGO (15:41)
- FLIGHT 829 ORD-HKG – NOPAC
NO PSGRS OR CARGO (17:18)

OPS SPEC B055

U.S. Department
of Transportation
Federal Aviation
Administration

Operations Specifications

B055 - North Polar Operations

HQ Control: 08/25/2011
HQ Revision: 00b

a. The certificate holder is authorized to conduct north polar operations specified in this paragraph only within the polar area and areas referenced in paragraph B050 of these operations specifications, as defined below. The certificate holder shall not conduct any other polar route operation within any other area under these operations specifications.

b. Authorized Aircraft and Equipment. The certificate holder is authorized to conduct polar operations using the following aircraft and equipment.

Table 1

Aircraft M/M/S	Polar Diversion Alternate Airports	Special Equipment and Procedures
B-747-422	FAIRBANKS INTL. AK. PAPA; IQALUIT, N.W.T., CANADA; CYFB; THULE AIR BASE (MIL), GREENLAND; BGTL SVALVARD/LONGYEAR, NORWAY; ENSB BRATSK, RUSSIAN FEDERATION; UIBB KHABAROVSK/NOVY, RUSSIAN FEDERATION; UHHH NOVOSIBIRSK/TOLMACHEVO, RUSSIAN FEDERATION; UNNT YAKUTSK, RUSSIAN FEDERATION; UEEE	Recovery plan for passengers at diversion alternates. Fuel freeze analysis program. Training program for Polar Operations. Plan for solar flare activity. Refer to the B-747/Minimum Equipment List for any special equipment and procedure requirements.
B-747-451	FAIRBANKS INTL. AK. PAPA; IQALUIT, N.W.T., CANADA; CYFB; THULE AIR BASE (MIL), GREENLAND; BGTL SVALVARD/LONGYEAR, NORWAY; ENSB BRATSK, RUSSIAN FEDERATION; UIBB KHABAROVSK/NOVY, RUSSIAN FEDERATION; UHHH NOVOSIBIRSK/TOLMACHEVO, RUSSIAN FEDERATION; UNNT YAKUTSK, RUSSIAN FEDERATION; UEEE	Recovery plan for passengers at diversion alternates. Fuel freeze analysis program. Training program for Polar Operations. Plan for solar flare activity. Refer to the B-747/Minimum Equipment List for any special equipment and procedure requirements.
B-777-222	ALYKEL/NORILSK, RUSSIAN FEDERATION; UOOO ANADYR/UGOLNY, RUSSIAN FEDERATION; UHMA BARROW/WILEY POST-WILL ROGERS MEM. AK. PABR BRATSK, RUSSIAN FEDERATION; UIBB FAIRBANKS INTL. AK. PAPA IQALUIT NU, CANADA; CYFB IRKUTSK, RUSSIAN FEDERATION; UHHH KHABAROVSK/NOVY, RUSSIAN FEDERATION; UHHH KRASNOYARSK, RUSSIAN FEDERATION; UNKL MAGADAN/SOKOL, RUSSIAN FEDERATION; UHHM MOSCOW/DOMODEDOVO, RUSSIAN FEDERATION; UDDD MOSCOW/SHEREMETYEVO, RUSSIAN FEDERATION; UUEE MURMANSK, RUSSIAN FEDERATION; UMMM NOVOSIBIRSK/TOLMACHEVO, RUSSIAN	Recovery plan for passengers at diversion alternates. Fuel freeze analysis program. Training program for Polar Operations. Plan for solar flare activity. Refer to the B-777/Minimum Equipment List for any special equipment and procedure requirements.

Print Date: 11/28/2011

B055-1

United Air Lines, Inc. and/or
Continental Airlines, Inc.

Certificate No.: CALA014A

U.S. Department
of Transportation
Federal Aviation
Administration

Operations Specifications

Aircraft M/M/S	Polar Diversion Alternate Airports	Special Equipment and Procedures
	FEDERATION; UNNT PETROPAVLOVSK-KAMCHATSKY/YELIZOVO, RUSSIAN FEDERATION; UHPP SVALBARD/LONGYEAR, NORWAY; ENSB THULE, GREENLAND; BGTL VLADIVOSTOK/KNEVICH, RUSSIAN FEDERATION; UHHW YAKUTSK, RUSSIAN FEDERATION; UEEE YELLOWKNIFE, NT, CANADA; CYZF YUZHNO-SAKHALINSK/KHOMUTOVO, RUSSIAN FEDERATION; UHSS; BEIJING/CAPITAL, CHINA; ZBAA; GUANGZHOU ACC, CHINA; ZGGG	
B-777-224	ALYKEL/NORILSK, RUSSIAN FEDERATION; UOOO ANADYR/UGOLNY, RUSSIAN FEDERATION; UHMA BARROW/WILEY POST-WILL ROGERS MEM. AK. PABR BRATSK, RUSSIAN FEDERATION; UIBB FAIRBANKS INTL. AK. PAPA IQALUIT NU, CANADA; CYFB IRKUTSK, RUSSIAN FEDERATION; UHHH KHABAROVSK/NOVY, RUSSIAN FEDERATION; UHHH KRASNOYARSK, RUSSIAN FEDERATION; UNKL MAGADAN/SOKOL, RUSSIAN FEDERATION; UHHM MOSCOW/DOMODEDOVO, RUSSIAN FEDERATION; UDDD MOSCOW/SHEREMETYEVO, RUSSIAN FEDERATION; UUEE MURMANSK, RUSSIAN FEDERATION; UMMM NOVOSIBIRSK/TOLMACHEVO, RUSSIAN FEDERATION; UNNT PETROPAVLOVSK-KAMCHATSKY/YELIZOVO, RUSSIAN FEDERATION; UHPP SVALBARD/LONGYEAR, NORWAY; ENSB THULE, GREENLAND; BGTL VLADIVOSTOK/KNEVICH, RUSSIAN FEDERATION; UHHW YAKUTSK, RUSSIAN FEDERATION; UEEE YELLOWKNIFE, NT, CANADA; CYZF YUZHNO-SAKHALINSK/KHOMUTOVO, RUSSIAN FEDERATION; UHSS; BEIJING/CAPITAL, CHINA; ZBAA; GUANGZHOU ACC, CHINA; ZGGG	Recovery plan for passengers at diversion alternates. Fuel freeze analysis program. Training program for Polar Operations. Plan for solar flare activity. Refer to the B-777/Minimum Equipment List for any special equipment and procedure requirements.

c. Polar Operations Recovery Plan.

