



March, 2002

National Weather Service Central Region

Volume 1 Number 2

Inflight Advisories - Timely and accurate aviation weather warnings from the NWS

"Attention all aircraft..." begins the ATC announcement that describes a weather hazard that may well impact flight operations and flight safety. The controller reads the Navaids and airports that outline the area for a Convective SIGMET. Any conversation among the crew or passengers stops, and eyes become fixed in a gaze of concentration The duty now is to form a mental picture of the area described. Then quickly, the task becomes that of assessing the short term impact of these thunderstorms.

SIGMETs, Convective SIGMETs, and AIRMETs are Inflight Advisories that are skillfully and meticulously maintained for aviation safety by forecasters at the Aviation Weather Center. Convective SIGMETs are short term aviation warnings for thunderstorms that pose a danger to all aircraft. Here are the basics:

- A. Meteorological criteria
 - 1. Severe thunderstorms due to:
 - a. surface wind gusts greater than or equal to 50 knots.

- b. hail at the surface equal to or greater than 3/4" in diameter. c. tornadoes.
- 2. Embedded thunderstorms.
- 3. Lines of thunderstorms.
- 4. Thunderstorms greater than or equal to Level 4 affecting 40 % or more of an area that is 3,000 square miles in size.
- B. Issuance and valid times
 - 1. issued hourly at H+55.
 - 2. valid for 2 hours, but replaced hourly.
 - 3.outlook portion valid 2 to 6 hours discusses technical aspects that are producing the thunderstorms.
 - 4. numbered sequentially beginning at 0000 UTC
 - 5. uses Navaids to locate the threat.
 - uses 3 sections of the country -<u>West, Central, and East to reduce</u> the size of each hourly bulletin -W, C, or E are appended to the number to denote the section of the country for which they apply.

In this issue:

Anatomy of Convective SIGMETs

Center Weather Advisories
- The Inflight Advisory
that augments
Convective SIGMETs

NCWF - National Convective Weather Forecast - a graphical Nowcast tool

Sectorized plotting charts
- new compact tools for
the cockpit for locating
Inflight Advisory areas

SVI TUI S (2) 170-230 Molt Icing 120-180 Lgt-Mdt Turbe 080-110

Figure 1. If you could "see" Inflight Advisories in effect on any day, you may wonder just how free you are to choose your altitude and route without encountering weather problems.

Mission Statement

To enhance aviation safety by increasing the pilots' knowledge of weather systems and processes and National Weather Service products and services.

All pilots need to keep current on weather. That's just common sense, and that includes keeping abreast of Inflight Advisories, since there is no more urgent product issued for pilots. Yet, a review of the FAA test questions for Private Pilot/Flight Instructor, Instrument, and Commercial ratings shows that there are no questions that test a pilot's ability to actually interpret any Inflight Advisory.

The very few questions about Convective SIGMETs that do exist focus mainly on the issuance criteria. That's like asking a pilot, "when is an altimeter used" and not providing simulated altimeter depictions to test the pilot's ability to interpret this crucial instrument.

The Aeronautical Information Manual (AIM), section 7-1-5 does a pretty good job of describing SIGMETs and Convective SIGMETs. Perhaps a graphic explaining the content of Convective SIGMETs would be more helpful. That's the focus of the following pages.

When Inflight Advisories were first introduced, the only source was Flight Service, and that was verbal. Gradually, DUATS matured giving pilots their first direct access to NWS products. Then private vendors created airport weather terminals for use at FBOs. Today the Internet delivers a plethora of weather text products, maps, and graphics to pilots. Does just having them available mean that pilots can remain current with these products? Perhaps, but let's study a couple of Inflight Advisories, namely Convective SIGMETs and Center Weather Advisories and get reacquainted.

The AWC home page,

http://aviationweather.noaa.gov/

has menu options on the left-hand side that take you directly to the Convective SIGMET page shown in Figure 2. The current WSTs are plotted in red, and outlooks are plotted in green. Options at the bottom of that page offer two other map displays as well as the ability to display the text message only.

The text versions can be plotted on the AWC's advisory plotting chart shown in Figure 3. That chart is available at:

http://aviationweather.noaa.gov/awc/advsry/advsrypltn.html

The anatomy of a Convective SIG-MET is shown in Figure 4 on the next page. The individual advisories shown there are the ones plotted in Figure 3.

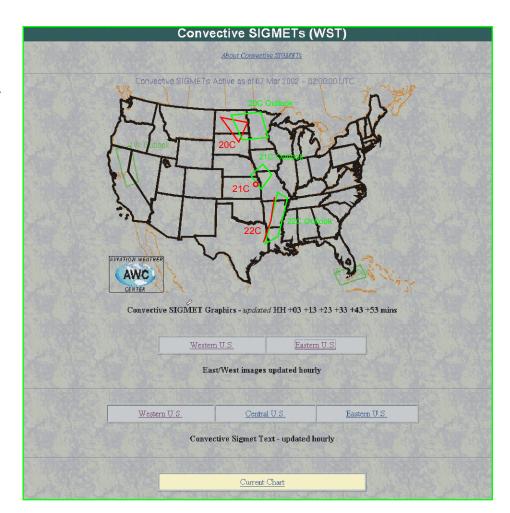


Figure 2. The Convective SIGMET page displays plots of WSTs in red and outlook areas in green. The map can be divided into east and west portions using the clickable tabs below the map. Text versions of the Convective SIGMETs are also available using the three tabs near the bottom of the page. Access it from the AWC home page, or go direct to this page with: http://aviationweather.noaa.gov/awc/awc-wsts.html

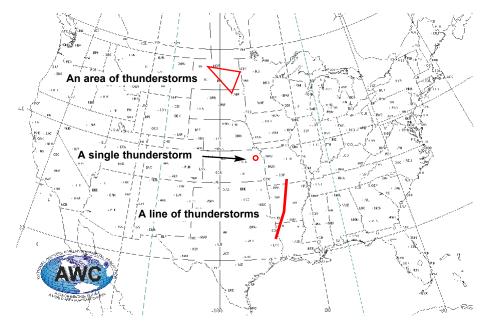


Figure 3. The Inflight Advisory plotting chart is used by Aviation Weather Center to graphically depict the location of SIGMETs, Convective SIGMETs, and AIRMETs. The Convective SIGMETs shown in Figure 4 on the next page are plotted here.

MKCC indicates this Convective SIGMET is from the AWC. The end "C" means it is for the central portion of the continenal U.S. E or W would be for East or West sections respectively.

States affected

Area of thunderstorms. Points are relative to Navaids that outline the threat area. The starting and ending point are identical.

Single Cell thunderstorm 35 nm west of Kansas City

Line of severe thunderstorms 25 nm wide

Each Convective SIGMET has an outlook. that is valid for 2 to 6 hours, but 4 hours is normally chosen. The outlook begins at the expiration time of the SIGMET.. The outlook uses Naviads to describe the area. Outlook Area 1 refers to the first SIGMET, in this case, 20C. Outlook Area 2 refers to the second SIGMET in this message, 21C. Outlook Area 3, refer-

ences 22C.

