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REPORT OF THE 1968  
INTERDEPARTMENTAL HURRICANE WARNING CONFERENCE  
(COMBINED - ATLANTIC AND PACIFIC)

Miami, Florida

January 16-18, 1968

AD HOC GROUP ON HURRICANE CONFERENCE  
SUBCOMMITTEE ON BASIC METEOROLOGICAL SERVICES  
February 1968

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Col. R. Moeller  
Lt.Col. R.E. Boyce  
Lt.Col. R.H. Foote  
Lt.Col. E.L. Jenner  
Lt.Col. H.R. Montague  
Lt.Col. M.H. Sipple  
Lt.Col. A. Smith  
Lt.Col. E.P. Sugrue  
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Capt. D.N. Gerbaz  
Capt. C.U. Hendricks, Jr.  
Capt. J.D.K. Hoppes  
Capt. A.C. Korelishn  
Mr. R.E. Hairston  
Mr. G.J. Finger (PAA)

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CAPT J.P. Fleet  
CAPT R.J. Brazzell  
CAPT R.M. Cassidy  
CDK E.L. Snopkowski  
LCDR T.D. Deagen  
LCDR D.H. Edgren  
LCDR J.O. Heft  
LCDR F. Nelson  
LT F.E. Horn  
LT L.E. Zeigler  
LTJG J.J. Bourdon

Coast Guard

CDR W.T. Adams

ESSA

Mr. K.R. Johannessen  
Dr. R.H. Simpson  
Dr. G.E. Dunn (Retired)  
Dr. R.C. Gentry  
Dr. B.I. Miller  
Mr. H.E. Root  
Mr. R.E. Rush  
Mr. R.E. Beck  
Mr. A.W. Youmans  
Mr. H.M. Johnson  
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FAA

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Mr. J.J. Staut  
M. J. Corretjer  
Mr. J.F. Harris  
Mr. G. Allen  
Mr. H.L. Mount

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Mr. H.V. Senn

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Co-Chairman CAPT Brazell (USN)  
CAPT Cassidy (USN)  
LCDR Nelson (USN)  
LCDR Heft (USN)  
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LCDR Deagan (USN)  
LTJG Bourdon (USN)  
CDR Adams (USCG)  
Mr. Youmans (ESSA)  
Mr. Davis (ESSA)  
Mr. Redus (ESSA)  
Mr. Ahrens (ESSA)  
Mr. Freedman (ESSA)

REPORT OF THE 1968

INTERDEPARTMENTAL HURRICANE WARNING CONFERENCE

The 22nd Annual Interdepartmental Hurricane Warning Conference convened at 9 AM January 16, 1968. Dr. Robert Simpson, Director, National Hurricane Warning Service welcomed the delegates to Miami and invited the heads of participating delegations to offer a few opening remarks. Mr. K. R. Johannessen, Associate Director of Meteorological Operations, Weather Bureau; Captain E. T. Harding, Commander, Naval Weather Service Command; Colonel F. G. Brenner, Commander, 9th Weather Reconnaissance Wing, USAF; Mr. Hugh Henline, FAA Communication Staff; Dr. G. E. Dunn, Retired Director, National Hurricane Warning Service responded. Dr. Simpson then introduced LCDR D. H. Edgren, USN, Rota, Spain; CDR E. L. Snopkowski, USN, FWC Alameda, Calif.; Lt. Col. E. P. Sugrue, USAF, McClellan AFB, Calif.; Mr. R. E. Rush, Weather Bureau, Pacific Region Headquarters, Honolulu, Hawaii, and Mr. H. E. Root, Weather Bureau, Western Region Headquarters, Salt Lake City, Utah. Dr. Simpson then discussed the plans for the conference and invited the conferees to visit the Hurricane Center facilities.

Dr. Simpson then asked for reports on the General Agenda Items.

1. Aircraft Reconnaissance Operations

- a. Col. Kerr presented a summary of the USAF 1967 operations and resources for the 1968 season in both the Atlantic and the Pacific. (See Attachment A)
- b. LCDR Nelson indicated that the Navy would have the same resources as last year. This will include 6 aircraft (WC-121's) and 5 operational crews for support of hurricane reconnaissance in the Atlantic.
- c. Mr. Mason, ESSA-RFF, indicated that their capability would be the same as last year.

2. Report on Hurricane Research and Plans (ESSA)

Dr. Gentry and Dr. Miller discussed the research activities at the National Hurricane Research Laboratory. (Attachment B)

Attached to this report (Table 1-4) are verification results for the 1967 hurricane forecasts in the Atlantic area.

Dr. Simpson stated that five new positions have been authorized for the National Hurricane Center. Four of these positions will be hurricane specialists and these men will spend full time on hurricane problems. He also requested that the Navy send NHC information on their Monterey Model and also forward the forecasts derived from Navy techniques to NHC on an operational basis.

3. Report on ECAFE (Economic Commission for Asia and the Far East) Meeting of Experts on Typhoons (ESSA)

Dr. Dunn represented the United States at the second ECAFE meeting on typhoons held in Bangkok during October 1967. He pointed out that ECAFE is an agency of the United Nations. Dr. Dunn gave the following information on this agency's activities: The first meeting of typhoon experts was held in Manila in December 1965. Dr. Simpson and Dr. Gentry attended this meeting and the main topic of discussion was typhoon control. A committee was appointed to visit the ECAFE countries and a "Report of the ECAFE/WMO Preparatory Mission on Typhoons" was prepared and published in May 1967 to point out what needed to be done in southeast Asia to improve their typhoon warning service. The second meeting of the ECAFE group on typhoons considered this report and made recommendations on the following items:

- a. Flood Warning Service
- b. Storm Surge Warnings
- c. Typhoon Center - to serve as an advisory center and not as a joint forecast center. This center will probably be established in Bangkok and have 4 to 5 professional meteorologists.

The final step will be approval of the recommendations by all ECAFE states. Dr. Dunn stated that all the countries attending the meeting expressed appreciation for the U. S. Military aircraft reconnaissance of typhoons in the Western Pacific.

4. Resume of the 1967 Tropical Storm Season in the Pacific (ESSA)

Mr. Root presented a resume of the 1967 tropical storm season in the Eastern North Pacific and discussed data acquisition problems of the San Francisco Hurricane Warning Office. (Attachment C)

Mr. Rush presented a resume of Pacific Hurricane/Typhoon Warning Service which includes the Hurricane Warning Office, Honolulu. He discussed the availability of surface and upper air data, tropical cyclone warnings, work in progress, and a summary of the 1967 storms affecting the Central North Pacific. (Attachment D)

Dr. Simpson then presented the agenda to the delegates and assignment of agenda items were made to the three working committees. The committee chairmen were then appointed. The plenary session was then adjourned. Committee discussions began about 3 PM on the 16th and continued until noon on the 18th. General Pierce, Commander, Air Weather Service visited the conference Wednesday afternoon, January 17, 1968.