(1) NOC Business Manual, Appendices, International Diversion Checklist

Print Date: 11/28/2011

B055-2

United Air Lines, Inc. and/or
Continental Airlines, Inc.

Certificate No.: CALA014A

Appendix P to Part 121—Requirements for ETOPS and Polar Operations

Section III. *Approvals for operations whose airplane routes are planned to traverse either the North Polar or South Polar Areas.*

- (a) Except for intrastate operations within the State of Alaska, no certificate holder may operate an aircraft in the North Polar Area or South Polar Area, unless authorized by the FAA.
- (b) In addition to any of the applicable requirements of sections I and II of this appendix, the certificate holder's operations specifications must contain the following:
 - (1) The designation of airports that may be used for en-route diversions and the requirements the airports must meet at the time of diversion.
 - (2) Except for supplemental all-cargo operations, a recovery plan for passengers at designated diversion airports.
 - (3) A fuel-freeze strategy and procedures for monitoring fuel freezing.
 - (4) A plan to ensure communication capability for these operations.
 - (5) An MEL for these operations.
 - (6) A training plan for operations in these areas.
 - (7) A plan for mitigating crew exposure to radiation during solar flare activity.
 - (8) A plan for providing at least two cold weather anti-exposure suits in the aircraft, to protect crewmembers during outside activity at a diversion airport with extreme climatic conditions. The FAA may relieve the certificate holder from this requirement if the season of the year makes the equipment unnecessary.

POTENTIAL ISSUES

- HUMAN SAFETY – LOWER, LESS EFFICIENT ALTITUDES TO LIMIT RADIATION EXPOSURE
- COMMUNICATION - FAR 121.99 MANDATES RELIABLE COMMUNICATION OVER THE ENTIRE ROUTE OF FLIGHT - SATCOM LOST AT 82 N
- NAVIGATION - UAL AIRCRAFT ARE EQUIPPED WITH GPS AND INERTIAL REFERENCE UNITS

POLICY

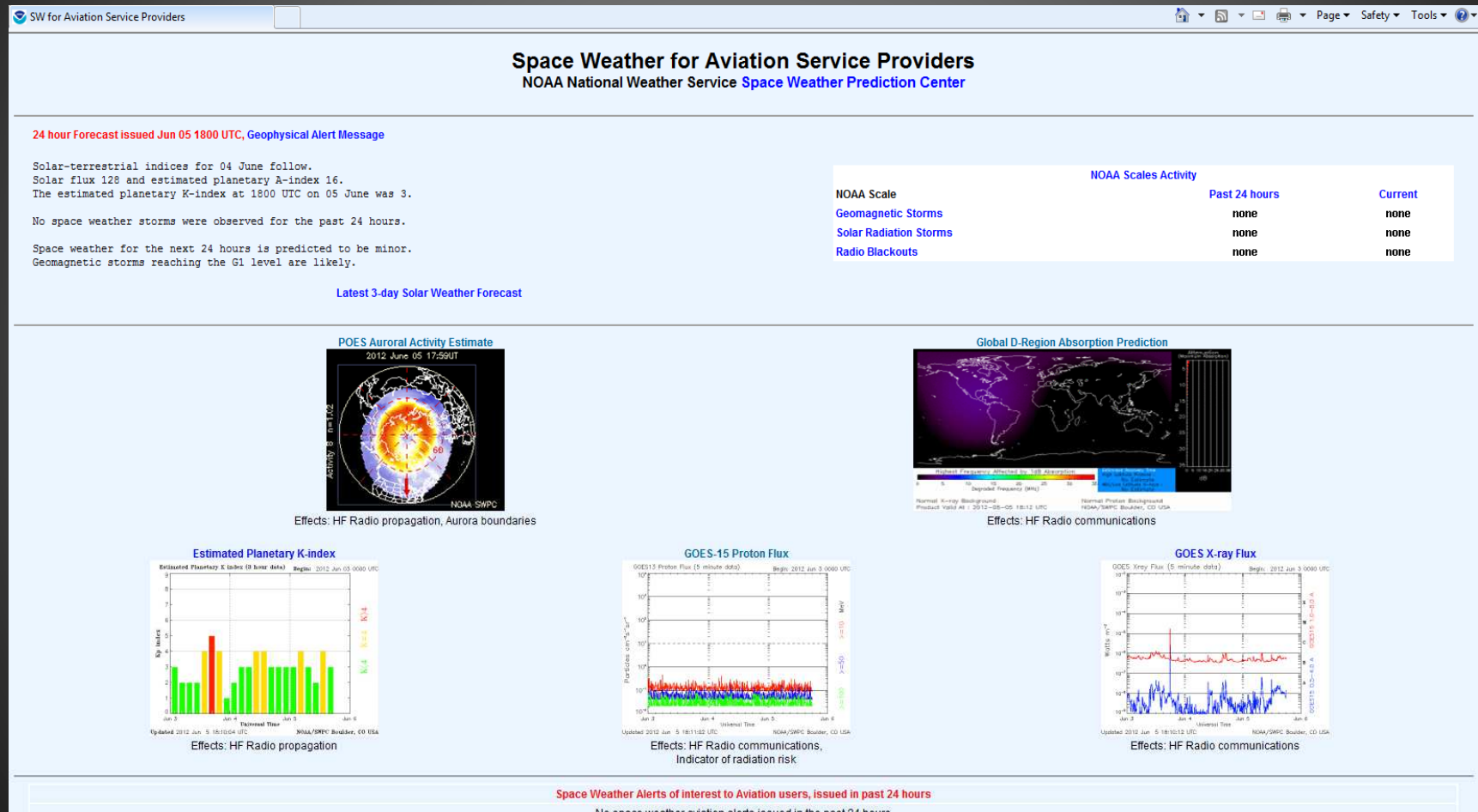
- DURING ADVERSE SOLAR ACTIVITY, UAL POLICY RESTRICTS FLIGHTS TO SPECIFIC ROUTES AND ALTITUDES.
- UAL POLICY IN PART, IS DERIVED FROM AND BASED ON THE NOAA SPACE WEATHER SCALES