SIGMET number. Issuance time: 22nd day, 1855 UTC 0000 UTC. The "C" means

Numbering begins daily at it's for the "Central" portion of the country.

Expiration time is 2 hours after issuance, but Convective SIGMETs are issued hourly and replace the previous hour's product.

> "Intensifying area of severe thunderstorms moving from 240 degrees at 45 knots. Storm tops above flight level 4-5-Zero. Wind gusts to 60 knots reported. Tornadoes, hail to 2 inches in diameter, wind gusts to 65 knots possible in the North Dakota portion."

"Isolated severe thunderstorm, 30 nautical miles in diameter moving from 250 degrees at 20 knots. Tops above flight level 4-5-Zero. Hail to 2 inches in diameter. Wind gusts to 65 knots possible."

"Line of severe thunderstorms 25 miles wide moving from 270 degrees at 45 knots. Tops above flight level 4-5-Zero. Hail to 2 inches Wind gusts to 65 knots possible.

"Severe thunderstorms continue to develop in the area over North Dakota. Area is expected to remain severe and spread into Minnesota as strong positive vorticity advection moves over very unstable airmass characterized by a minus 12 lifted index."

"Isolated strong thunderstorms will continue ovr eastern Kansas and northwestern Missouri through the forecast period as divergence associated with upper level trough moves northeastward over very unstable airmass. Lifted index remains in the minus 9 to minus 10 range.."

MKCC WST 221855 **CONVECTIVE SIGMET 20C**

VALID UNTIL 2055Z

ND SD

FROM 90W MOT-GFK-ABR-90W MOT

INTSPYG AREA SVR TSTMS MOVG FROM 2445. TOPS ABV FL450. WIND GUSTS TO 60KT RPRTD. TORNADOES...HAIL TO 2 IN...WIND GUSTS TO 65KT PSBL ND PTN.

CONVECTIVE SIGMET 21C VALID UNTIL 2055Z

KS MO

35W MKC

ISOLD SVR TSTM D30 MOVG FROM 2520 TOPS ABV FL450. HAIL TO 2 IN. WIND GUSTS TO 65 KT PSBL.

CONVECTIVE SIGMET 22C VALID UNTIL 2055Z AR MO OK TX

FROM 90SE SGF-70NE TXK-50NE LFK

LN SVR TSTMS 25 MI WIDE MOVG FROM 2745. TOPS ABV FL450. HAIL TO 2 IN. WIND GUSTS TO 65 KT PSBL.

OUTLOOK VALID 222055-230055

AREA I FROM INL-MSP-ABR-MOT-INL

SVR TSTMS CONT TO DVLP IN AREA OVR ND. AREA IS XPCD TO RMN SVR AND SPRD INTO MN AS STG PVA MOVS OVR VERY UNSTBL AMS CHARACTERIZED BY -12 LIFTED INDEX.

AREA 2 FROM DSM-IRK-BUM-PWE-DSM

ISOLD STG TSTMS WILL CON OVR ERN KS AND NWRN MO THRU FCST PD AS DVRGC ASSOCD WITH UPR LVL TROF MOVS NEWD OVR VERY UNSTBL AMS. LIFTED INDEX RMNS IN THE -9 TO -10 RANGE.

AREA 3 FROM COU-FAM-MCB-LFK-COU

LN SVR TSTMS WILL CONT OVR SRN MO AR NRN LA AND ERN TX ALG RPDLY MOVG CD FNT. TSTMS MOVG INTO AREA OF SFC DWPTS OF 70 TO 75 AND CAPE OF 3000 TO 4000 I/KG.

> " 'Line of severe thunderstorms will continue over southern Missouri, Arkansas, northern Louisiana and eastern Texas along a rapidly moving cold front. Thunderstorms are moving into an area of surface dew points of 70 to 75 and CAPE of 3000 to 4000 joules per kilogram."

Figure 4. Convective SIGMETs consist of a warning section on top, each of which is sequentially numbered, and an outlook section below. The numbered areas refer to the warning areas in the same order.

Several Convective SIGMETs can be listed in each hourly bulletin if convection stretches over a wide area and if the clusters of thunderstorms are distinct from each other.

These bulletins consist of a warning section on top, in which each Convective SIGMET is sequentially numbered. Below that is an outlook section which is a concise short term forecast (up to 6 hours) for each respective area of thunderstorms. It's carefully crafted by AWC forecasters using satellite cloud motion and motion vectors from NWS NEXRAD data, as well as model output from the RUC (Rapid Update Cycle), ETA, MesoETA, and AVN atmospheric models. The numbered outlook areas are listed in the same sequence as the warnings above. In other words, Area 1 in the outlook refers to Convective SIGMET 20C.

Technical terms are used in this outlook section, and discuss the most important meteorological features that are contributing to the thunderous disruptions of air traffic.

Normally, Convective SIGMETs serve the country quite well. Sometimes though, a thunderstorm develops rapidly in an area of high traffic volume, or a portion of a storm cluster will affect a large terminal and disrupt the tight flow of traffic. One of these particular storms may

not meet Convective SIGMET criteria, but it may pose a problem for Air Traffic Control.

Center Weather Advisories (CWA) are another type of Inflight Advisory and were created for this very purpose. CWAs are equal in urgency to Convective SIGMETs but are issued by Center Weather Service Units (CWSU) in the Air Route Traffic Control Centers (ARTCC). The function of the CWA is to provide real time help when adverse weather erupts or covertly evolves.

Figure 5 is a diagramed example of a CWA. CWAs may augment existing Convective SIGMETs, in which case that fact will be stated in the CWA as shown in Figure 5. CWSU forecasters are direct resources for ATC controllers but are not a pilot's alternative to Flight Watch.

CWAs are available on the AWC web site in the section called the CWSU Corner. Start again at the AWC home page:

http://aviationweather.noaa.gov/

Figure 6 shows that home page and where to click to access the CWSU Corner and other AWC products and services.

Figure 7 is the CWSU Corner page. Clicking on the dot under the ARTCC IDs will display any CWAs in effect for that Center at the top left corner of the page.

A new automated tool arrived on the

aviation scene in October, 2001. The National Convective Weather Forecast (NCWF) in Figure 9 depicts six level radar data on a map with ARTCC boundaries and hub airports. To zoom in on one of the hubs, click on the appropriate button at the bottom of the map. The NCWF looks for max reflectivity areas and then projects a one hour future location with a polygon similar to the way that AWC forecasters create the outlook portion of the Convective SIGMET. While the NCWF could be a parallel to the Convective SIGMET program, work is ongoing to assess its performance.