The final plenary session was called to order at 1 PM January 18th by the conference chairman. Dr. Simpson expressed his admiration and gratification for the excellent work carried on by the committees. He stated that the heads of each delegation have read and approved the reports of the three committees. Committee chairmen then briefly summarized their package of recommendations and conclusions and they were adopted with very little discussion. Mr. Johannessen, Captain Harding, Colonel Brenner, and Hugh Henline in their closing remarks expressed appreciation to the chairmen of the working groups and the committee members for their positive spirit and hard work. The conference was then adjourned.

## SUMMARY MINUTES

### 1. AIRCRAFT RECONNAISSANCE

#### 1.1 Reconnaissance in the Eastern Pacific (ESSA)

DISCUSSION: Although reconnaissance in the Eastern Pacific was improved in 1967, there is a need for more frequent reconnaissance, especially low level and longer range. The Air Force occasionally staged from March Air Force Base which extended the range of WB-47's this year.

CONCLUSION: The Air Force sees no possibility of obtaining capability for low level reconnaissance for the 1968 season. The only Air Force capability will be high level WB-47 aircraft as in 1967.

#### 1.2 Reconnaissance Communications (ESSA)

DISCUSSION: There were substantial delays in receipt of reconnaissance reports at the National Hurricane Center (NHC) and the Hurricane Warning Office (HWO), San Francisco. The problem seems to be one of communications and should be investigated to see if it can be improved. The Air Force states there is no reason at present to criticize their ground station support. It was suggested that the ESSA Research Flight Facility (RFF) aircraft use the Air Force communications system. The Navy feels that this is an occasional problem but the Navy has no objection to establishing receiving only capability at NHC, however, neither the Navy nor the Air Force can supply personnel to operate such a facility.

No specific delays were reported between McClellan Air Force Base and Weather Bureau HWO at San Francisco. Acknowledgment procedures are used on this circuit.

The committee did not concur with the recommendation that a direct radio link be established between the hurricane reconnaissance aircraft and the NHC forecaster. The present communication policy gives priority to all hurricane observations. If additional information is desired, the NHC forecasters are invited to send requests through Chief, Aerial Reconnaissance Coordination, Atlantic (CARCAH) to the air ground site for relay to aircraft.

#### RECOMMENDATIONS:

- (1) That all efforts be made to route messages as rapidly as possible.
- (2) That NHC maintain a time of receipt record which can be compared with time of transmission at Fleet Weather Jacksonville.
- (3) That immediate coordination be effected between NHC and Fleet Weather Jacksonville in the event delays are encountered.

1.3 Hurricane Reconnaissance Overflights of Cuba (ESSA)

DISCUSSION: ESSA was interested in whether the military will overfly Cuba for the purpose of obtaining hurricane fixes. Captain Cassidy stated that the Department of Defense (DOD) relayed their position on this item through a letter to the Department of Commerce (DOC) in 1967.

CONCLUSION: The decision to overfly Cuba with military aircraft for providing airborne tropical storm reconnaissance may not be operationally desirable and for military reasons should remain a determination of the Department of Defense. It is not intended that military weather reconnaissance aircraft will overfly Cuba during the impending hurricane season.

1.4 Dissemination of Reconnaissance Plan of the Day (CARCAH)

DISCUSSION: The reconnaissance plan of the day has been distributed to some agencies which have only minor interest in the operations of reconnaissance aircraft. This wide dissemination has caused problems. CARCAH feels the Reconnaissance Plan of the Day (POD) should be distributed to only those agencies that provide support to or exercise control of the missions.

RECOMMENDATION: That Annex 3, Section 6a(2), Page 15, the first two paragraphs should be combined and read as follows:

"The "Reconnaissance Plan of the Day" (POD) will be made available to all appropriate agencies that provide support to and/or exercise control of the missions. CARCAH will be responsible for disseminating the POD by 1800Z on the day preceding the planned missions to the USAF, USN, NHC and FAA. CARCAH will be advised immediately by the appropriate agency of any changes in the status of the missions scheduled in the POD, for example: delayed take off, aborts, etc."

1.5 Post Flight Summary Reports (ESSA, CARCAH)

DISCUSSION: The 1967 Hurricane Plan does not state a requirement for a Post Flight Summary Report from reconnaissance aircraft.

RECOMMENDATION: That the following should be added to Annex 3, as Item 6, page 13:

Post Flight Summary Report - All reconnaissance flights should file a post flight summary report. This will contain all pertinent information that the meteorologist feels is important.



1.6 Stormfury 1968 (USN)

DISCUSSION: Dr. Gentry stated at the opening plenary session that plans have been made to hold a meeting to discuss the operational program of Stormfury for 1968. He pointed out that this took care of the recommendation that DOD and DOC provide an operational planning conference to implement Stormfury for 1968.

CONCLUSION: The committee took note of the agenda item.

1.7 Establishment of Gull Reconnaissance Tracks (FAA)

DISCUSSION: The following problems were discussed: (a) Altitude utilization along the Gull tracks. (b) Potential conflicts of Gull routes with missile ranges in the Atlantic and Gulf of Mexico. The USAF and FAA should coordinate, prior to revision of Gull tracks, the reporting points and the communication facilities to be used for Air Traffic Control (ATC) along the tracks.

CONCLUSION: Coordination on Gull Reconnaissance Tracks will be effected with pertinent air traffic services units.

1.8 Position Reporting by Military Aircraft Operating within the Havana, Cuba FIR/CTA (FAA)

DISCUSSION: During the 1967 hurricane season, military aircraft at times reported positions to Havana Control Center. This resulted in Havana Control Center querying Miami Control Center for the flight plan. Under present directives the Miami Center is not permitted to pass the military flight plan to Havana.

CONCLUSION: USN-USAF military crews will be instructed not to contact the Havana area control center even though operating in the Havana FIR/CTA.

1.9 Revision of RECCO Code (ESSA)

DISCUSSION: The working group on meteorological codes for SC/BMS is presently studying the RECCO Code and making recommendations for revisions to this code.

RECOMMENDATIONS:

- (1) That the 71717 and 17171 indicators be excluded from reconnaissance data since ascent-descent soundings are made very rarely and vertical data are obtained primarily from dropsondes.
- (2) That another group be added to the present RECCO Code to accommodate sea surface temperature in degrees and tenths, centigrade.

- (3) That surface wind be reported in the 4th and/or 5th groups of RECCO Code at discretion of airborne meteorologist.

The Forecasts and Warnings Committee accepted the recommendation of the Reconnaissance Committee.

## 2. FORECASTS AND WARNINGS

### 2.1 Information Supplied by Reconnaissance Aircraft Between Fixes (ESSA)

DISCUSSION: The ESSA representative stated that discussions with the reconnaissance people indicated that in some cases the capability of aircraft could be more effectively used if a program were designed to have the aircraft obtain peripheral data between primary fixes. NHC has a format (Attachment E) for requesting aircraft reconnaissance information through CARCAH. The form has been updated for this season and the first 3 lines of Item 6 apply to peripheral data between fixes.

#### RECOMMENDATIONS:

- (1) That no change be made to the current Plan since it already provides for obtaining peripheral data when practicable.
- (2) That in addition to the assigned agenda item, the last sentence of Annex 3, Paragraph 5, Page 13 of the Plan should be revised by adding "or as requested." This addition would provide for deviations from the standard levels and distances given in the cited paragraph.