POLICY

- POLAR WEATHER PACKAGE CONTAINS SOLAR ACTIVITY AND SWPC RECOMMENDATIONS (12z,24z,3HR,ammended as needed)
- ON SITE METEOROLOGISTS MONITOR SWPC WEBSITES AND MAINTAIN CONTACT WITH THE SWPC



SOLAR ACTIVITY



SOLAR EVENTS AND RESPONSE

JANUARY 2005

26 FLIGHTS OPERATED ON LESS THAN OPTIMUM POLAR ROUTES DUE TO SOLAR ACTIVITY

- CHICAGO TO HONG KONG ANCHORAGE STOP 4 CONSECUTIVE DAYS, PENALTY 180 TO 210 MINUTES
- CHICAGO TO BEIJING PENALTIES 18 TO 55 MINUTES
- BEIJING TO CHICAGO PENALTIES 55 MINUTES TO 80 MINUTES



SOLAR EVENTS AND RESPONSE

SEPTEMBER EVENT 2005

- **CHICAGO TO HONG KONG** ANCHORAGE STOP, SCHEDULE PENALTY 180 MINUTES

DECEMBER EVENT 2006

- **CHICAGO TO HONG KONG** ANCHORAGE STOP 2 CONSECUTIVE DAYS
- 5 OTHER FLIGHTS BOUND FOR ASIA FLEW LESS THAN OPTIMUM ROUTES AND/OR ALTITUDES