Most pilots have heard Convective SIGMETs read either directly by the controller or by changing to the HIWAS frequency. Controllers will normally summarize the area concerned. But if the controller chooses to read the points that outline the area of thunderstorms, it may be hard to quickly visualize where the area is. This task is nearly impossible if the current flight plan has you in an unfamiliar part of the country.

Does that WST straddle the course between two waypoints that you have entered into your GPS?

One way to find out is take out an en route chart, unfold it and search for the VORs just mentioned. Maybe you need to flip the chart over, or get another one out

ARTCC ID, ZKC is Kansas City Center.

The "2" is a phenomenon number for a meteorologically uniqure event. There are normally only 6 numbers used, and they begin numbering each day at 00 UTC.

<u>Urgent Center Weather Advisory</u>

Issued 22nd day of the month at 1913 UTC

2nd line of header

The "2" in "203" is the phenomenon number, a distinct area of thunderstorms. The "3" is the number of the CWA pertaining to this phenomenon. In other words, this is the 3rd CWA issued for this storm (phenomenon 2). This would be done only if the storm persisted, did not meet Convective SIGMET criteria, but was significant enough to impact the normal flow of air traffic.

Expiration time, 22nd day of the month at 2113 UTC.

/D ZKC2 UCWA 221913

ZKC CWA 203 VALID UNTIL 222113 ←
32W MKC

ISOLD LVL 6 TSTM (EXTREME) DIAM 30 NM MOVG FROM 25020KT. TOP TO FL550. TSTM WILL MOV OVR MKC BTWN 2030 UTC AND 2100 UTC. WND GUSTS TO 51 KTS RPTD. SEE CONVECTIVE SIGMET 21C.

"32 nm west of Kansas City VOR (MKC)

Isolated level 6 thunderstorm (extreme) 30 nm in diameter moving from 250 degrees at 20 knots. Tops to Flight Level 5-5-Zero. Thunderstorm will move over MKC between 2030 UTC and 2100 UTC. Wind gusts to 51 knots reported. See Convective SIGMET 21C."

Figure 5. Anatomy of a Center Weather Advisory (CWA). CWAs are issued by Center Weather Service Units (CWSUs) for weather threats that are either not covered by SIGMETs or Convective SIGMETs or to add important details for safe and efficient movement of air traffic by ATC.

PAZA - Anchorage	ZLA - Los Ageles
ZAB - Albuqurque	ZLC - Salt Lake
ZAU - Chicago	ZMA - Miami
ZBW - Boston	ZME - Memphis
ZDC - Washington	ZMP - Minneapolis
ZDV - Denver	ZNY - New York
ZFW - Fort Worth	ZOA - Oakland
ZHU - Houston	ZOB - Cleveland
ZID - Indianapolis	ZSE - Seattle
ZJX - Jacksonville	ZTL - Atlanta
ZKC - Kansas City	

Air traffic control center IDs used in the headers of Center Weather Advisories.

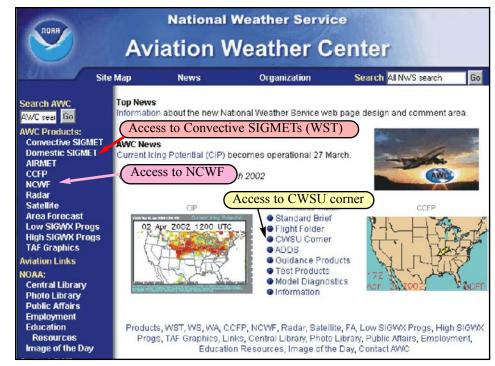


Figure 6. Convective SIGMET maps and text are available with a single click. Two other useful links are available. The CWSU corner will reveal Center Weather Advisories. The National Convective Weather Forecast (NCWF) is a new automated product used to forecast movements of thunderstorms.

of the flight case wedged behind the seat.

What's really needed is some way to easily locate the hazard areas without clutter or confusion in the cockpit, especially when you're in the terminal environment, or in a hold upstream from your destination.

What if you had a compact map that clipped right on the yoke or to your knee

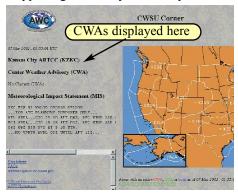


Figure 7. The CWA Corner page at AWC offers Center Weather Advisories.

board? What if the map served as a quick reference and kept the cockpit clutter-free so you could perform your primary duties without distraction? Would you then take the time to locate the hazard that you just received from HIWAS?

The maps on the following pages should help with that. The AWC's advisory plotting chart has been divided into

three separate maps, each covering one of the Convective SIGMET sections, West, Central, and East. There is some overlap into the adjoining sections.

The list of Navaids also has been sectorized. Only those that are in or near each section are listed. So your search for the Navaids will be reduced considerably.

With these pages, you can make your

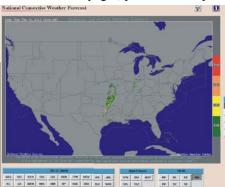


Figure 8. The National Convective Weather Forecast (NCWF) is a new operational tool used to forecast very short term movements of thunderstorms.

own Inflight Advisory plotting chart. Here's how. Make a photocopy or a printer copy of the maps for any section (West, Central, or East). Load that map back in the copier or printer so the next copy will be on the back side. Then print or photocopy the page of Navaids for that section

onto the backside of the maps. You may have to do this a couple times to get the maps and Navaid list to be oriented correctly.

If done correctly, you'll get two slightly different plotting charts. One will have the map on one side, and the list of plotting points upside down on the back. The two circles will be at the top on both the front and the back. This map can be clipped to the yoke of your aircraft or on your knee board. When ATC reads the Navaids and airports for an Inflight Advisory, you'll be able to locate them easily on this sectorized chart. If you're unfamiliar with any or all of the Navaids, simply flip up the map and find them in the list on the back. They'll be oriented so you can read them without removing the chart from the yoke clip or knee board.

The other chart that you've made with this process is intended to be filed in a three ring flight book like those in which you might keep instrument approach procedure charts. On this map, the Navaids and airports are readable merely by turning the page as you would in any book. Which map you choose is purely a matter of personal preference. These maps have been added to the bottom of the AWC page shown in Figure 2.

Until cockpit data uplinks are common in all aircraft, pilots will need a way to locate and follow Inflight Advisories without affecting the primary task of safe flying and good cockpit management. Techniques learned here should help.

Coming up next time...

Explaining the indices and tech terms found in Convective SIGMETs

Web sources where these observed and forecast indices can be found so pilots can get a jump on convective potential for the day.