### 2.2 Definition of Reliability of Position (USN)

DISCUSSION: The Navy representative suggested that in lieu of the proposals in the agenda, the following definitions for the Military Advisory in Annex 2, Paragraph 9, Page 9 be considered:

Excellent	-	Accurate to within 10 miles
Good	-	Accurate to within 20 miles
Fair	-	Accurate to within 40 miles

No term will be used when a location accuracy could be in excess of 40 miles. In such cases the position reliability will be expressed in miles, i.e., position accurate within 50 miles.

The ESSA representative suggested:

Good	-	$\frac{1}{2}$ deg. or less
Fair	-	$\frac{1}{2}$ deg. to $1\frac{1}{2}$ deg.
Poor	-	More than $1\frac{1}{2}$ deg.

The major purpose is to eliminate the use of "Poor" and the resulting connotation to advisory users.

RECOMMENDATIONS :

(1) That Annex 2, Page 9 of the Plan be revised by adding:

9. Definition of Position Reliability.

Excellent - Accurate to within 10\* miles  
Good - Accurate to within 20\* miles  
Fair - Accurate to within 40\* miles

When the position accuracy is greater than 40\* miles it will be expressed as:

Position accurate within \_\_\_\_\_ miles.

\*Military advisory use nautical miles as the measure of distance.

(2) That WB Form 656-6 be revised as follows: (Attachment F)

- (a) Add "Excellent" between "Position" and "Good"
- (b) Delete "Position Poor" and substitute: "Position accurate within \_\_\_\_\_ miles."

2.3 Use of Satellite to Locate, Track, and Determine Intensity of Tropical Storms and Hurricanes (ESSA, USN)

DISCUSSION: The importance of APT information in data sparse regions was emphasized by all participating agencies. ESSA stated that no new classification system was currently anticipated, but that the current system will be subject to continuing critical examination for methods of improvement. The format of the "Miscellaneous Satellite Bulletins" was discussed at length. The Navy recommended that the bulletins include accuracy of the fix, current stage of development and, when feasible, the trend from the previously observed stage of development. Negative bulletins would also be required. The Air Force and Weather Bureau concurred. The criteria decided upon in the last hurricane conference for naming tropical cyclones based on satellite pictures alone was reviewed and accepted. It was agreed that Annex 10 should be revised.

RECOMMENDATION: That Annex 10, Page 76 and 77 be revised. A draft of corrections to Annex 10 and a suggested miscellaneous satellite bulletin format to be added to Annex 10 are attached to this report. (Attachment G)

#### 2.4 Definition of a Tropical Cyclone (ESSA)

DISCUSSION: NHC stated that in many cases the forecaster had difficulty in determining if a system has a warm-core. The Navy would like to number (or letter) only those tropical depressions which have the potential for further development. National Hurricane Research Laboratory (NHRL) emphasized that only warm-core systems should be named.

##### RECOMMENDATIONS:

- (1) That the definition of the tropical cyclone, Annex 7, Page 64, be amended by deleting "warm-core."
- (2) That the practice of numbering will be directed toward those systems which, by virtue of satellite or other evidences and for their migratory character hold potential for development.
- (3) In Annex 6, Page 59 replace "cyclones" with "depressions" where applicable. (Attachment H)
- (4) That Annex 6, Paragraph 4, Page 60 of the Plan be revised by deleting the last sentence.

#### 2.5 Outlook on Tropical Storms Crossing 35°W Eastbound (ESSA)

DISCUSSION: ESSA suggested that in order not to preempt the Fleet Weather Central Rota, the 48 and 72-hour outlooks should be dropped from the advisory whenever the 24-hour forecast position places the storm east of 35°W. The Navy poses no objection but Jacksonville will have to give the 48 and 72-hour outlooks until such times as they pass the responsibility to Rota. The Air Force wants either NHC or Rota to include the 48 and 72-hour forecasts. ESSA stated that the question was one of who has the best capability rather than one of preempting. The Navy stated that there was no objection or connotation of preempting Rota if NHC continued to provide this information.

RECOMMENDATION: That NHC continue to provide the 48 and 72-hour outlook positions for all storms located west of 35°W as indicated in the present Plan.

#### 2.6 Retaining Names in Bulletins on Tropical Cyclones After Advisories Have Been Discontinued (ESSA)

DISCUSSION: The ESSA representatives suggested that the Plan be revised to include a requirement that the name be retained until all bulletins on a tropical cyclone are discontinued.

RECOMMENDATION: That Annex 2, Page 9 of the Plan be revised by adding:

"Bulletins on Tropical Cyclones After Discontinuance of Advisories. The storm name will be retained until all bulletins have been discontinued on a tropical cyclone."

2.7 Requirement for 50 Knot Winds in Military Advisories (ESSA)

DISCUSSION: The ESSA representatives suggested deleting the requirement for radius of 50K winds in the Marine/Aviation/Military advisory in the 12, 24, and 48 hour forecasts if these winds do not affect any land area within the 48 hour period. The Air Force and Navy stated that radius 50K winds is required in all forecasts. The ESSA representatives from the Central Pacific also stated a requirement for this information.

RECOMMENDATION: That this information continue to be provided in the Military Advisories.

2.8 Amendment of Preliminary Prognostic Position in Tropical Cyclone Discussion (ESSA)

DISCUSSION: ESSA stated that forecast positions given in the Tropical Cyclone Discussion (TCD) are preliminary and do not require an amendment if they are changed in the final forecast (Military Advisory). The NHC does not have the required time to issue amendments to the preliminary prognostic positions.

RECOMMENDATION: That Annex 2, Paragraph 4, Page 8 of the Plan be revised by adding:

"The Marine/Aviation/Military Advisory will give the final forecast positions and will serve as the amendment to the preliminary forecast position in the Tropical Cyclone Discussion."

2.9 Definition of "Present Movement" as Used in the Advisory (USN)

DISCUSSION: To remove possible confusion when the "present movement" is not consistent with the forecast position, the Navy recommended that: (a) the "present movement" be defined as - the direction of movement at the time of the warning and (b) that appropriate remarks be made to clarify any apparent inconsistency between the direction and speed of movement given as the "present movement" and the average direction and speed the cyclone must take to arrive at the forecast position. The Air Force stated that they could dispense with "present movement;" however, if used it must be defined. The Navy has a firm requirement for this information.

RECOMMENDATION: That Annex 7, Page 64 of the Plan be revised by adding:

"Present Movement - The best estimate of movement of the center of the tropical cyclone at the time of position indicated in the advisory. (In advisories, remarks will be used to amplify significant changes between present movement and forecast movement.)

2.10 Access to Radar Sites (USAF)

DISCUSSION: The Air Force stated that this was primarily to bring Annex 4, Page 53 up-to-date. The Navy agreed. ESSA stated that its listing of personnel for access to radar sites will be up-dated.

RECOMMENDATIONS:

- (1) That Annex 4, Pages 51-52, Paragraph 6a(2) be written before Paragraph 6a(1) to provide better continuity and the first sentence of this paragraph be changed to read:

"The WB must notify the appropriate coordinator by wire or telephone of the intent to visit a site."