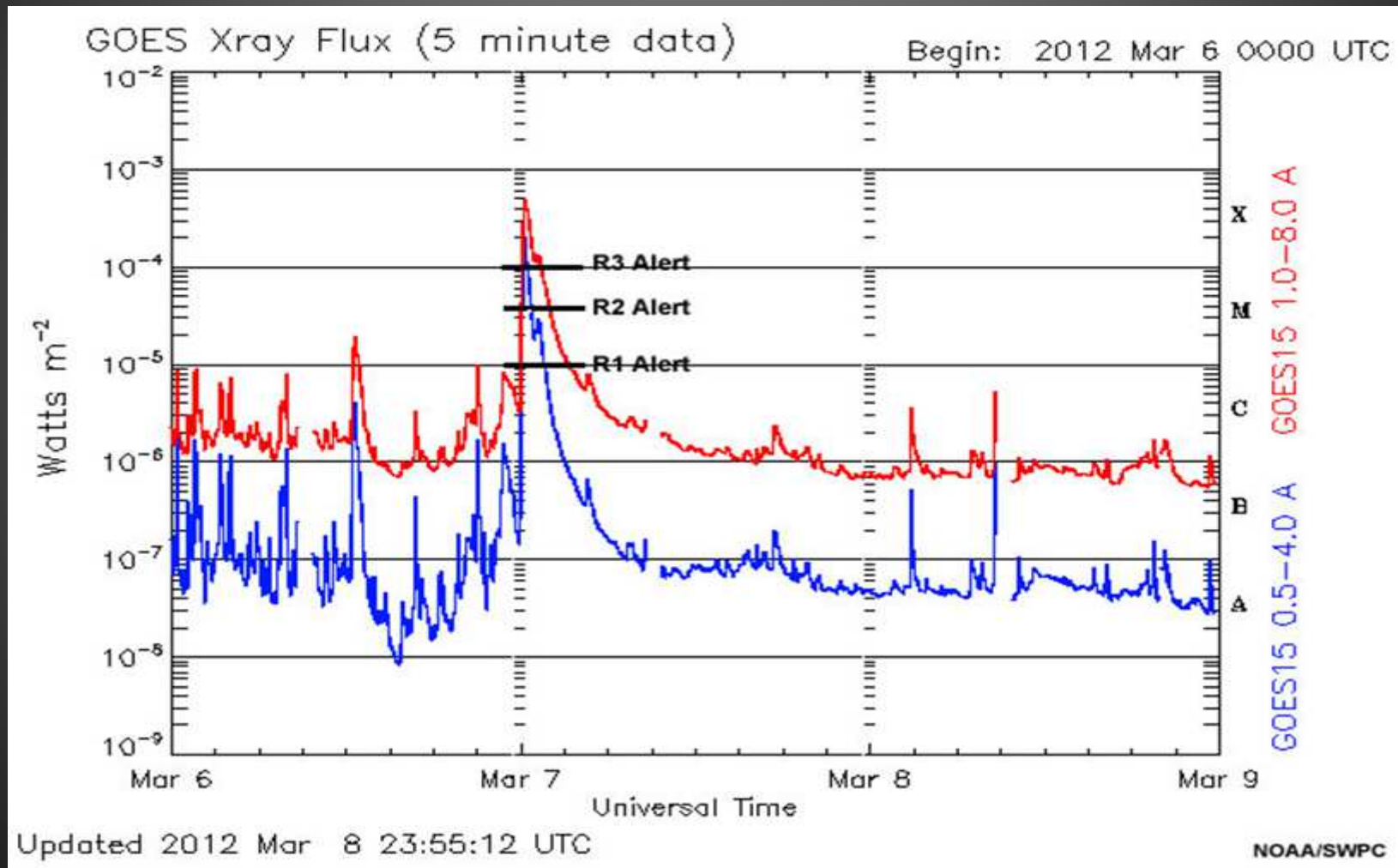


PROCEDURAL CONSIDERATIONS

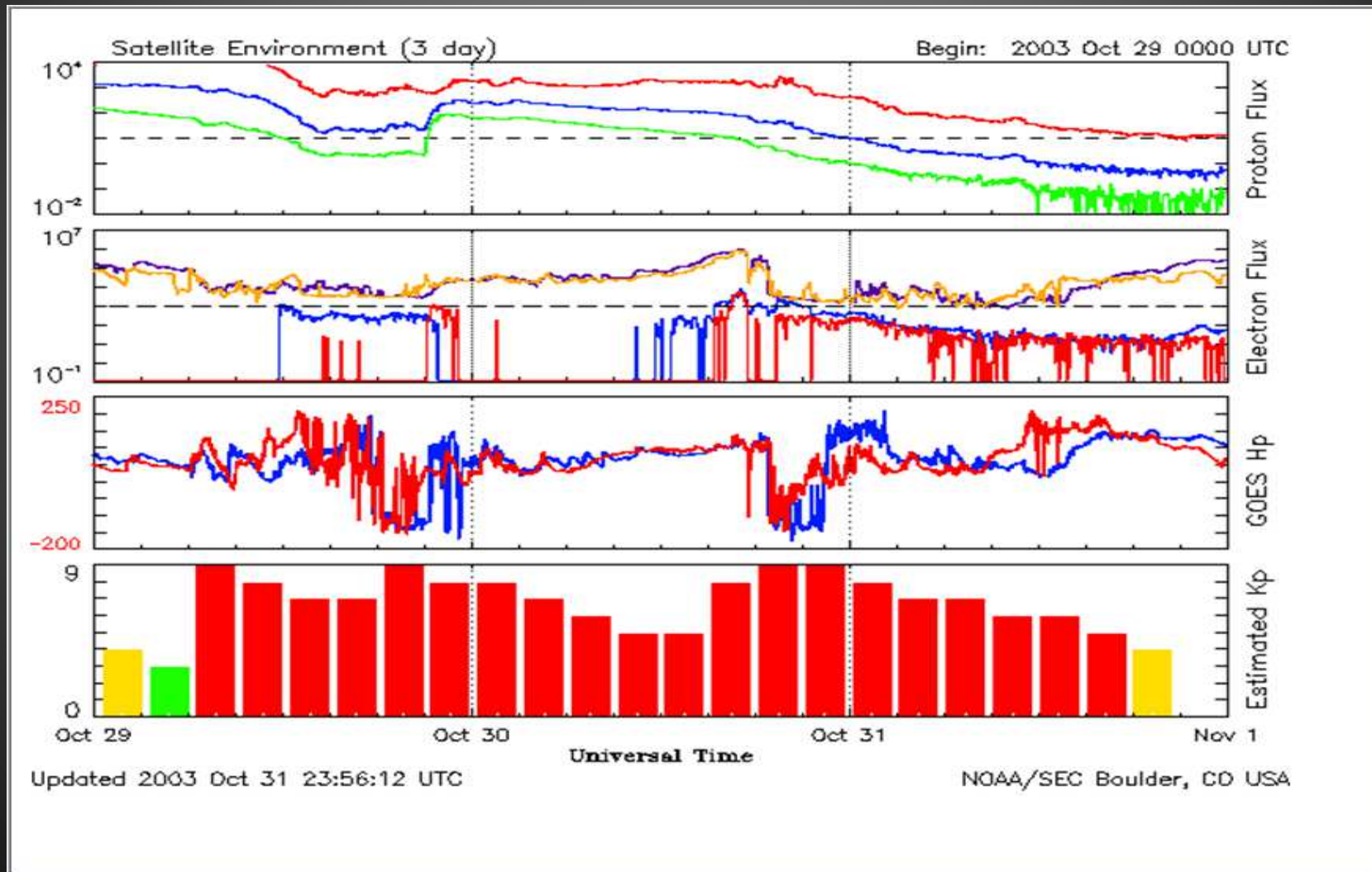
- **GOES MONITORING**
- **D REGION ABSORPTION**
- **POLAR CAP ABSORPTION**
- **AURORAL ABSORPTION**
- **PARTICLE ENERGY LEVELS**
- **X RAY FLUX**
- **K INDEX**
- **PROTON FLUX**