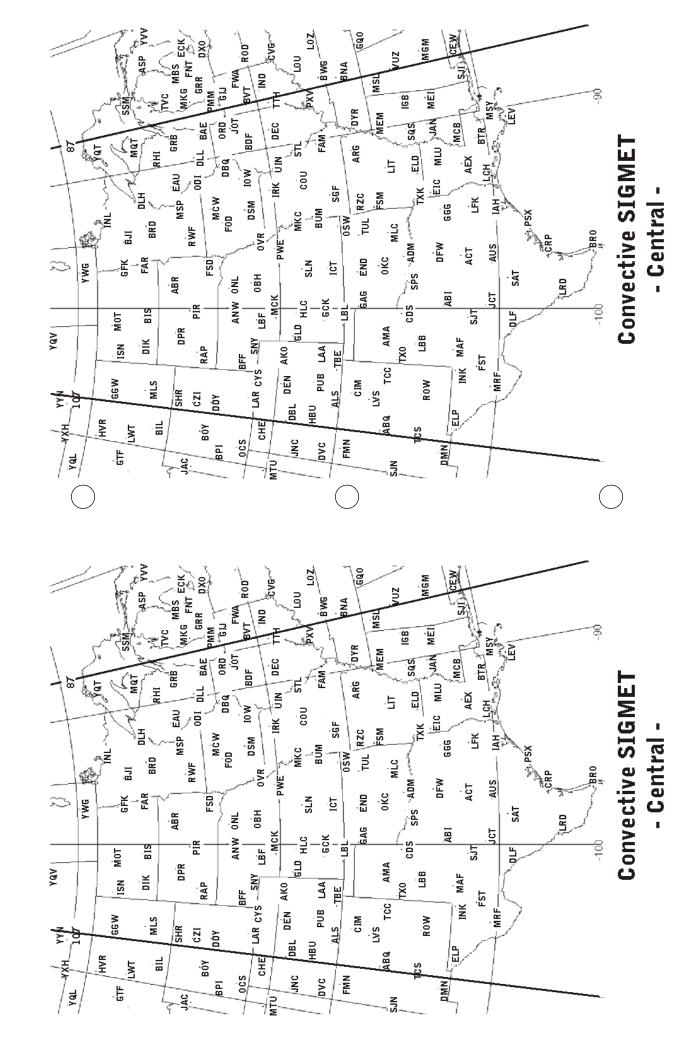
Special thanks go to Jim Roets of the Aviation Weather Center, Philip Kennedy, NOAA Corps pilot, and to FAA Flight Service Green Bay, Wisconsin for their technical advice and insight.

Send comments and suggestions to:

craig.sanders@noaa.gov sally.pavlow@noaa.gov

The Front is published bimonthly and is always available at:

http://www.crh.noaa.gov/crh/aviation/thefront.html



	Abilene TX Abilene SD Waco TX Ardmore OK Alexandria LA Alexandria LA Alexandria TX Alexandria LA Alexandria TX Alexandria LA Alexandria TX Alexandria TX Alexandria TX Alexandria NE Badger/ SCOTT Bradford IL Bradford IL Bradford NE Billings MT Bismarck NI Bismarck NI Bismarck NI Boysen Resv WY Big Piney WY Big Piney WY Big Piney WY Brainerd MN Brownsville Baton Rouge LA Baton Rouge LA Brainayette IN
s	I I G I
	Z. 2 / Ma 0 / 2 / Map 2 / 12
Wink Int! Falls Int! Falls Inwa City Kirksville Williston Jackson Hole Jackson Joliet Lamar Laramie Lubbock Int'! North Platte Liberal Lake Charles Leeville / Grand Isle Lufkin Little Rock Louisville London Laredo Las Vegas Lewistown Midland Saginaw McComb McCook Mason City Meridian Memphis Montgomery Kansas City	ngton ngton odge Falls nith ockton ayne ayne ayne ayne ayne ayne ayne ayn
MACH MAN	State ND
ROW RWF STA TICK STA	M MKG MMLC MMLC MMLC MMLC MMU MMC MMU MMC MMC MMC MMC MMC MMC MM
Roswell Redwwod Falls Razorback San Antonio Springfield Sheridan Semmes /Mobile St. Johns San Angelo Salt Lake City Salina Sidney Wichita Falls Sidon Sault Ste. Marie St. Louis Tobe Tucumcari Truth Or Consequences Terre Haute Tulsa Traverse City Texarkana Texico Quincy Vulcan CANADA Lethbridge Thunder Bay Yorkton Wiarton Wiarton Winnipeg Medicine Hat Swift Current	Muskegon Muskegon Muskegon Muskegon Muse City Monroe Minot Marquette Marfa Muscle Shoals Minneapolis New Orleans Myton Wolbach Rock Springs Nodine Oklahoma City Oneill O'Hare Int'l Oswego Omaha Pierre Pullman Palacios Pueblo Pawnee City Pocket City Rapid City Rhinelander Rosewood
u .	State MI OK NT
als s s s s s s s s s s s s s s s s s s	lo City alls i inces te te e e e e e e e e e e Hat rent
Muskegon Miles City Monroe Minot Monroe Minot Marfa Muncapolis Muncapolis Muncapolis Muncapolis Muncapolis Modhach Rock Springs Nodine Oneill O'Hare Int'l O'Hare Int'l O'Hare Int'l Palacios Platric Pocket City Rapid City Redwwod Falls Reswood Roswood Roswell Roswood Roswo	San Angelo Salt Lake City Salina Salina Salina Salina Sidon Sault Ste. Marie St. Louis Tobe Tucumcari Truth Or Consequences Terre Haute Tulsa Traverse City Texarkana Texico Quincy Vulcan CANADA Lethbridge Thunder Bay Yorkton Wiarton Wiarton Warton Wandicine Hat Swift Current
MKG Muskegon MLC Mc Alester MLS Miles City MLU Monroe MOT Minot MOT Minot MRT Marfa MST Muscle Shoals MSP Minneapolis MSP Minneapolis MSP Minneapolis MSP Molbach OCS Mostle Springs ODI Nodine OKC Oklahoma City ONL Oneill ORD O'Hare Int'l O'NA Omaha PIR Pierre PIR Pierre PWE Paylacios PUB Pueblo PWE Paylacios PWE Paylacios O'N Rosewell RWF Redwwod Falls RCO SAF Razorback SAF San Antonio SGF Springfield SGF Springfield SJN Sheridan SJJ Semmes/Mobile	SJT San Angelo SLC Satt Lake City SLN Salina SQS Sidney SPS Wichita Falls SQS Sidon SSM Sault Ste. Marie STL St. Louis T TEE Tobe T TEE Tobe T TCC Tructmorari TVC Tracerse City TXK Texarkana TXO Texico U UIN Quincy V VUZ CANADA Y YQL Letthbridge YQT Thunder Bay YQV Vorkton YWW Wiarton YWW Wiarton YWW Wiarton YWW Wiarton YWW Wedicine Hat YYN SWift Current
NM MKG Muskegon NM MLC Mc Alester NM MLS Miles City IA MLU Monroe SD MOT Minot AR MAT Marquette TX MRF Marfa IN MSP Minneapolis KS MSP New Orleans ND MTU Myton TX O OBH Wolbach MT OCS Rock Springs NM MTU Nyton TX O OBH Wolbach MI OOS Nock Springs MI OOR Oneill TN ORD O'Hare Int'l OND O'Hare Int'l WI OSW Oswego MI OVR Omaha MT P PIR Pierre PMM Pullman CO SSX Pub Pueblo MT PWE Pawnee City TX PXV Pocket City KS R RAP Rapid City MS RAH Rhinelander IN ROD Rosewood TX ROW Rosewell MN ROS SAT San Antonio SAT San Antonio NS SAT San Antonio NS SAT Semmes/Mobile SU SAN Sheridan MS SJI Semmes/Mobile	nction CO SJT San Angelo CO SLN Salina CO SLN Salina SLC Salt Lake City SNY Sidney SNY Sidon TTRE Tobe TTRE Tobe TCC Tucumcari TX TTRE Tothe TCC Tucumcari TX TTR TER Haute TX TUL Tulsa TX TUL Tulsa TX TV TV Trakana TX TV TV Trakana TX TV Trakanana TX TV TV Trakanana TX TV TV TV Trakananana TX TV TV TV Trakanananananananananananananananananana
Fargo ND MKG Muskegon Farmington NM MLG Mc Alester Film MLD Monroe Sioux Falls SD MOT Minot Ft. Snotkon TX MRF Marfa Ft. Stockton TX MRF Marfa Ft. Stockton TX MRF Marfa Gage ND MOT Minneapolis Garden City KS MSY New Orleans Grand Forks ND MTD Myton Longview TX O OBH Wolbach Gipper / Niles MT O OSH Wolbach Goodland KS OKC Oklahoma City Choo Choo / ONL Oneill Chattanooga TN O ONL Oneill Chattanooga TN O ONL Oneill Chattanooga TN O SW O Swego Grand Rapids MI O VR O Maha Grand Rapids MI O SW O Swego Grand Rapids MI O SW Pocket City Havre MT P PWF Palacios Hill City KS RAP Rapid City Bigbee MS RHI Rhinelander Indianapolis IN RWF Redwood Falls Indianapolis MS RAI Rhinelander Indianapolis MS RAI RAP Rapid City Rirksville MN SAF San Antonio Willston MS SHR Sheridan Jackson Hole WY SJN St. Johns	Grand Junction CO Joliet Laname CO SLN Salina Laramie CO SLN Salina Laramie CO SLN Salina Laramie CO SLN Salina Colliperal CO SLN Salina Sidne Subock Intil TX SQS Sidon Liberal Card Isle Crand Isle Charles Consequences Lufkin Lufkin Lufkin Condon CO Consequences C
F FAR Fargo ND M MKG Muskegon Fint Famington NI MLC Nuc Aleaster (FD Ft. Dodge IA MLU MUC Nuroe FSD Sioux Falls SD MOT Minot FST Ft. Stockton TX MRF Marfa FST Ft. Stockton TX MRF Marfa GGG GAG Gagen City KS MSY New Orleans GFK Grand Forks ND MTU Myton GGG Longview TX O OBH Wolbach GGW Glasgow MT OCS Rock Springs GLD Goodland KS ONC Oklahoma City GGW Glasgow MT OCS Rock Springs GLD Goodland KS ONC Oklahoma City GRR Grand Rapids MI OVR Omaha GRR Grand Rapids MI OSW Oswego Choc Choo Choo Choo Choo Choo Choo Cho	JNC Grand Junction CO JOT Joliet IL LAA Lamar CO SLN Salina LAR Laramie CO SLN Salina LBB Lubbock Int'l TX SSPS Wichita Falls LBL Liberal KS LEV Leville KS Crand Isle LA LIT Little Rock AR LND Louisville KY LND Louisville KY LND Levistown MT LWT Lewistown MT LWT Lewistown MT LWT Lewistown MT NAF Midland TX MAS Saginaw MS MCCOMB MCK Mason City IA MGM Montgomery AL MMCK Kansas City MO YXM Swift Current MMCK Kansas City MO YXM Swift Current MGM Montgomery AL YWG Winningeg MCC Kansas City MO YXM Swift Current