- (2) That Annex 4, Page 52, Paragraph 6e be changed to read:

"6e. The following Weather Bureau/ESSA personnel have the indicated clearances and are authorized by ADC USAF to visit ADC radar sites listed in Section 3e, above, when paragraphs 6a(1) and (2) above have been complied with. Positive identification must be presented to the ADC radar site entry post before entry to the site will be granted. The purpose of these visits is the making and transmitting of radar hurricane observations. These personnel have also been authorized by the FAA to visit the ARTC Centers listed in Section 7 for the same purpose."

2.11 Transfer of Tropical Advisory Responsibility from Rota to NHC (ESSA)

DISCUSSION: There is a need for voice communications between NHC and Rota for coordination on items such as naming storms and transfer of responsibility. The Navy agrees.

RECOMMENDATIONS:

- (1) That the Navy explore a communication system by which NHC can contact Rota for coordination. The Navy will then advise NHC of the communication arrangements.
- (2) That all agreements regarding transfer of responsibility or naming of storms be promptly confirmed by a record message.

2.12 Numbering of Public Advisories (ESSA)

DISCUSSION: ESSA proposed that NHC issue its first public advisory of a named tropical cyclone as Number 1 when the cyclone moves westward across 35°W. The Navy will number its advisories serially through the life of the storm and strongly indicated that there should be no disparity between the advisory number used by NHC and Fleet Weather Facility (FWF) Jacksonville. ESSA stated that the Atlantic and Pacific problems differ considerably and may require two systems. The Air Force wants a uniform system and feels the present plan is adequate and the Navy concurs.

RECOMMENDATION: That Annex 9 of the Plan remain unchanged.

2.13 Forecasts and Advisories (ESSA)

DISCUSSION: The 1967 season was somewhat unique in that there were three storms in progress at one time and on occasion proper coordination was not completed on special advisories and their numbering. The Navy stated that the difference arose from a misunderstanding over numbering of a special advisory. This problem can be resolved by better use of the NHC-Jacksonville hot line.

RECOMMENDATIONS:

- (1) That every effort be made to reach full agreement and understanding between NHC and Fleet Weather Jacksonville as regards special advisories and their numbering.
- (2) That the Navy provide NHC with their numerical hurricane forecasts prepared at Fleet Numerical Weather Facility (FNWF) Monterey by the most expeditious means available.

2.14 Advance Warning Procedures (FAA)

CONCLUSION:

- (1) The Communications Committee proposed withdrawing this item.
- (2) The Forecasts and Warnings Committee agreed.

### 3. COMMUNICATIONS

#### 3.1 Public Dissemination of 48 and 72 Hour Outlook (ESSA)

DISCUSSION: Apparently at New Orleans during the past hurricane season, there were leaks of the 48 and 72 hour outlook on hurricane positions. Considerable discussion brought out the many facets through which this privileged information could leak out to commercial radio and TV stations, the press and the general public and because of no particular fault or negligence of participating agencies.

RECOMMENDATION: That all participating agencies issue a reminder to their personnel prior to each hurricane season emphasizing the fact that the outlook is restricted to authorized personnel only.

#### 3.2 Hurricane Circuit GT 22117 (USAF)

DISCUSSION: Air Force indicates this is mainly an information item and that no known problems exist with respect to speeding-up of circuit GT 22117 from 60 to 100 WPM.

CONCLUSION: Committee took note of the item.

#### 3.3 Public Advisories and Bulletins on Service A (ESSA)

DISCUSSION: During Hurricane Beulah the Flight Service Stations (FSS) in the Gulf area requested that advisories and bulletins be placed on Service A circuits 8028 and 8029 and the New Orleans office complied.

RECOMMENDATION: That the FAA determine which FSSs have a need for public advisories and bulletins and if considered necessary make distribution on appropriate circuits.

#### 3.4 Relay of Information From Circuit 7072 to Circuit 23421 (ESSA)

DISCUSSION: ESSA indicates this is an information item only. In the 1967 National Hurricane Plan, Annex 8, Weather Bureau Transfer Plan, it was noted the HWO Washington would have responsibility for relay of information from 7072 to 23421. At present the Weather Bureau is unable to meet this requirement and the phrase "7072 with relay to 23421" should be deleted. The Weather Bureau at present is studying a means of remedying this situation.

CONCLUSION: The committee took note of the item.



3.5 ATC Communications Between Albrook and San Juan (FAA)

DISCUSSION: FAA requested the item be withdrawn.

CONCLUSION: The Air Force Communication System will investigate communication delays between Albrook and San Juan.

3.6 Navy Air Traffic Control Communications - Atlantic (FAA)

RECOMMENDATION: That first paragraph Annex 3, Item 8, Page 17, "1967 National Hurricane Plan" be revised to read "operating within the San Juan and Miami FIR areas," in lieu of "operating within U.S. FIR areas."

3.7 Air Traffic Control Communication, Houston Center (FAA)

RECOMMENDATION: That in so far as operations in the Houston FIR area are concerned, the FAA provide for the installation of a direct interphone circuit between the Houston Center and McDill Airways or installation of Autovon capability at Houston Oceanic Sector.

The following tables (1-4) are the homogeneous comparisons of the vector errors for 12, 24, 48 and 72 hours of the Weather Bureau official forecast, NHC-64 statistical forecast technique, NHC-67 statistical forecast technique and persistence.

TABLE 1  
 "12 HOUR FORECAST PERIOD" 1967

AREA	NAME OF TECHNIQUE	NO. OF FCSTS	MEAN (N.MI.)	STANDARD DEVIATION (N.MI.)	MEDIAN (N.MI.)	LOWER QUANTILE (N.MI.)	UPPER QUANTILE (N.MI.)	RANGE (N.MI.)
A	WB	31	76	51	62	34	106	0-211
A	NHC-64	31	71	34	70	36	99	20-138
A	NHC-67	31	75	41	72	44	92	25-192
A	PERS	31	88	55	75	44	125	12-222
B	WB	24	37	19	33	18	48	6-83
B	NHC-64	24	42	35	35	13	53	6-169
B	NHC-67	24	50	30	45	30	65	13-159
B	PERS	24	37	21	36	19	46	0-98
C	WB	13	65	29	54	40	74	23-114
C	NHC-64	13	88	45	84	59	92	37-224
C	NHC-67	13	82	49	87	33	101	11-193
C	PERS	13	65	32	49	43	69	31-137
ALL	WB	68	60	42	49	30	75	0-211
ALL	NHC-64	68	64	40	61	34	84	6-224
ALL	NHC-67	68	68	42	58	39	86	11-193
ALL	PERS	68	66	47	50	35	76	0-222

TABLE 2

"24 HOUR FORECAST PERIOD"

