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METEOROLOGICAL

SERVICE

TROPICAL CYCLONE REPORT 87/4

**TROPICAL CYCLONE TUSI  
15-21 JANUARY 1987**

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# FIJI METEOROLOGICAL SERVICES

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15-21 January 1987

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## Introduction

Cyclone Tusi was a small tropical cyclone, which intensified rapidly to hurricane force during the 18 hours before it passed over the Manu'a Islands in American Samoa. At Pago Pago only 70 miles west of Tusi's track, winds did not reach gale force. Although there were no meteorological observations close to the path of the centre, the widespread devastation in the Manu'a Group and the appearance of an eye in satellite imagery confirm that the cyclone reached full hurricane force.

## History

Tusi started on 13 January 1987 as a small depression near Tuvalu within an active trough extending from Tuvalu to the Southern Cook Islands. The depression slowly deepened, and the associated cloud became organised into a circular central cloud mass with cloud bands extending to the northeast and southwest. By 160000Z\* the cyclone, near Tokelau, was sufficiently well organised to be named Tusi.

Initially the system was slow moving and it was anticipated that it would move southeastwards along the trough between Fakaofu and Swains Island. It did so, passing about 60 miles east of Swains Island around 170000Z. At about this time it started moving southwards towards American Samoa at about 5 knots.

By 170600Z the cyclone was estimated to have intensified to storm force and was moving south at about 10 knots. The cyclone continued to intensify, developing an eye visible on satellite imagery and hurricane force winds by 171600Z. Tusi then moved more towards the southeast at 10 knots to reach the Manu'a Islands in American Samoa around 180300Z.

\* Z zonetime is equivalent to GMT or UTC.

Subsequently the cyclone continued to 'curve- more towards the east causing concern for the Southern Cook Islands, especially Rarotonga. However, from about 200000Z when it was about 250 miles west of Rarotonga, the cyclone again curved more towards the south and winds did not reach gale force in any part of the Cook Islands.

Tusi crossed the 25-degree latitude line near 160 West between 201800Z and 210000Z. Subsequently it moved southwest and became a slow-moving extra-tropical depression between 25 and 30 South and 160 and 165 West for the next three days.

#### Warnings Issued by the Nadi Tropical Cyclone Warning Centre

##### Tokelau

Special Weather Bulletin (SWB) Number 1 was issued at 152000Z containing a gale warning for Tokelau. Swains Island was included at 160600 Z in the third Bulletin. By 1613JOZ when the cyclone was about 80 miles South of Fakaofu, the gale warning for Tokelau was cancelled, but the warning for Swains Island was maintained and it was advised that any further warnings for Swains Island would be included in the Special Weather Bulletins for Samoa. In all, four Special Weather Bulletins were issued for Tokelau at six-hourly intervals.

##### Samoa

A gale warning was maintained for Swains Island until 170730Z.

The first SWB for Samoa was issued at 160145Z containing a tropical cyclone alert for Samoa indicating that if Tusi continued on its current track or curved to the south, gale force or stronger winds could develop over Samoa the next day. This alert was issued about 48 hours before the strongest winds reached American Samoa.

Alerts were maintained at six-hourly intervals until 170630Z, mentioning the possibility of gale or stronger winds if the cyclone swung to the south. At this time, it was estimated that sustained winds close to the centre were about 60 knots.

By midnight, it had become evident that Tusi was taking a southward track. Accordingly-SWB Number 8 issued at 171330Z (about 12 hours before the strongest winds struck the Manu'a Group) contained a storm warning for American Samoa and a tropical cyclone alert for Western Samoa. Tusi was forecast to be near Ta'u Island by 180000Z. This bulletin warned of the likelihood of very destructive storm force winds~ very high seas and heavy rain, and rapid flooding of low-lying coastal areas from late morning.

Thereafter bulletins were issued at approximately three hourly intervals. SWB Number 9 issued at 171700Z upgraded the warning for American Samoa to a hurricane warning, estimating sustained winds of 65 knots and gusts to 90 knots. Bulletin Number 10 increased the winds near the centre to 75 knots with momentary gusts of 100 knots, maintaining the hurricane warning for American Samoa and introducing a gale warning for Upolu in' Western Samoa.

At 172230Z SWB Number 11 forecast the centre close to Ta'u around 180300Z. Bulletin 13 at 180400Z dropped the gale warning for Western Samoa. After this the warnings for American Samoa were progressively downgraded through storm and gale force until the final SWB at 181530L

#### Southern Cook Islands

By 181600Z cyclone Tusi had curved from a southward track to a south southeast track and was forecast to curve further towards the east.

Special Weather Bulletin Number 1 issued at 181630Z contained a tropical cyclone alert for all of the Southern Cooks, warning of the possibility of gales or stronger winds initially over Palmerston Island and later over the rest of the group.

Similar bulletins were issued at six hourly intervals.

By 190430Z, Tusi was too far south to pose a further threat to Palmerston Island. Accordingly, the alert for Palmerston was dropped in SWB Number 3. At the same time it was considered that there was an increased risk of the cyclone swinging far enough east to bring gales to Rarotonga and Mangaia, so a gale warning was issued for these islands. The rest of the group, excluding Palmerston, remained on an alert.