State

Name

믜

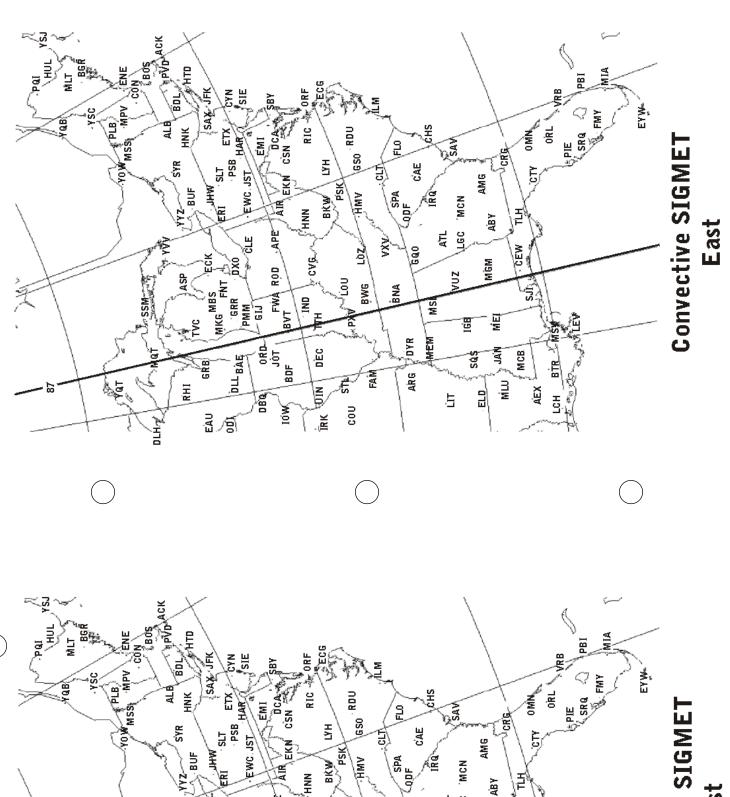
State

Name

<u>State</u>

Name

ABB ABB ABB ABB ADD ABS AMA ANW ARG ASP AUS



NH.

ر CVG.

DÈC

Ľ.

R00

PF

留

MKG FNT CRR DD

DLL BAE

a /a

ŘHI

\$**5**

λM.

2

¥.