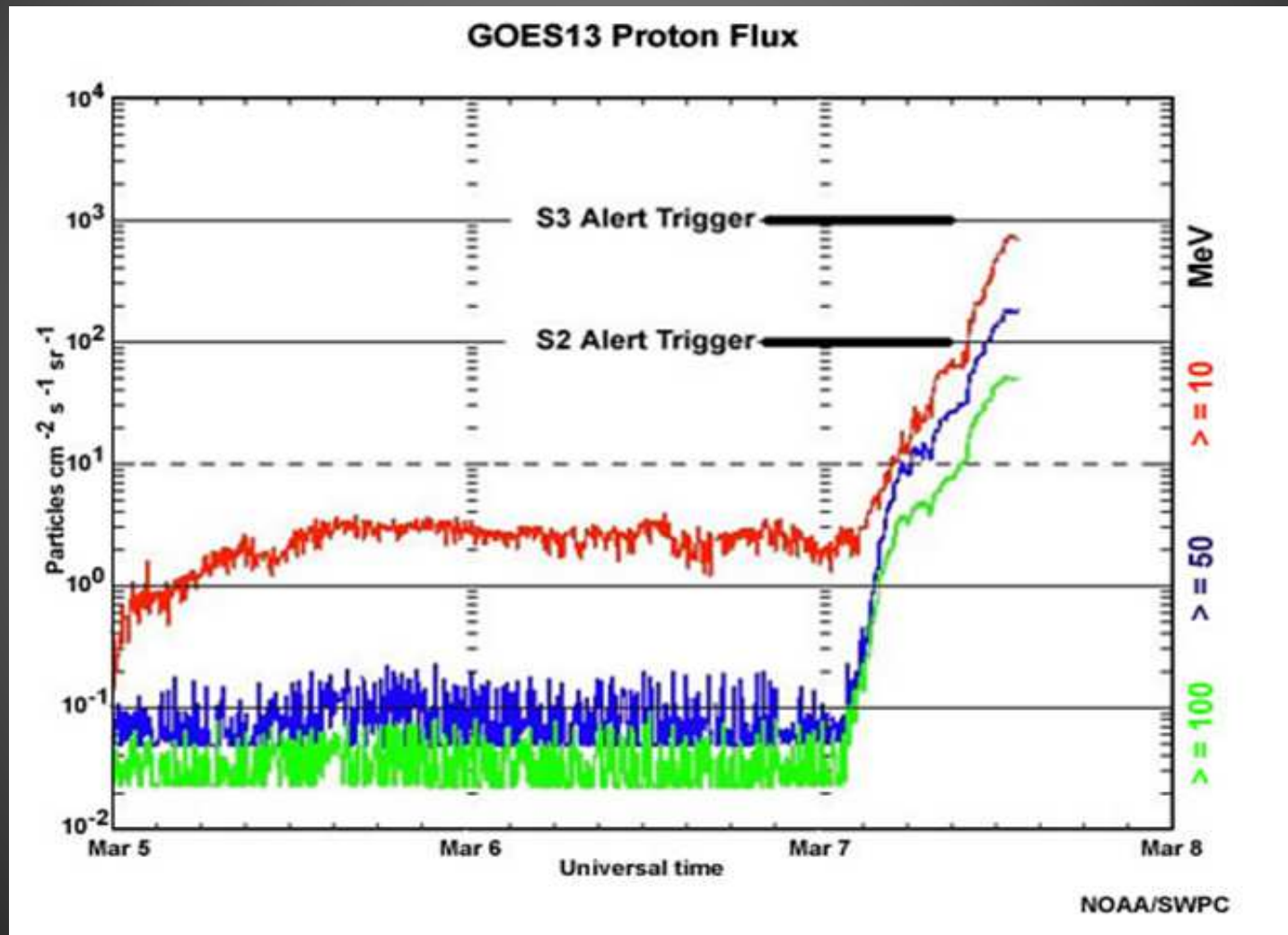
SWPC



SWPC



SWPC



SOLAR DATA

Official Space Weather Advisory issued by NOAA Space Weather Prediction Center
Boulder, Colorado, USA

SPACE WEATHER ADVISORY OUTLOOK #11- 28
2011 June 14 at 11:26 a.m. MDT (2011 June 14 1726 UTC)

**** SPACE WEATHER OUTLOOK ****

Summary For June 6-12

A category S1 (Minor) solar radiation storm was observed on 07-08 June from active sunspot Region 1226.

A Category R1 (Minor) radio blackout was observed on 07 June due to flare activity from active sunspot Region 1226.

Outlook For June 15-21

No space weather storms are expected.

Data used to provide space weather services are contributed by NOAA, USAF, NASA, NSF, USGS, the International Space Environment Services and other observatories, universities, and institutions. More information is available at SWPC's Web site <http://swpc.noaa.gov>

SWPC

Impacts	Causal Event	Levels for Concern	Timescales
<ul style="list-style-type: none"> • HF & VHF communications disruptions on sunlit side of Earth 	Radio blackout induced by solar flare	R1 (mainly near subsolar point) R2 R3 R4 R5	First effects 8 minutes after the event (typically no warning prior to onset). Duration: Up to a few hours.
<ul style="list-style-type: none"> • HF radio disruptions • Avionics issues • Radiation exposure 	Charged particles from flare or CME interact with Earth's atmosphere	S2 S3 S4 S5	First effects ~30 minutes to several hours after solar event. Duration: Hours to days.
<ul style="list-style-type: none"> • HF radio disruptions • Avionics issues • Power grid disruptions • GPS errors 	Geomagnetic storm initiated when magnetized plasma from CME interacts with Earth's ionosphere & magnetic field	G1 (mainly near poles) G2 G3 G4 G5	First effects ~20 to 90 hours after solar event, allows time for Watch product to be issued. Duration: Hours to days.

SOLAR DATA

A SOLAR PROTON EVENT IN PROGRESS MAY LEAD TO EXCESSIVE RADIATION DOSES TO AIR TRAVELERS AT CORRECTED GEOMAGNETIC LATITUDES ABOVE 35 DEGREES NORTH OR SOUTH.

SEE MAP AT

[HTTP://WWW.CAMI.JCCBI.GOV/RADIATION.HTML](http://WWW.CAMI.JCCBI.GOV/RADIATION.HTML)

CURRENT RECOMMENDED MAXIMUM FLIGHT ALTITUDE: 25 000 FEET.

SOLAR RADIATION	
ALTITUDE (FEET)	EFFECTIVE DOSE RATE (MILLISIEVERTS/HOUR) *
20 000	0.0056
30 000	0.032
40 000	0.10
50 000	0.19
60 000	0.30
70 000	0.41
80 000	0.52

* ESTIMATES FOR HIGH-LATITUDE LOCATIONS. DOSE RATES ARE BASED ON NEAR REAL-TIME GOES SATELLITE MEASUREMENTS AND ARE RECALCULATED EVERY 3 MINUTES.