1967

AREA	NAME OF TECHNIQUE	NO. OF FCSTS	MEAN (N.MI.)	STANDARD DEVIATION (N.MI.)	MEDIAN (N.MI.)	LOWER QUARTILE (N.MI.)	UPPER QUARTILE (N.MI.)	RANGE (N.MI.)
A	WB	30	141	105	112	69	173	6-498
A	NHC-64	30	136	64	124	80	176	49-306
A	NHC-67	30	112	67	95	60	148	25-293
A	PERS	30	168	100	146	86	238	25-451
B	WB	22	80	41	79	43	106	19-172
B	NHC-64	22	102	74	78	65	116	8-343
B	NHC-67	22	96	55	88	55	110	29-290
B	PERS	22	88	52	80	54	96	13-257
C	WB	13	133	55	152	85	163	30-221
C	NHC-64	13	144	76	132	86	186	27-330
C	NHC-67	13	134	76	126	64	165	41-284
C	PERS	13	150	48	131	106	189	82-236
ALL	WB	65	119	84	101	62	153	6-498
ALL	NHC-64	65	126	72	110	71	164	8-343
ALL	NHC-67	65	111	67	97	60	136	25-293
ALL	PERS	65	137	86	114	80	201	13-451

TABLE 3

"48 HOUR FORECAST PERIOD"

1967

AREA	NAME OF TECHNIQUE	NO. OF FCSTS	MEAN (N.MI.)	STANDARD DEVIATION (N.MI.)	MEDIAN (N.MI.)	LOWER QUARTILE (N.MI.)	UPPER QUARTILE (N.MI.)	RANGE (N.MI.)
A	WB	27	298	202	229	157	357	20-759
A	NHC-64	27	339	158	339	207	482	42-647
A	NHC-67	27	337	151	303	214	389	95-665
A	PERS	27	380	230	291	177	556	78-978
B	WB	19	197	131	155	99	221	47-591
B	NHC-64	19	275	110	253	198	307	131-577
B	NHC-67	19	241	110	222	178	297	63-524
B	PERS	19	195	146	165	107	220	37-694
C	WB	11	288	121	329	193	341	65-508
C	NHC-64	11	363	201	418	179	532	8-660
C	NHC-67	11	276	124	262	162	360	72-498
C	PERS	11	342	87	344	270	362	209-550
ALL	WB	57	262	173	216	138	334	20-759
ALL	NHC-64	57	322	157	286	199	426	8-660
ALL	NHC-67	57	293	141	278	202	369	63-665
ALL	PERS	57	311	201	269	155	396	37-978

TABLE 4

"72 HOUR FORECAST PERIOD"

1967

AREA	NAME OF TECHNIQUE	NO. OF FCSTS	MEAN (N.MI.)	STANDARD DEVIATION (N.M.)	MEDIAN (N.MI.)	LOWER QUARTILE (N.MI.)	UPPER QUARTILE (N.MI.)	RANGE (N.MI.)
A	WB	23	395	364	266	124	480	31-1427
A	NHC-64	23	620	295	607	461	739	90-1478
A	NHC-67	23	446	270	388	225	613	67-1043
A	PERS	23	606	388	462	236	790	102-1505
B	WB	15	324	176	333	180	411	13-612
B	NHC-64	15	475	141	452	397	547	241-832
B	NHC-67	15	423	184	404	312	472	98-851
B	PERS	15	309	209	267	146	369	88-943
C	WB	11	521	197	513	338	604	182-889
C	NHC-64	11	676	313	599	483	863	77-1180
C	NHC-67	11	581	191	592	441	647	213-920
C	PERS	11	578	155	538	476	627	329-936
ALL	WB	49	402	292	358	165	563	13-1427
ALL	NHC-64	49	588	274	551	417	694	77-1478
ALL	NHC-67	49	469	237	436	273	625	67-1043
ALL	PERS	49	509	327	444	237	655	88-1505

ATTACHMENT A

SUMMARY OF 1967 UNITED STATES AIR FORCE  
RECONNAISSANCE OPERATION AND RESOURCES FOR 1968 SEASON

1. During the 1967 hurricane season in the Atlantic (1 June through 30 November) the Air Force provided the following flying hours for NHC:

Plan of the Day	638:51
NHC Synoptic (Gull India, etc.)	1765:22
Total	2404:13

All of this flying time was provided by WC-130 aircraft. In the Eastern Pacific, the WB-47s flew a total of 205.3 hours on storm missions during the 1967 season. During the 1968 season Air Force will have the following resources to perform storm reconnaissance for the National Hurricane Center:

- a. Five WC-130 aircraft (475 flying hours/mo.).
  - b. In addition, six WB-47 aircraft (120 hours/mo.) can be devoted to the high altitude peripheral reconnaissance.
  - c. In the Eastern Pacific 10 WB-47 aircraft (five at McClellan AFB and five at Hickam AFB) (200 hours/mo.) can be devoted to high altitude storm reconnaissance.
2. WC-130 aircraft are equipped with the following navigation, communications, and meteorological equipment.

VHF-101	VHF Command
AN/ARC-39	UHF Command
Collins 618T	SSB HF Radio
AN/APN-59	Rad Set
AN/APN-70	Loran
AN/APN-147	Doppler Radar
SCR-718F	Radio Altimeter
Rosemont Total Temp Probe	Temperature Ind.
AN/AMT-6	Dropsonde

3. Crewmembers for a WC-130 aircraft are:

Aircraft Commander	Navigator
Copilot	Weather Officer
Weather Observer	Engineer

ATTACHMENT A (Continued)

4. WB-47 aircraft are equipped with the following navigation, communication and meteorological equipment:

VHF-101	VHF Command
AN/ARC-27	UHF Command
Collins 618T	SSB HF Radio
AN/APS-64	Radar Set
AN/APN-70	Loran
AN/APN-102	Doppler Radar
AN/APN-42A	Radar Altimeter
Rosemont Total Temp Probe	Temperature Ind.

NOTE: No dropsonde capability on WB-47 aircraft.

5. Crewmembers for a WB-47 aircraft are:

Aircraft Commander  
Copilot  
Navigator

6. With WC-130 resources cited above, the Air Force has the capability to perform four storm fixes/day at six hour intervals (normally this is two per aircraft) with the spurt capability of providing eight fixes per day if two storms require reconnaissance. Additionally, the WB-47s can supply peripheral data at 300 and 200 mb as requested by NHC at the storm reconnaissance conference held in Miami during July 1965. While not engaged in storm reconnaissance, the capability exists to fly two and one half synoptic tracks per day the same as or similar to the Gull India and Gull Hotel flown during 1967, one track with the WB-47 and 1 1/2 with a WC-130.

ATTACHMENT B

REPORT OF RESEARCH ACTIVITIES AT THE  
NATIONAL HURRICANE RESEARCH LABORATORY

by Banner I. Miller and R. Cecil Gentry

The National Hurricane Research Laboratory is supporting a number of projects in attempts to develop improved techniques for forecasting of hurricanes. These include both statistical and dynamical approaches.

Following the 1966 hurricane season it was obvious that the NHC-64 statistical method for prediction of hurricane motion could be improved. Therefore, the equations were revised, and these new equations were used operationally during the 1967 season. Tests have shown that the NHC-67 set of equations are somewhat superior to the earlier version. Efforts to improve the statistical prediction of hurricane tracks are being continued by NHRL and NHC.

