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NAVAL AIR TEST CENTER

Patuxent River, Maryland

Report....

WEPTASK RA1200001/201 1/F012-15-002
PROBLEM ASSIGNMENT RSSH-31003

OPTIMUM WIND-OVER-DECK FOR SHIPBOARD RECOVERY OPERATIONS WITH CARRIER BASED AIRPLANES

REPORT NO. 2
FINAL REPORT

U S NAVAL AIR TEST CENTER
PATUXENT RIVER MARYLAND

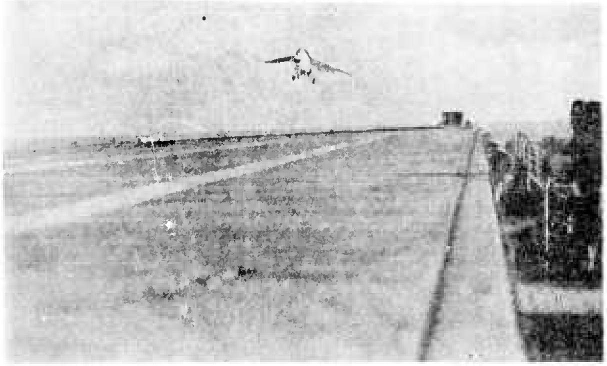
FLIGHT TEST DIVISION

RA1200001
(RSSH-31003)
FT2222-176

NAVAL AIR TEST CENTER
U. S. NAVAL AIR STATION
Patuxent River, Maryland

21 JUN 1962

WEPTASK RA1200001/201 1/F012-15-002, Problem Assignment RSSH-31003, Optimum Wind-Over-Deck for Shipboard Recovery Operations with Carrier Based Airplanes; Report No. 2, Final Report



ABSTRACT

1. Airflow disturbance aft of the ramp and in the landing area is one of the most significant adverse influences on the pilot's ability to make a precise carrier final approach and landing, and is primarily affected by the Wind-Over-Deck (WOD). Tests conducted on board USS MIDWAY (CVA-41), USS RANGER (CVA-61), USS CORAL SEA (CVA-43) and USS SARATOGA (CVA-60) determined that, from the pilot's viewpoint, a WOD of 25 kt for jet and 15 kt for propeller airplanes is optimum. Conclusions are drawn concerning required glide slope angles and the undesirable demands imposed on pilots by variations in carrier landing conditions.

2. The determination of an optimum WOD must be predicated upon operational feasibility as well as pilot considerations. A 25 kt WOD, in comparison with a 35 kt WOD, accrues the following advantages for jet airplanes: Less demanding on the pilot; reduction in landing gear loads; improved approach airspeed control; less deviation in alignment; and increased jet recovery flexibility. The increased closure rate of a reduced WOD results in the following disadvantages: Earlier wave-off initiation; slightly degraded landing dispersion; and increased bolter rate. Based on arresting gear and/or airplane limits, fleet capability for utilizing a reduced WOD is determined.

3. It is concluded that any operationally feasible reduction in WOD that is standardized as optimum for individual carriers, and is as near as practicable to 25 kt for jet and 15 kt for propeller airplanes, will improve safety of recovery operations.

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(RSSH-31003)
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21 JUN 1962

PREPARED BY:

R. M. DECKER
Project Engineer

LCDR N. A. CASTRUCCIO, USN
Project Pilot

REVIEWED BY:

CDR G. W. ELLIS, USN
Head, Carrier Suitability Branch

APPROVED BY:

B. V. STUBER
Chief Project Engineer

F. G. EDWARDS
Captain, U. S. Navy
Director, Flight Test

NAVAL AIR TEST CENTER
U. S. NAVAL AIR STATION
Patuxent River, Maryland

RA1200001
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21 JUN 1962

From: Commander, Naval Air Test Center
To: Chief, Bureau of Naval Weapons

Subj: WEPTASK RA1200001/201 1/F012-15-002, Problem Assignment RSSH-31003, Optimum Wind-Over-Deck for Shipboard Recovery Operations with Carrier Based Airplanes; Report No. 2, Final Report