000

XX

BNA

DYR

ARG

Σ

Tec McN

品

占

ÀΒΥ

MGM

MCB

ĄĘX

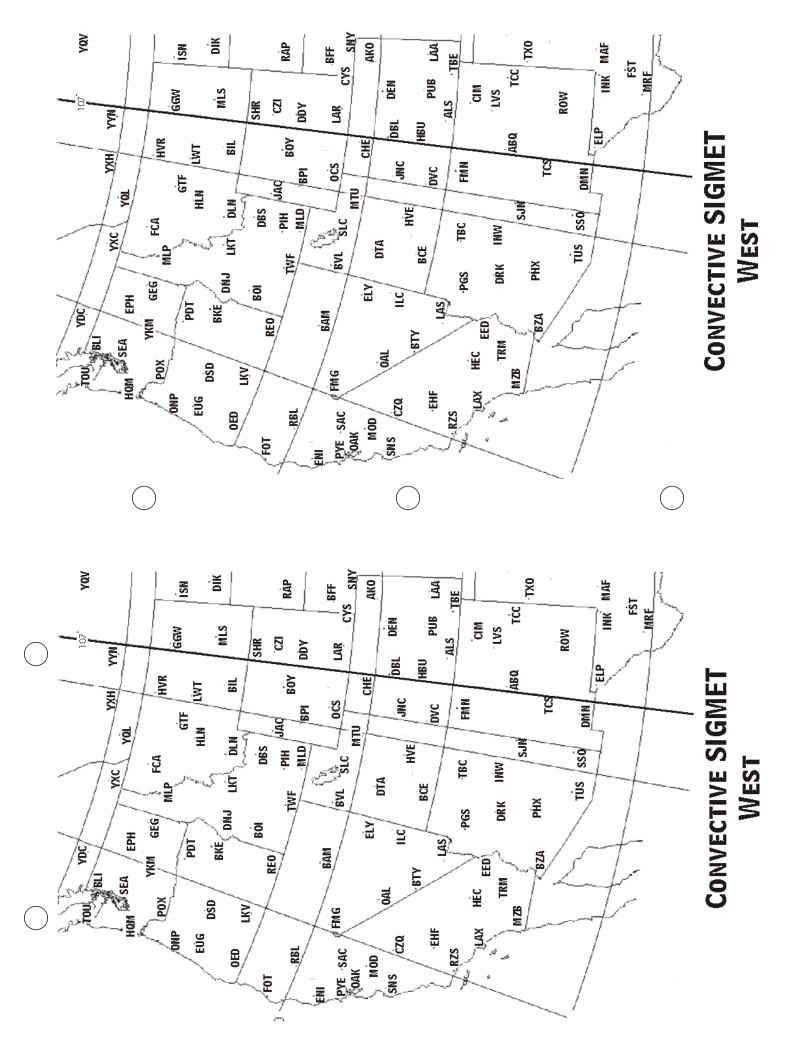
Ā 503

ΞĒ

Convective SIGMET East

								John NB	rbrooke QB	nder Bay ON		awa ON	4	unteer/ TN	can AL	ach	ncy IL	~	e Huate IN	ahassee FL	Eunis MA		ř			3	te Run PA		~		annah GA	ewood OH	4			ket City IN			sque Isle ME	man MI		3	ach	ando FL	Int'l	ond Beach FL	
						()))
STATE	ls AL		5 2	2 5 5			Υ	4	4			M	ΜE	Z S	∀	2 2	•	S	M	Y	등 :	4 -	2 2	} ≥	AL	PA	SC	S E	2	M	S	È i	ረ 롣			군 :	AL	Z	•	O	QB	<u>8</u>	QB	N N	8 8	<u> </u>	
NAME	Muscle Shoals	Massena	New Urleans	Nodine	Ormond Beach	O'Hare Int'l	Norfolk	Orlando	Palm Beach	St. Petersburg	Plattsburgh	Pullman	Presque Isle	Phillipsburg	Droyidonco	Pocket City	Raleigh-	Durham	Rhinelander	Richmond	Rosewood	Savannah	Salishurv	Sea Isle	Semmes	Slate Run	Spartanburg	Sidon	Sault Ste.	Marie	St. Louis	Syracuse	Terre Huate	Traverse City	Quincy	Vero Beach	Vulcan Voluntosi/	Volunteer/ Knoxville	CANADA	Ottawa	Quebec	Thunder Bay	Sherbrooke	St. John	Wiarton	Toronto	
	M MSL	MSS	MSY		NEO	ORD	ORF	ORL	P PBI	_	PLB	PMM	PQI	PSB	¥ 5	2 2	RDU		RHI	RIC		S SAV	SBY	SIE	SJI	SLT	SPA	Sas	SSM	<u>:</u>	STL	SYR I	5 E	<u>2</u>	NIN O		707	À A		V YOW	-	YQT	YSC	\S.	} }	λλ	
STATE	PA	ĕi	7 5	ב ע	3 2	Ξ	Z	Ξ		Z	M	Ξ	S	Z Z	Z	₹ }	ž	Σ	SΕ	S	₹ :	ĕ Z	S	SE		ž	Ž;	⊒ 5	2 4	i	4	Ą.	¥ >	≥	۸ ۲	Ξŝ	2 5	A N	? Z	: A	교	I	Ξ	۲.	<u></u>	Ē	
NAME STA	East Texas	Ellwood City	Key West	Florence	Ft Mevers	Flint	Ft Wayne	Gipper	Choo Choo/	Chattanooga	Green Bay	Grand Rapids	Greensboro	Harrisburg	Hoiston Mr.	Henderson	East Hampton	Houlton	Bigbee	Wilmington	IndianapolisS	Iowa City Kieksvillo	Colliers	Jackson	New York/	JF Kennedy	Jamestown	Joliet	Johnstown Lake Charles	Leeville/	Grand Isle	La Grange	Little Rock Louisville	London	Lynchburg	Saginaw	Mc Comb	Macon Meridian	Memohis	Montgomery	Miami	Muskegon	Millinocket	Monroe	Montpelier	Marquette	
<u> </u>	ETX	EWC	¥ 4	Ē [FM	FNT	FWA	CID	900	i	GRB	GRR	G S0	HAR	2	2 Z 2 Z 5 I	H 2	HUL	IGB	ΙL	ONI	N 2	IRO	AN	JFK		Ŋ.	5	- 53 - 53 - 53	LEV		<u>ا</u> و	3 3	10 2			2 Z	Z	Z E	Σ 5 Σ	MIA	MKG	MLT	D M	Δ <u>2</u>	MQT	
	Ш	_				_		5				_		I	>	_	_		_		_				_		_	_	_	l 						<u>Σ</u>			_			_		_		_	
STATE	ĞА	¥:	₹ 2	5 ≥	5	H			M	GA.		M		s F	¥ \$	≧ ≥	Σ¥					<u>></u> 5	3 =	SC	동	2	¥ :	Σ	겉	X	귙	∑ ;	2 ≥	2	=	Z :	X X	Z Z	=			≷	AR	Σ	¥ a	¥	
NAME	Aalbany	Nantucket	Alexandria	Dellaire Aalhanv	Aalma	Appleton	Walnut Ridge	Au Sable/	Oscoda	Atlanta	Badger/	Milwaukee	Bradford	Windsor Locks	Bangor	Deckiey Nachville	Boston	Baton Rouge	Buffalo	Boiler/	Lafayette	Bowling Green	Crestview	Charleston	Cleveland	Charlotte	Concord	Columbia Cuein/	Craig/ Jacksonville	Casanova	Cross City	Covington	Dubugue	Washington	Decatur	Duluth	Dells	Dvershiird	Eau Claire	Elizabeth City	Peck	Elkins	El Dorado	Westminster	Kennebunk	Erie	
	A ABY	ACK	AEX	A IA	AMG	APE	ARG	ASP		ATL	B BAE		BDF	80L	אם אלא	B B	B0S	BTR	BUF	BVT		BWG		CHS	CLE	CLT	CON	000	5	CSN	CΤ	5 2	0 CT N		DEC	H :	3 6	0 X C	E EAU		ECK	EKN	ELD	ΕMI	U E	ERI	