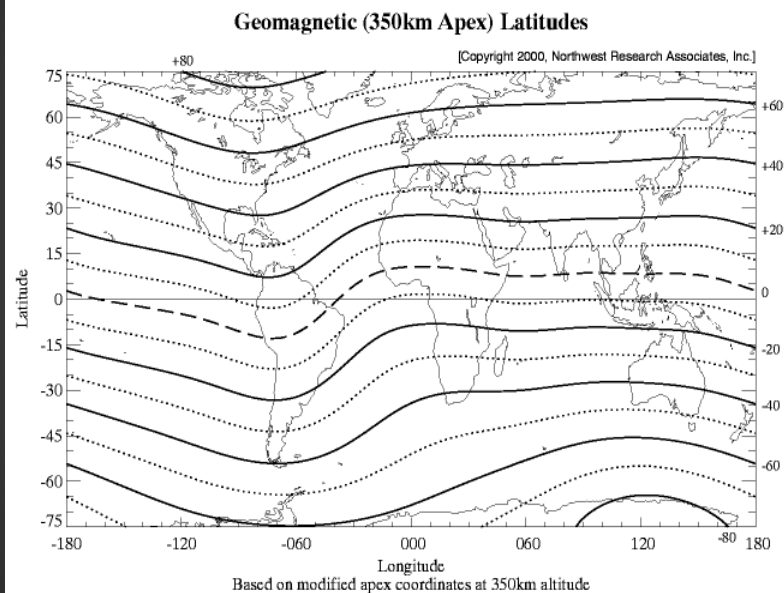
MORE INFORMATION AT

[HTTP://WWW.CAMI.JCCBI.GOV/RADIATION.HTML](http://WWW.CAMI.JCCBI.GOV/RADIATION.HTML)

:10292216 108658 0001

SOLAR DATA

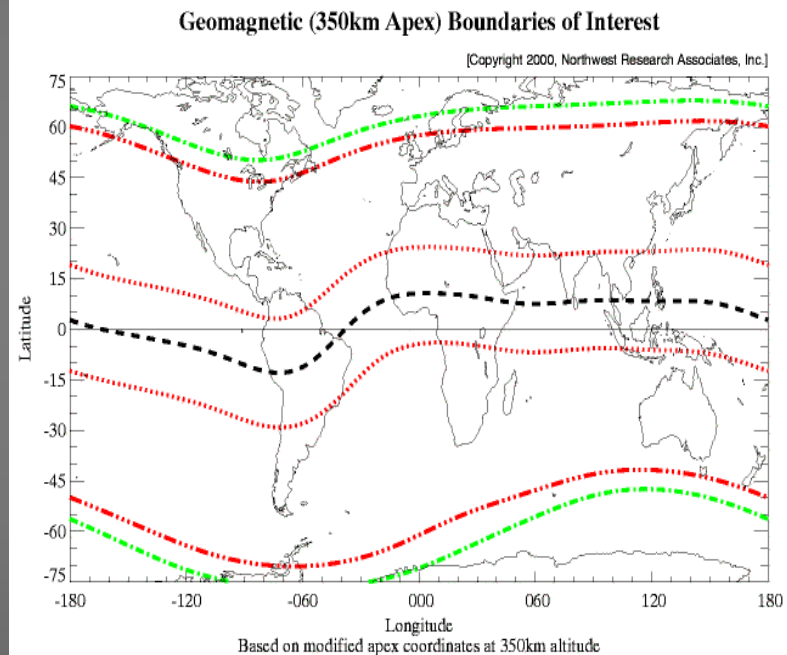
Geomagnetic Latitude



This map shows lines of constant geomagnetic latitude based on apex geomagnetic coordinates referenced to an altitude of 350km. The geomagnetic equator is indicated by a dashed line. The coordinates were calculated using the IGRF-1985 geomagnetic field model updated to epoch 1990.0.

The coordinate system used here is a modified version of apex coordinates as defined in the following reference: VanZandt, T.E., W.L. Clark, and J.M. Warnock, Magnetic Apex Coordinates: A Magnetic Coordinate System for the Ionospheric F2 Layer, *J. Geophys. Res.*, 77, 1972.

Geomagnetic Latitude Boundaries



This map shows lines of constant geomagnetic latitude (350km apex coordinates) for various latitudes of general interest for ionospheric effects. The heavy black dashed line indicates the geomagnetic equator, and the red dashed lines to the immediate north and south indicate nominal locations of the crests of the equatorial (Appleton) anomalies, regions of potentially enhanced ionization during the afternoon and early evening hours.

SOLAR DATA

- Source Document

DOT/FAA/AM-05/14
Office of Aerospace Medicine
Washington, DC 20591

Solar Radiation Alert System

Kyle Copeland¹
Herbert H. Sauer²
Wallace Friedberg¹

¹Civil Aerospace Medical Institute
Federal Aviation Administration
Oklahoma City, OK 73125

²CIRES, University of Colorado and
National Geophysical Data Center
NOAA, Boulder, CO 80305

July 2005

Final Report



U.S. Department
of Transportation
**Federal Aviation
Administration**

SOLAR DATA

- *SFU is Solar Flux Unit, literally the power of the radio burst measured on Earth at a given frequency
- * PFU is Particle Flux Units, the count of protons or electrons
- * Region 486 is located at (S17E04). The heliocentric co-ordinate system is in degrees from the center of the disk. 04 degrees to the left of center and 17 degrees below the solar equator.