Numerical models for hurricane prediction are also being developed. These include a multi-level primitive equation model, a simple barotropic model, and a vertically integrated barotropic model. In preliminary tests under research environment, results from the latter suggest that this model is much better than any other tested so far. This is especially true for periods of 24 to 72 hours in advance. We are working with its developer (Dr. Frederick Sanders) to get more of the procedures automated. We are trying to have it ready for operational tests during the 1968 hurricane season.



ATTACHMENT C

RESUME' OF THE 1967 TROPICAL STORM SEASON  
IN THE EASTERN NORTH PACIFIC EAST OF 140° W

by Hal Root

There was a total of 19 tropical cyclones on which bulletins and/or advisories were issued. Seventeen of these attained tropical storm intensity. Six reached hurricane intensity. The 17 tropical cyclones reaching at least tropical storm intensity established a new record for the San Francisco area of responsibility. The previous record of 13 tropical storms was established in the 1966 season. The fact that a record number of storms were reported in the 1966 and 1967 seasons is probably due largely to the excellent satellite coverage.

One dying hurricane, LILLY, threatened southern California on September 9-10, but turned away from the coast before actually causing rain or unusual winds on the mainland. Destructive surf from distant tropical storms was a recurring problem on southern California beaches.

Five million dollars in property damage was estimated at the Baja California town of San Felipe from Hurricane KATRINA on September 1. Some 1500 people were left homeless and one was killed. About 2,000 Americans were in town at the time, and many suffered hardships. Also, most residents of the town of Mulege, Baja California (population 1500) were left homeless on Friday, October 13, by OLIVIA. Hurricane PRISCILLA went directly over Socorro Island with sustained winds of 80 knots reported in one observation on October 17. Damage to the island is unknown.

San Francisco issued a total of 300 numbered advisories on hurricanes and tropical storms. In addition there were 100 bulletins on tropical depressions.

DATA ACQUISITION IN THE EASTERN NORTH PACIFIC

1. APT

- a. APT is the number 1 tool for detection, tracking and evaluation of tropical cyclones in the Eastern Pacific.
- b. Comparisons have shown that a Muirhead Mufax recorder improves detail and shading by 15 to 20%. Such a recorder would provide a large improvement in the capability of the HWO, SFO to evaluate storm intensity.

ATTACHMENT C (Continued)

2. Ship Reports

There has been a gradual deterioration in the number of ship reports received over the past few seasons. At times ships known to be in the vicinity of storms did not report. Suggest action be taken through the ship visitation program to increase the number of reports received.

3. Mexican Land Stations

More reports are needed from Baja California to improve the forecasts for the Gulf of California. The one report from LaPaz was a poor indicator of the intensity of the two destructive Hurricanes in this area during the 1967 season.

Upper Air

There is very little upper air information in the San Francisco area of tropical storm responsibility.

4. Reconnaissance

- a. The reconnaissance program was improved this season. The range on a number of flights was extended by staging out of March AFB.
- b. The range of the RB-47 aircraft limit reconnaissance to only a small portion of the active tropical storm area.
- c. The operating altitude (30,000 feet) of this aircraft does not provide the low level wind field information necessary for better definition and understanding of these storms.

ATTACHMENT D

CENTRAL NORTH PACIFIC TROPICAL CYCLONE WARNINGS, 1967

by

Joseph Vederman, Paul R. Moore, and Rue E. Rush  
ESSA, Weather Bureau, Honolulu, Hawaii

We wish first to mention briefly the organizational set-up of the Pacific Hurricane/Typhoon Warning Service, and that of the Hurricane Warning Office, Honolulu. Then we will discuss the availability of surface and upper-air data, tropical cyclone warnings, work in progress, and finally, a summary of 1967 storms affecting the Central North Pacific.

Organization

The entire Pacific Basin north of the equator falls under the cognizance of the Environmental Group, Pacific Command, insofar as weather services to the military establishment are concerned. The EG PACOM membership consists of the staff meteorologist, Commander-in-Chief Pacific, who is chairman; the fleet meteorologist, Commander-in-Chief Pacific Fleet; the Commander, First Weather Wing, U. S. Air Force; the Director, Pacific Region, ESSA, Weather Bureau; the Pacific Field Director, ESSA, Coast and Geodetic Survey; and a representative from the U. S. Army, Pacific. Basic responsibility for issuances regarding tropical cyclones within this EG PACOM area rests with the Hurricane Warning Office, San Francisco, for the area East of 140° West; with the Joint Typhoon Warning Center, Guam, for the area West of 180°; and with the Hurricane Warning Office, Honolulu, for that area between. In order to insure the utmost consistency of issuances, the Hurricane Warning Office, Honolulu, and JTWC, Guam, follow the directives contained in the CINCPAC instructions. These instructions are carefully studied and updated each year, by EG PACOM, with major decisions arrived at in the annual Pacific Typhoon Conference. The Hurricane Warning Office, Honolulu, provides issuances, as required, in accord with ESSA, Weather Bureau, directives in addition to those made in the CINCPAC instructions format. Before any issuances are made, a three-way telephone conference with the Forecast Duty Officer at Fleet Weather Central, Pearl Harbor, and the Air Force Forecast Duty Officer at Hickam AFB Weather Central is always held. The Air Force is responsible for supplying aerial reconnaissance of tropical storms. Responsibility for issuing warnings when tropical cyclones cross 140° West is transferred from the San Francisco Hurricane Warning Office; similarly, responsibility for warnings is transferred to Joint Typhoon Warning Center at Guam when tropical cyclones cross 180°. In those rare cases wherein a storm might be moving eastward across either of these boundaries, the transfer process would be reversed.

ATTACHMENT D (Continued)

DATA

Accuracy of tropical cyclone analyses and the issuance of timely and accurate warnings is extremely sensitive to the amount of data available to the forecaster. Data are certainly scarce in some areas, but an increasing amount of surface observations are becoming available to the tropical meteorologist.

Speed and direction of movement of tropical cyclones is also associated with the upper-air circulation. For this reason we have made an all-out effort to define the upper-air flow patterns. In addition to using conventional rawinsonde and pibal data, we make extensive use of aereps. During December 1967, over 1400 aereps per day were included in our computer-derived upper-air analyses. Computer facilities are available through our cooperative Air Force, Navy, and Weather Bureau program.

The use of meteorological satellite cloud pictures to locate and track tropical cyclones is well established in the Pacific. Pictures were then shown of the life history of Typhoon SARAH (September 1967) from the time of its discovery until it struck Wake Island with winds of near 120 knots. It often happens that satellite cloud pictures locate tropical cyclones in areas from which no surface reports are available. Then the problem arises of estimating the strength of the surface winds. We make use of the diagram developed by Fett (NESC) which relates the banded structure of the storm and the overcast area to the surface wind speed. We have had good success with this technique.

The APT pictures of Typhoon SARAH covered a much larger geographical area than that ordinarily covered by APT. During September and October, in addition to our own APT pictures, we also received Wake Island APT pictures on a real-time basis by an experimental FAA radio link.