		_	_	_	_		m	_	_		_	_		0					_	_				_	0	_	_			_	_					₩			_	_	_		_	_	>	
֓֞֞֜֜֜֟֓֓֓֓֓֓֓֓֓֓֓֓֓֟֜֟֓֓֓֓֓֓֓֓֓֓֓֓֓֟֜֓֓֓֓֓֡֓֟֜֓֓֓֡֓֡֓֡֓֡	7 F	E (6	E S	ECK	ECG	EAU	DYR	DX0			DEC	DCA	DBQ	CYN		SS		CRG	00U	CON	- F	2 E	CEW	CAE	BWG	-	R 5	BTR	BOS	BNA	BK W		BDF		BAE	ATL	2	ARG	APE	AMG	ALB	AIR	AEX	ACK ACK	
Trip	Kennehunk	Westminster	El Dorado	Elkins	Peck	Elizabeth City	Eau Claire	Dyersburg	Detroit	Dells	Duluth	Decatur	Washington	Dubuque	Covie	Cross City	Casanova	Jacksonville	Craig/	Columbia	Concord	Charlotte	Charleston	Crestview	Columbia	Bowling Green	Lafavette	Boiler/	Baton Rouge	Boston	Nashville	Beckley	Windsor Locks	Bradford	Milwaukee	Badger/	Atlanta	Oscoda	Walnut Ridge	Appleton	Aalma	Aalbany	Bellaire	Alexandria	Aalbany Nantucket	
8	Z :	<u> </u>	Æ	₹	≝	S	¥.	Į	ĭ	۲	Z Z	F	DC	Ā	2 3	? ?	! ≶	7		<u>≼</u>	Z	5 5	SC	2			Ī	2	5	M	Į	₹			٧		GA :	≦	AR	유	GA	۲	유	5	M G	2
											≤							_					ے					-	•				I	:				9	ר				ч		П	1
5 5	<u> </u>	<u> </u>	≤	S N	MIA	M M M	S E S	M EI	S C N	MCB	MBS	H	L0Z	<u></u>		3	LEV	H LCH	JST	jo	¥	577	Ā	IRQ	IRK	Wol		= E	Ę	F	I	¥	HAR N	GSO	GRR	GRB	į	000	E W	Ž	FMY	FLO	FAM	EΥW	E V X	Į
Marringtho	Montpelier	Monroe	Millinocket	Muskegon	Miami	Montgomery	Memphis	Meridian	Macon	Mc Comb	Saginaw	Lynchburg	London	Louisville	Little Rock	Grand Isle	Leeville/	Lake Charles	Johnstown	Joliet	Jamestown	JE Kennedy	Jackson	Colliers	Kirksville	Iowa City	IndianapolisS	Wilmington	Houlton	East Hampton	Henderson	Hancock	Harrisburg	Greensboro	Grand Rapids	Green Bay	Chattanooga	Choo Choo/	Ft Wayne	Flint	Ft Meyers	Florence	Farmington	Key West	East Texas Ellwood City	1
≦ :	\$	5	≤	≦	2	P	Į	SN	GA	S	ĭ	¥	ঽ	ঽ	A S	3 5		F	PΑ	F	Ž:	Z	MS	3S	Mo	IA :	Z Z	N N	_ _ _ _		₹	₹ ;	Į P	NC	M	ĕ	Z	I	= =	<u> </u>	7	SC	M O	2	PA PA	3
						<u> </u>					<	_		-	-											S				æ							-	Ū					0		3	:
* :	§ 5	LSA	YSC	YQT	ΥQB	WOY			××	۷UZ	٧RB	SIN	TVC	뒾	로	2	<u> </u>	MSS	SRQ	SQS	SPA	2 5	SIE	SBY	SAX	SAV	ROD	R R		RDU	PX۷	P 5	PSB	PQI	PMM	PLB	PIE	BE		ORD	O M N	ODI	ODF	YSM	NSS NSL	2
Toronto	Wiarton	St. John	Sherbrooke	Thunder Bay	Quebec	Ottawa	CANADA	Knoxville	Volunteer/	Vulcan	Vero Beach	Quincy	Traverse City	Terre Huate	Syracuse Tallahassee	St. Louis	Marie	Sault Ste.	Sarasota	Sidon	Spartanburg	Slate Run	Sea Isle	Salisbury	Sparta	Savannah	Rosewood	Richmond	Durham	Raleigh-	Pocket City	Providence	Phillipsburg	Presque Isle	Pullman	Plattsburgh	St. Petersburg	Palm Beach	Nortolk	O'Hare Int'l	Ormond Beach	Nodine	Тоссоа	New Orleans	Muscle Shoals Massena	N
2 2	2 2	Z į	B	9	Q B	9		Į		A	2	F	≦	Z	2 3	3 3	5 ≥		2	S	SC:	₽ }	2 2	. ≥	z	G :	유 :	5 ≥	N C		Z	곤 ;	< P	≅	≤	٧	۳;	<u> </u>	□ ≲	F		3	G A	F	Z P	2