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.0025 282215
FXXK01 KNP 282211
DAYDSF
:PRODUCT: DAILY SPACE WEATHER SUMMARY AND FORECAST DAYDSF.TXT
:ISSUED: 2003 OCT 28 2210 UTC
* PREPARED BY THE US DEPT. OF COMMERCE, NOAA, SPACE ENVIRONMENT CENTER
* PRODUCT DESCRIPTION AND SEC CONTACT ON THE WEB
* HTTP://WWW.SEC.NOAA.GOV/WWIRE.HTML
#
# DAILY SPACE WEATHER SUMMARY AND FORECAST.
#
:ANALYSIS:
ANALYSIS OF SOLAR ACTIVE REGIONS AND ACTIVITY FROM 27/2100Z
TO 28/2100Z: SOLAR ACTIVITY CONTINUES AT HIGH LEVELS. REGION 486
(S17E04) PRODUCED ONE OF THE LARGEST FLARES OF THIS SOLAR CYCLE. AN
X17/48 PROTON FLARE PEAKING AT 28/1110Z. THIS FLARE HAD INTENSE
RADIO BURSTS INCLUDING A 245 MHZ BURST NEAR 500,000 SFU AND A
TENFLARE OF 13,000 PFU. A VERY FAST (NEAR 2000 KM/S), EARTHWARD
DIRECTED FULL HALO CME WAS OBSERVED ON SOHO/LASCO IMAGERY. REGION
486, A BETA-GAMMA-DELTA GROUP WITH OVER 2100 MILLIONTHS OF WHITE
LIGHT AREAL COVERAGE, IS NOW ONE OF THE LARGEST AND MOST COMPLEX
ACTIVE REGIONS OF SOLAR CYCLE 23. REGION 484 (N03W68) MAINTAINS
CONSIDERABLE SIZE AND COMPLEXITY AS IT APPROACHES THE WEST LIMB. IT
PRODUCED OCCASIONAL C-CLASS ACTIVITY AND A LOW M-CLASS FLARE AT
28/1613Z. REGION 488 (N06W04) CONTINUES ITS RAPID GROWTH AND NOW
EXCEEDS 800 MILLIONTHS OF COVERAGE IN A BETA-GAMMA-DELTA
CONFIGURATION. FREQUENT C-CLASS FLARE ACTIVITY WAS OBSERVED IN THIS
REGION THROUGHOUT THE PERIOD. NEW REGION 493 (N09E05) WAS NUMBERED
TODAY.
#
:FORECAST:
SOLAR ACTIVITY FORECAST: SOLAR ACTIVITY IS EXPECTED TO CONTINUE
AT HIGH LEVELS. REGION 486 IN PARTICULAR, HAS POTENTIAL TO PRODUCE
FURTHER MAJOR FLARE ACTIVITY. AN ISOLATED MAJOR FLARE IS ALSO
POSSIBLE FROM REGIONS 484 AND 488.
#
:GEOPHYSICAL ACTIVITY:
GEOPHYSICAL ACTIVITY SUMMARY 27/2100Z TO 28/2100Z:
THE GEOMAGNETIC FIELD WAS QUIET TO ACTIVE. A CME WAS OBSERVED TO PASS
THE ACE SPACECRAFT AT AROUND 0130Z. SOLAR WIND SPEED ROSE TO NEAR
800 KM/S, BUT STAYED NORTHWARD, THWARTING A SIGNIFICANT
GEOMAGNETIC RESPONSE. THE X17 FLARE THAT OCCURRED AT 28/1110Z
PRODUCED PROTON EVENTS AT GREATER THAN 10 AND GREATER THAN 100 MEV
WHICH REMAIN IN PROGRESS AT THIS TIME. THE GREATER THAN 100 MEV
EVENT BEGAN AT 28/1145Z WITH A MAXIMUM SO FAR OF 176 PFU. THE
GREATER THAN 10 MEV PROTON EVENT BEGAN AT 28/1215Z WITH A MAXIMUM SO
FAR OF 6020 PFU. A POLAR CAP ABSORPTION BEGAN AT 28/1237Z AND
REMAINS IN PROGRESS.
#
:GEOPHYSICAL FORECAST:
GEOPHYSICAL ACTIVITY FORECAST: THE GEOMAGNETIC FIELD IS
EXPECTED TO RANGE FROM UNSETTLED TO POTENTIALLY SEVERE STORMING IN
THE NEXT 24 TO 48 HOURS. TODAY'S X17 FLARE PRODUCED A LARGE AND FAST
HALO CME THAT WILL LIKELY IMPACT THE EARTH'S MAGNETIC FIELD BY
MIDDAY ON DAY ONE. PAST EVENTS OF THIS MAGNITUDE HAVE ALMOST ALWAYS
PRODUCED SEVERE STORMING. THE STORM IS EXPECTED TO CONTINUE THROUGH
AT LEAST THE FIRST HALF OF DAY TWO. UNSETTLED TO MINOR STORM LEVELS
ARE EXPECTED ON DAY THREE. THE GREATER THAN 100 MEV PROTON EVENT
IS EXPECTED TO END BY DAY TWO. THE GREATER THAN 10 MEV PROTON
EVENT WILL LIKELY PERSIST THROUGH DAY THREE.
:10282215 100628 0765
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SOLAR DATA

- Applicability?
- Readability?
- Efficiency?

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*
# PREDICTION DATES: 2003 OCT 29 2003 OCT 30 2003 OCT 31
# GEOMAGNETIC A-INDICES:
A_FREDERICKSBURG      80      100      15
A_PLANETARY           100      120      25
#
# PREDICTED 3-HOUR MIDDLE LATITUDE K-INDICES
# PRED_MID_K:
MID/00-03UT           4          9          4
MID/03-06UT           3          7          4
MID/06-09UT           4          7          4
MID/09-12UT           4          5          2
MID/12-15UT           4          4          2
MID/15-18UT           7          3          2
MID/18-21UT           8          3          2
MID/21-00UT           7          3          2
#
# PREDICTED 3-HOUR HIGH LATITUDE K-INDICES:
# PRED_HIGH_K:
HIGH/00-03UT          3          9          2
HIGH/03-06UT          4          8          4
HIGH/06-09UT          3          7          4
HIGH/09-12UT          4          6          6
HIGH/12-15UT          4          5          4
HIGH/15-18UT          7          4          3
HIGH/18-21UT          7          3          2
HIGH/21-00UT          9          3          2
#
# PROBABILITY OF GEOMAGNETIC CONDITIONS AT MIDDLE LATITUDE
# PROB_MID:
MID/ACTIVE            15          15          50
MID/MINOR_STORM       25          25          15
MID/MAJOR-SEVERE_STORM 60          60          5
#
# PROBABILITY OF GEOMAGNETIC CONDITIONS AT HIGH LATITUDES
# PROB_HIGH:
HIGH/ACTIVE           10          10          50
HIGH/MINOR_STORM      20          20          25
HIGH/MAJOR-SEVERE_STORM 70          70          10
#
# POLAR CAP ABSORPTION FORECAST
# POLAR_CAP:
#
# SOLAR
# 10CM_FLUX:
#
#
# WHOLE DISK FLARE PROB:
CLASS_M              90          90          90
CLASS_X              50          50          50
PROTON               99          99          75
#
# REGION FLARE PROBABILITIES FOR 2003 OCT 29
# REGION CLASS C M X P
# RES_PROB: 2003 OCT 28
#
# 0482 1 1 1 1
# 0483 1 1 1 1
# 0484 99 45 15 10
# 0485 1 1 1 1
# 0486 99 80 25 99
# 0487 25 5 1 1
# 0488 50 50 10 5
# 0489 15 1 1 1
# 0490 10 1 1 1
# 0491 25 5 1 1