Aerial reconnaissance is another and long established way of obtaining information concerning the location, size, wind speed, etc., of tropical cyclones. This is usually accomplished by specially instrumented aircraft with skilled observers by the Air Force, Navy, and Weather Bureau. We suggest that civil commercial aviation interests be brought into the picture more. On April 5 we got three reports from different airlines on the location of Typhoon ELLEN. Whenever there is a tropical cyclone anywhere in the Pacific, we ask all Honolulu-based airlines that have aircraft flying near the cyclone to make special observations, and to relay them to us. Cooperation has been excellent.

ATTACHEMENT D (Continued)

Paths of Tropical Cyclones

Let us now look at our 1967 tropical cyclones.

Tropical Storm ELEANOR. Eleanor moved west-northwestward at 12 knots and weakened to a tropical depression on July 15. It was still visible on APT a few days later near 21 north 143 west.

Tropical Storm DENISE. Denise moved from the San Francisco area and weakened to a tropical depression near 16 north 146 west. Satellite pictures still showed it, but very weak on July 17. Maximum winds in the Honolulu Hurricane Warning Office area were 40 knots. Honolulu and San Francisco issued 28 advisories on Denise.

Typhoon OPAL. Opal was first detected to the southeast of Wake Island on August 30. Wind rapidly increased to 70 knots. By the time it approached Marcus Island, it had winds near 140 knots. Opal is not in our hurricane warning office area but is mentioned here because of the threat it posed to Weather Bureau stations in the Pacific.

Hurricane/Typhoon SARAH. Sarah was a tropical storm when first observed by satellite on the morning of September 8 and later became that rarity, a storm which was both a hurricane a typhoon. From the internal banding, and the area of overcast, surface winds were initially estimated at 40 knots. Advisory #1 was issued quickly. From September 10 to 14 the storm was under reconnaissance by the Air Force from Hickam Air Force Base, Honolulu. Somewhere north of Johnston Island, Sarah became a hurricane as it crossed 180° it became a typhoon. Our Wake Island office issued its first local typhoon warning at 0100Z, September 15. About 36 hours later, the center passed Wake. Maximum gusts reached 120 knots. The control tower was knocked out of operation, many homes were damaged, and public utilities were severely damaged. All dependents had to be removed from the island. Damage was estimated at over a million dollars. Before recurvature, Sarah maintained an average west-northwestward speed of 14 knots. Honolulu and Guam issued 52 advisories on Sarah. Numerous newspaper, radio, and TV releases were also issued. By coincidence, Wake Island had been devastated 15 years previously, to the day, by Typhoon OLIVE.

Tropical Storm ROMONA. Ramona crossed 140° west as a depression then intensified to a tropical storm. It moved westward to near 146° west where it turned sharply northward under the influence of an upper trough and dissipated. Our first APT fix placed Romona near 17 north 142 west on October 30; our last APT fix placed it at 20 north 148 west on November 3. Maximum winds reached 50 knots. Honolulu and San Francisco put out 44 bulletins and advisories on Ramona.

ATTACHMENT D (Continued)

Plans and Work in Progress

We hope that within the next year we will be able to find the resources to set up, on a real time basis, an APT system which will connect Manila, Guam, Wake, Honolulu, and San Francisco. This will enable all forecast centers in the Pacific to keep tropical cyclones under surveillance at all times.

In the meantime, by close cooperation with commercial aviation interests, we expect to get an increasing number of special aereps of tropical cyclones. One final item. Most of the computer analyses and prognoses produced at this time have grids so coarse that they cannot define the circulation around a tropical cyclone. This is also true of the Honolulu tropical analyses and prognoses.

Major Joern of our NWP group is beginning to produce analyses using a smaller grid of  $2\frac{1}{2}$  degrees. We expect his work to have application to tropical cyclone forecasting. Another approach was taken by Rue E. Rush of the Pacific Region Headquarters staff, climatological tropical cyclone models were developed, subtracted from the initial observations field, then added back into the final analysis picture after the conventional number of passes had been accomplished. Results of this experiment were encouraging, and the system may be eventually incorporated into the operational analyses after further testing.

ATTACHMENT E

NHC COORDINATED REQUEST FOR AIRCRAFT RECONNAISSANCE (OPERATIONAL)

1. NEGATIVE REQUIREMENT
2. OBTAIN /12Z /18Z /00Z /06Z FIX FOR STORM/DEPRESSION/  
HURRICANE \_\_\_\_\_ EXPECTED TO BE NEAR \_\_\_\_N \_\_\_\_W AT /12Z
3. INVESTIGATE/SEARCH DEPRESSION/SUSPICIOUS AREA/EASTERLY WAVE EXPECTED TO  
BE NEAR \_\_\_\_N \_\_\_\_W AT /12Z
4. PROVIDE STANDARD AIR FORCE RECONNAISSANCE TRACK GULL \_\_\_\_\_
5. PROVIDE STANDARD NAVY RECONNAISSANCE TRACK \_\_\_\_\_
6. IF OPERATIONALLY FEASIBLE  
/OBTAIN \_\_\_\_\_Z FIX THEN PROCEED AT \_\_\_\_\_MBS TO \_\_\_\_N \_\_\_\_W AND MAKE  
DROP AND RETURN TO STORM/HURRICANE FOR \_\_\_\_\_Z FIX.

SOUTH/NORTH ZONE WITH DROPS AT

\_\_\_\_N \_\_\_\_W

\_\_\_\_N \_\_\_\_W

\_\_\_\_N \_\_\_\_W

\_\_\_\_N \_\_\_\_W

DROPS COMPLETED PRIOR TO /12Z  
OBS BETWEEN DROPS  
ALTITUDE \_\_\_\_\_

SOUTH/NORTH ZONE WITH DROPS AT

\_\_\_\_N \_\_\_\_W

\_\_\_\_N \_\_\_\_W

\_\_\_\_N \_\_\_\_W

\_\_\_\_N \_\_\_\_W

DROPS COMPLETED PRIOR TO /00Z  
OBS BETWEEN DROPS  
ALTITUDE \_\_\_\_\_

(ZONE BOUNDARY 27.5 N. PERIPHERAL FLIGHTS TWICE PER DAY WHEN THE STORM IS  
WITHIN 500 MILES OF ANY LAND AREA FOR WHICH THE U.S. HAS FORECAST  
RESPONSIBILITY. DROPS EVERY 400 MILES AT 10000 FT; 450 MILES AT 19000 FT;  
500 MILES AT 31000 FT.)