<u>State</u>	OR	OR R	9 R	ΑZ	ΑZ	<u>n</u>	00	CA	SD	CA	OR R	Σ		CA	CA	×	≽	ΑZ	5	CA	Ш Z	ΑZ	ΑZ	ဝ	Σ	2	≥ Z	***	¥	AZ	<u>e</u>	×	٨		BC	ΑB	SA	BC	ΑB	SA		
Name S	Newport	Pendleton	Portland	Peach Springs	Phoenix	Pocatello	Pueblo	Point Reyes	Rapid City	Red Bluff	Rome	Roswell	San Marcos/	Santa Barbara	Sacramento	Seattle	Sheridan	St. Johns	Salt Lake City	Salinas	Sidney	San Simon	Tuba City	Tobe	Tucumcari	Iruth or	Consequences Tatoch/	IALOOSEI/	Neall Day	Tucson	Twin Falls	Texico,	Yakima	CANADA	Princeton	Lethbridge	Yorkton	Cranbrook	Medicine Hat	Swift Current		
	0 0NP		PDX	PGS	PHX	FI	PUB	PYE	R RAP	RBL	RE0	ROW	RZS		S SAC	SEA	SHR	S	SLC	SNS	SN≺	280	T TBC	TBE	221	3	Ē	2	E E	TUS	Ι¥Ε	OXT	Y YKM		YDC	YQL	ΥQV	YXC	XXH	λ		
State	WA	0R			Σ	CA	ĭ	٨	Δ		00	CA	Δ	M۸	T	Δ	>	ĭ	ΑZ	Q N			00	`			2 2	2 2	≦ - ≥ ≥	×	Ω	ID	Δ	CA	×	T	CA	CA	<u>></u>	≽	0R	
Name S	Ephrata	Eugene	Kalispell	Mustang/Reno	Farmington	Fortuna	Ft. Stockton	Spokane	Great Falls	Blue Mesa/	Gunnison	Hector	Helena	Hoquiam	Hanksville	Havre	Wilson Creek	Wink	Winslow	Williston	Jackson Hole	Grand Junction	Lamar	Laramie	Las Vegas	Los Angeles Int	Salmon	Lakeview	Las Veyas I ewistown	Midland	Malad City	Mullan Pass	Miles City	_	Marfa	Myton	Mission Bay	0akland	Coaldale	Rocks Springs	Medford	
	EPH	EUG	FCA	FΜG	Z E L	F 0T	FST	GEG	GTF	HBU		HEC	Z I I	ΗQ	ΗVΕ	HVR	IFC	Ϋ́	≥ N	ISN	JAC	3 1	LAA L	LAR	LAS:	Ž!	3 3) 	2 \	MAF	Ę	MLP	MLS	MOD	ARF	MT	MZB	0AK	OAL	OCS	OED	
	Ш		L					5		Ξ							_				_		_							Σ								0				
State	Σ	<u>ပ</u>	00	Ž	5	Ш Z	Ξ	0 R	×		⋛	⋛	ž	5	-	<u>ပ</u>	Σ Z	⋚	≽	CA				:	} 8	3 5	z E	= 2 2	<u> </u>	=	AZ		0 R	5	00	CA		CA	ĭ	≥		CA
<u>Name</u> S	Albuquerque	Akron	Alamosa	Battle Mount.	Bryce Canyon	Scottsbluff	Billings	Baker City	Bellingham	Boise	Boysen Resv.	Big Piney	Beatty	Bonneville	Bard CA/Yuma	Hayden	Cimarron	Cheyenne	Crazy Woman	Clovis/Fresno	Red Table//	Eagle CO	Dubois	Muddy Mtn/	Casper	Denver	Dickinsin		Donnelly/	Mc Call	Drake/Prescott	Deschutes/	Redmond	Delta	Dove Creek	Needles	Shafter/	Bakersfield	El Paso	Ely	Mendocino/	Ukiah
	A ABQ	AK0		B BAM	BCE	BFF	BIL	BKE	BLI	BOI	B 0√	BPI	BT₹	BVL		E CHE	CIM	CYS	CZI		D DBL		DBS		i	D E	¥ 2		Z Z	2	DRK	DSD		DTA	DVC	E EED	EHF		ELP	ΕĽ	ENI	

					г	П														0				C										B	ı		>	
	EN	EY	EP		ק ק ק		DTA		DSD	DRK		P	D S Z				DDY	DBS	,	DBC 4	CZ1	CYS	CIM	CHE	BVL	BTY	BPI	BOY	BOI		BZF	2 F	BCE	BAM	ALS	AK O	ABQ	F
CKIAII	Mendocino/	Ely	El Paso	Bakersfield	Shaffer/	Dove Creek	Delta .	Redmond	Deschutes/	Drake/Prescott	Mc Call	Donnelly/	Deming	Dillon	Dickinsin	Denver	Muddy Mtn/	Dubois	Eagle CO	Red Table//	Crazy Woman	Cheyenne	Cimarron	Bard CA/Yuma Havden	Bonneville	Beatty	Big Piney	Boysen Resv.	Boise	Rollingham	Ballings	Scottsbluff	Bryce Canyon	Battle Mount.	Alamosa	Akron	Albuquerque	Name S
Ä	3	2	X	CA	Ä	00	35	9R		ΑZ	Ħ		Z S	≅ i		3		ID		5	3₹	ş	Z S	CO	=	2	₹	₹	5	§ §	8 =	Z	=	2	00	00	Z S	<u>State</u>
				0							3							_	•	_			,	-				:	I	9	ה				T		ш	
	0ED	S 200 8	0AL	A E	≦	돌 주		S M S	S F	<u>M</u>	MAF	¥	LVS	\{\bar{2}\}	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	X Z	Æ	LAA	JNC S	JAC	Z Z	Ĭ	ב ק	X X F	MQM	Z	HEC	į	E :	בו ה	ב ה ה	3 5	Z Z	FMG	FCA	EUG	EPH	6
	Medford	Rocks Springs	Coaldale	Oakland	Mission Ray	Marfa	Modesto	Miles City	Mullan Pass	Malad City	Midland	Lewistown	Las Vegas	Lakeview	Salmon	Las Vegas	Laramie	Lamar	Grand Junction	Jackson Hole	Winslow	Wink	Wilson Creek	Hanksville Havre	Hoquiam	Helena	Hector	Gunnison	Blue Mesa/	Great Falls	Spokano	Fortuna	Farmington	Mustang/ Reno	Kalispell	Eugene	Ephrata	Name
	0R		Z V	CA	3 =	×	CA	<u> </u>	Ħ	Ħ	×	≅	Z S	유		Int CA	!		2		N A			≤ ⊆	٧A	ĕ	CA	00	3	Z \$	₹ ×	T C	Z Z		×	0R	WA	State
_							_	~	_		_	_						_						v	,				-	0				_	_	7	0	
		¥	≾	ዺ .	_													•																				
		Z	¥	X :	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	YDC		×κ	OXT O	TWF	SUT	TRM		TOU	5	בן ה	I BE	TBC	SSO	SNS SNS	SLC	NGS	SHR	SAC		RZS	RO₩	RE O	B 3	0 - 0 -	֓֟֓֓֓֓֓֓֟֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓] <u>-</u>	PHX	PGS	PDX	PDT	ONP	F
			_		OV Vorkton			- Ya	_	•		_			Consequences					SNY Sidney		St. Johns		SAC Sacramento SEA Seattle					RBL Red Bluff					PGS Peach Springs			ONP Newport	<u>Name</u>
		Swift Current	Medicine Hat	Cranbrook		Princeton	CANADA	Yakima	Texico,	Twin Falls	Tucson	Thermal		Tatoosh/		_	Tobe .	Tuba City	San Simon	Sidney	Salt Lake	St. Johns		Sacramento Seattle	Santa Barbara	San Marcos/	Roswell	Rome	Red Bluff		Point Power	Pocatello	(Phoenix	Peach Springs	Portland	Pendleton		ID Name State