By 191400Z the position of Tusi was such that the alert was dropped leaving only Rarotonga and Mangaia with a gale warning. The final SWB, Number 8, cancelling this gale warning was issued at 202000Z.

Niue

At 181700Z when Tropical Cyclone Tusi was 200 miles north northeast of Niue, it was feared that a, further southward swing might be taking place and Special Weather Bulletin Number 1, a tropical cyclone alert, was issued for Niue warning of a risk of gale or stronger winds developing in the evening. By 182130Z it was evident that Tusi was maintaining a southeast track at 12 knots and as at that time it was 170 miles northwest of Niue, there was no longer any risk of gales and the alert was cancelled.

Advisory Messages

Tusi was the first cyclone for which Nadi issued routine tropical disturbance advisory messages. These were issued twice daily at about 1945Z and U745Z.

The purpose of these messages is to inform regional meteorological centres of the thinking behind the information conveyed in international marine warnings and special weather bulletins, and also to discuss some of the uncertainties in the current and forecast behaviour of the cyclone.

Twelve formal advisories were issued on Tusi in a numbered series.

Advisories from Other CentresHonolulu

Southern hemisphere tropical cyclone summaries were received regularly from Honolulu as well as some other bulletins.

The routine "narrative synoptic description for American Samoa today" (bulletin FXZM) issued by Honolulu at 171600Z advised recipients to take all precautions immediately for possible strong and damaging winds and referred them to the latest Nadi bulletin.

Guam

No information on was received from Guam. It is understood that warnings on disturbances east of the dateline 'are issued by Pearl Harbour. These have been requested through Honolulu for future cyclones.

### Damage Reports

Samoa newspapers report that only two people of the 2000 inhabitants of the Manu'a group were seriously injured and none killed.

According to the Samoa News of 20 January, of the 300 houses, plus churches, schools, stores and other buildings in Manu'a, 100% of these buildings were destroyed in Faleasao, Fitiuta and Sili, 90% in Ta'u and Ofu and 50% in Olosega.

### Discussion

#### Weather Reports

Tracking and estimating the intensity of Tusi was hampered by the lack of observations. For much of its life-span Tusi was not close enough to land stations to provide surface observations which could help to determine the position of the centre with greater accuracy.

When the cyclone was close to Tokelau additional reports were requested from Tokelau through Apia. However many routine synoptic reports were not received at Nadi and no extra reports were provided. Synoptic reports of winds up to 50 knots were received at 160000Z. These winds were estimated and it is thought likely that they may have been over-estimated.

In the case of American Samoa the only reports available are those from Pago Pago as there are no meteorological observing stations on the Manu'a group.

As a result it is not possible to determine accurately the wind speeds experienced. The source, and therefore the accuracy, of Australian newspaper reports of winds of 117kph (63 kt) and 177kph (95kt) as reported in the Fijian press is unknown.

The damage caused in the Manu'a Group and the small eyes visible in satellite imagery are consistent with the forecast speed of 75 knots (10-minute average) and 100kt momentary gusts.

The normal excellent level of service with extra reports was provided by the Cook Islands.

#### Operational Problems

As is often the case, locating the cyclone centre was difficult in the early stages because the cloud system was not well organised and a large area of cloud covered the surface depression. Because the centre at 170600Z was located further east from its probable location estimated from post-analysis, the southward swing was not evident until 171200Z.

Gridding and parallax errors from the satellite are not accurately known at Nadi.

However, inspection of the 180300Z imagery, when the cyclone was close to Manu'a, suggests a combined error of a little less than half a degree of longitude - true position west of apparent position.

### Conclusions

The storm and hurricane warnings for American Samoa gave about 12 hours advance notice of the strongest winds (about 8 hours of daylight).

The Nadi Tropical Cyclone Warning Centre likes to give up to 24 hours notice of severe conditions in the form of specific warnings. However this is often difficult in the case of hurricanes which intensify rapidly near the source, and also when a sudden change of direction takes place relatively close to land areas.

Alerts were issued 48 hours in advance and the population of Manu'a should have been prepared to act quickly on receipt of the specific warnings.

The light casualty toll of two people seriously injured and no deaths despite the widespread destruction of buildings and trees suggests that this was in fact the case.

It is likely that warnings were issued from Honolulu and possibly also from Washington as well as those issued by Nadi.

The Samoa News of Tuesday 20 January 1987 reports that "Manu'a residents were well informed of the slowly approaching hurricane".

### Recommendations





Efforts should be made within the region to improve the standard of equipment and reporting at some places. Wind recording equipment is much preferable to subjective estimates.

### Acknowledgement

I would like to thank Mr Tutekawa, Officer in Charge of the Meteorological Office at Pago Pago, for quickly sending me Samoan Newspaper reports and weather information for Pago Pago. In the absence of meteorological reports from Kanu'a, these greatly assisted the preparation of this report.

# TROPICAL CYCLONE TUSI

17-21 JAN 1987

-  Limit of Hurricane force winds
  -  Limit of Storm force winds
  -  Limit of Gale force winds
  -  Depression not a Tropical Cyclone
- FIJI METEOROLOGICAL SERVICE