7. REQUEST NOT NOTED ABOVE \_\_\_\_\_

ORIGINAL TO CARCAH PRIOR TO 1630Z OR SPECIAL AT ANY HOUR AS REQUIRED  
COPY TO FORECASTERS BOARD

\_\_\_\_\_  
MONTH DATE YEAR TIME INITIALS

ATTACHMENT F

U. S. DEPARTMENT OF COMMERCE  
ENVIRONMENTAL SCIENCE SERVICES ADMINISTRATION  
Weather Bureau

ESSA WEATHER BUREAU MARINE/AVIATION/MILITARY \*BULLETIN ADVISORY NUMBER \_\_\_\_\_ \*AMENDED TROPICAL DEPRESSION  
CORRECTED TROPICAL STORM  
RELOCATED HURRICANE

\_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_ 2 \_\_\_\_\_ (MONTH) (DAY) (YEAR)

(WARNINGS)

DEPRESSION/STORM/HURRICANE CENTER LOCATED NEAR LATITUDE \_\_\_\_\_ NORTH LONGITUDE \_\_\_\_\_ WEST AT  
\_\_\_\_\_/\_\_\_\_\_ Z. POSITION EXCELLENT/GOOD/FAIR BASED ON AIR FORCE/NAVY/ESSA RECONNAISSANCE \_\_\_\_\_  
LAND BASED RADAR \_\_\_\_\_ SATELLITE \_\_\_\_\_ SHIP/PERIPHERAL SHIP/SYNOPTIC REPORTS/EXTRAPOLATION/ACFT  
RADAR FIX. POSITION ACCURATE WITHIN \_\_\_\_\_ MILES.

PRESENT MOVEMENT TOWARD THE \_\_\_\_\_ OR \_\_\_\_\_ DEGREES AT \_\_\_\_\_ KT.

PRESENT WIND DISTRIBUTION

MAXIMUM WINDS OF \_\_\_\_\_ KT NEAR CENTER

\*RADIUS OF 100 KT WINDS \_\_\_\_\_

#RADIUS OF 65 KT WINDS \_\_\_\_\_

RADIUS OF 50 KT WINDS \_\_\_\_\_

RADIUS OF 30 KT WINDS \_\_\_\_\_

REPEAT CENTER LOCATED \_\_\_\_\_ N \_\_\_\_\_ W AT \_\_\_\_\_ Z.

FORECASTS

12 HOURS VALID \_\_\_\_\_ / \_\_\_\_\_ Z LATITUDE \_\_\_\_\_ NORTH LONGITUDE \_\_\_\_\_ WEST.

MAXIMUM WINDS OF \_\_\_\_\_ KT NEAR CENTER

#50 KT WINDS \_\_\_\_\_

24 HOURS VALID \_\_\_\_\_ / \_\_\_\_\_ Z LATITUDE \_\_\_\_\_ NORTH LONGITUDE \_\_\_\_\_ WEST.

MAXIMUM WINDS OF \_\_\_\_\_ KT NEAR CENTER

#50 KT WINDS \_\_\_\_\_

(MARINE AVIATION ADVISORY NORMALLY ENDS HERE) (PLUS LAST PARAGRAPH)

#STORM SURGE OF

#HEAVY PRECIPITATION

EXTENDED OUTLOOKS

48 HOURS VALID \_\_\_\_\_ / \_\_\_\_\_ Z LATITUDE \_\_\_\_\_ NORTH LONGITUDE \_\_\_\_\_ WEST. MAXIMUM WINDS \_\_\_\_\_ KT.

#50 KT WINDS WITHIN \_\_\_\_\_ MILES OF THE CENTER.

72 HOURS VALID \_\_\_\_\_ / \_\_\_\_\_ Z LATITUDE \_\_\_\_\_ NORTH LONGITUDE \_\_\_\_\_ WEST. MAXIMUM WINDS \_\_\_\_\_ KT.

+RECONNAISSANCE PLANS INCLUDING SCHEDULED FIXES \_\_\_\_\_

NEXT ADVISORY AT \_\_\_\_\_ / \_\_\_\_\_ Z.

(FORECASTER \_\_\_\_\_)

\*For use in Pacific only.

#For use in Atlantic only.

+Central Pacific only.

USCMM-DC 60712-P67



ATTACHMENT G

AMENDMENT TO 1967 NATIONAL HURRICANE PLAN  
ANNEX 10 PAGES 76 AND 77

TROPICAL STORM SURVEILLANCE BY  
METEOROLOGICAL SATELLITES

GENERAL:

1. Add Indian Ocean
2. Change last statement to read "The format of these messages is as follows"  
  
Miscellaneous Satellite Bulletin (See Attachment G)  
  
Mercator projection Satellite nephanalyses and mosaics of the Pacific, Atlantic, and Indian Ocean areas of tropical cyclone activity during their storm seasons will be provided to the forecast centers whose forecast responsibility includes these areas.
3. NESC will provide the responsible forecast centers, by the most expeditious communications available, information in the event of
  - a. No change
  - b. No change
  - c. No change
  - d. No change
4. Update to reflect 1968 status.
5. NESC will examine on a continuing basis the current classification system for relating banding and storm diameter to surface winds, particularly to weakening or dissipating storms, and will inform all forecast agencies of new developments.
6. Guidelines for classifying tropical cyclones as named tropical storms or hurricanes/typhoons are as follows:
  - a. Satellite pictures will not be the sole basis for naming a tropical cyclone unless there is evidence of marked cyclonic banding.
  - b. Satellite pictures giving clear evidence of an eye in addition to marked cyclonic banding will be considered sufficient evidence to term a tropical cyclone a hurricane.

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Miami, Florida 33149

ATTACHMENT G (Continued)

ATLANTIC: Delete

1. Delete
2. Delete
3. Forecast centers will advise ----. (This will be included as Item 7 under the General Section.)
4. NESC will provide responsible forecast centers information available from R&D Satellites which may prove useful to the forecaster. (This will be included as Item 8 under the General Section.)

EASTERN PACIFIC: Delete

1. Delete

CENTRAL PACIFIC:

1. No change

ATTACHMENT G (Continued)

SUGGESTED MISCELLANEOUS SATELLITE BULLETIN FORMAT

1. Area concerned.
2. Number of bulletins issued for that area during calendar year.
3. Month and year of bulletin.
4. Date time group of picture.
5. Location of tropical cyclone or name of storm, accurate within \_\_\_\_\_ miles.
6. Stage.
7. Diameter of overcast.
8. Bands.
9. Trend of development ie. intensifying, dissipating, developing.
10. Past 24 hour movement.
11. Remarks.
12. Satellite or R&D identification.
13. Next Bulletin at Date time group.

ATTACHMENT H

DESIGNATION OF TROPICAL DEPRESSIONS

Numbering of Tropical Depressions

1. Atlantic.

a. Tropical depressions will be numbered (lettered) as soon as their identity can be established, the first one of the season to be numbered "one". The number (letter) thus assigned to a tropical depression would be used for the depression for reference on warnings by the military.

b. The NHC assign numbers to tropical depressions.

2. Pacific. Each tropical depression will be assigned a number that will be retained throughout the life cycle of the cyclone.

a. For the area east of 140° west, a list of tropical depression numbers will be maintained by the FWC Alameda, Calif. Numbering will start at the beginning of each calendar year.

b. For the area west of 140° west, a list of tropical depression numbers from 01 through 99 will be maintained by the Joint Typhoon Warning Center (JTWC), Guam. Renumbering will be at the end of sequence, or, in all cases, at the beginning of each calendar year.

c. When a tropical depression generates in the Pacific the HWO-SFO and the HWO-HNL will respectively request a number from the FWC Alameda or JTWC, Guam. When forecast responsibility is passed from one warning office to another, the number assigned will be retained.



1  
2  
3