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SOLAR DATA

Page 1 of 1

Colleagues,

Please be advised that medium to severe Solar Flares are being observed and forecast for the next 48 hours. The Notam below issued by Edmonton Centre is issued based on a major degradation/loss in the availability of HF frequencies with Arctic Radio.

Please ensure your crews are briefed accordingly and the appropriate Radio Communication Failure procedures are adhered to.

Please note that Edmonton Centre may attempt to contact your Ops Centres for POS report updates and and urgent ground-air comms. via ADC channels should ATC channels fail.

FYI- Regards
Bernard Gonsalves

CZEG EDMONTON CENTRE (ACC)

A8577/03 - ROUTE AND LEVEL RESTRICTIONS DUE TO GEO-MAGNETIC STORM IMPACT ON COMM IN EDMONTON ACC ALL FLT TRANSITING CZEG FIR N OF 5700N AT FL290 OR ABOVE: 1. NORTHBOUND POLAR FLT PROCEEDING OVER DEVID, ORVIT OR RAMEL SHALL ROUTE VIA: A) 7500N 8000W - 8000N 8300W - PIGSO - 8852N 14100W - DEVID B) YRB - TAPSA - OVDON - 7810N 14100W - ORVIT C) 7000N 10500W - TAVRI - 8415N 14100W - RAMEL 2. ALL ACFT SHALL OPR ON PUB TRACKS 3. NO LATERALS, NO DIRECTS WHILE E OF 7000W 4. ACFT THAT ARE UNABLE TO OPR ON PUB TRACKS DUE TO THE NATURE OF FLT SHALL REQUIRE PRIOR APPROVAL OF THE ROUTE FROM SHIFT MANAGER AT 1-(780) 890-8397 5. ZAN SHALL RESTRICT ALL EASTBOUND ACFT ENTERING CZEG FIR AT AND N OF 6900N TO 20 MIN IN TRAIL 6. OPR ARE ADVISED THAT VHF AND HF COMM RELAYED FROM THE TRANS SITE TO ATC VIA SATELLITE MAY FAIL DUE TO THE EFFECTS OF THE CURRENT INTENSE MAGNETIC STORM. CZEG WILL UPDATE THESE MEASURES AS THE STORM IMPACTS BECOMES BETTER KNOWN. FOR INFO CONTACT: CZEG SHIFT MANAGER 1-(780)890-8397/1-(877)342-2276 NATIONAL OPS CENTRE 1-(613) 248-4087 FL290 UNL 24 OCT 15:14 UNTIL 25 OCT 12:30

INTEGRATING SPACE WEATHER

AMS Policy Workshop – November 2006

4 Recommendations:

- ☐ Improve Communication of Space Weather
- ☐ Improve Standardization of Information & Regulations
- ☐ Improve Education and Training
- ☐ Develop Cost Benefit and Risk Analysis

- *ACA, COA, Fedex, NetJets, NWA, UAL*

- <http://www.ametsoc.org/atmospolicy>

“The AMS Policy Program is equipping the scientific community and policy makers to deal with many policy issues related to meteorology and climate. Policy issues such as the public-private sector partnership, data sharing, uncertainty, transition from research to operations, and cost-benefit analyses are just a few of the issues that meteorologists have been dealing with for decades. These experiences and lessons learned can be applied to other emerging scientific fields.

As the field of space weather progresses, it appears to have many commonalities with the meteorological field. Both fields consist of research (ground-based and satellite observations, models) and operations (forecasting models, services and products). Additionally, both fields consist of relationships involving multiple federal agencies, the private sector, and the international community. Already, the space weather field is involved in similar policy issues that the meteorological field continues to face. Therefore the space weather community may choose to look at the meteorological field for guidelines in developing prosperous partnerships.

AMS conducts policy study on *Advancing Space Weather Science and its Use through Policy Research* with support from the NSF. AMS also continues to collaborate with the aviation industry on increasing the safety, reliability, and efficiency of the nation's airline operations through more effective use of space weather forecasts and information.”

POLICY FINDING

Finding:

Aviation operators prefer that the governing federal and international agencies provide a minimum set of requirements, rather than regulations, for making decisions based on space weather information.

SPACE WEATHER SUBGROUP

- Subgroup formed under CPWG to look at user requirements for space weather
- Subgroup consists of representatives from: NOAA, Natural Resources Canada, American Meteorological Society, NavCanada, United Airlines, SolarMetrics

USER REQUIREMENT DOCUMENT

- Focus on space weather user requirements of the commercial airline operators
- Based on input from users, define requirements from operational impact (i.e., communication, navigation, avionics and human health)
 - Follow on with consideration of operational processes and timelines during space weather activity

THANK YOU !