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(d) NATC spdltr RA1200001 (RSSH-31003) ser FT2222-348 of 9 Oct 1961
(e) Spec MIL-A-8629 (Aer) of 28 Aug 1953

Encl: (1) Data Recorded and Associated Accuracies of Data
(2) Arrested Landing Tabulated Data, USS CORAL SEA (CVA-43)
(3) Summary of Optimum WOD Landings
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(5) Minimum WOD Requirements for Most Critical Jet and Propeller Airplanes
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INTRODUCTION AND PURPOSE

1. Reference (a) established Problem Assignment RSSH-31003 with a "B" priority to determine if an optimum wind-over-deck (WOD) exists for the recovery of the various model airplanes currently assigned to the Fleet. Specific requirements were:

a. To determine whether an optimum WOD exists for particular groupings of models, such as by gross weight, wing loading or approach speed.

b. To evaluate the significance of variation from an optimum WOD, if established, on landing parameters such as approach speed, sinking speed, off-center distance and bolter rate.

2. Results of qualitative tests conducted on board USS MIDWAY (CVA-41), USS CORAL SEA (CVA-43) and USS SARATOGA (CVA-60) are reported in references (b) through (d), respectively.

DESCRIPTION OF TEST AIRPLANES

3. Model F8U-1/2, F4D-1, A4D-2, A3D-2P and TF-1 airplanes were used in the prosecution of the problem assignment. All were representative of production airplanes except models F8U-1 BuNo 143749 and A4D-2 BuNo 142089, which contained test instrumentation required for other projects, but not used during these tests.

RECORD OF TESTS

4. The below summary is a chronological record of tests conducted:

a.	Date of project directive	28 May 1960
b.	USS MIDWAY (CVA-41) Trials	12-16 Dec 1960
c.	USS RANGER (CVA-61) Trials	24-27 Feb 1961
d.	USS CORAL SEA (CVA-43) Trials	14-21 Jul 1961
e.	USS SARATOGA (CVA-60) Trials; Flying Completed	11-21 Sep 1961
f.	Data reduction of CORAL SEA tests of NATC airplanes completed	15 Dec 1961
g.	CORAL SEA data analysis completed for NATC airplanes	9 Mar 1962

SCOPE AND METHODS OF TESTS

5. This final report reflects the conclusions of references (b) through (d), includes qualitative test results not previously reported from trials on board USS RANGER (CVA-61), and reports the results of landing parameter analysis of both quantitative and qualitative data obtained from tests conducted on USS CORAL SEA (CVA-43).

6. Qualitative evaluation was made of day carrier approaches and landings under WOD conditions varying between 15 and 45 kt for jet and between 7 and 30 kt for propeller airplanes. Particular emphasis was placed on obtaining a large sample of pilot and landing signal officer (LSO) opinion aboard MIDWAY and RANGER, where 15 pilots flew 5 different model airplanes. Each pilot conducted two or more periods of touch-and-go landings in each model flown. One or more periods were at a high WOD and one or more at a low WOD value. The time interval between two periods for an individual pilot was held to a minimum.

7. Night qualitative evaluation was conducted on board SARATOGA and reported in reference (d). Tests consisted of two pilots' participation in one day period each, followed by two night periods each during one day's operation. The models F8U-2 and A4D-2 airplanes were utilized. WOD for the day and first night periods was 25 kt, while 35 kt was maintained for the second night period. Comparative results were thus determined between day and night landings for two WOD values.

8. Optimum WOD tests were conducted aboard CORAL SEA with three model A4D and two model F8U airplanes in order to obtain a representative sample of quantitative data (307 landings) for WOD values of 25 and 35 kt. Each pilot/airplane combination was maintained throughout the tests in order to provide a statistical comparison between a 25 kt WOD/$3\frac{1}{2}^{\circ}$ glide slope and a 35 kt WOD/4° glide slope for the following airplane landing parameters:

a. Approach speed.

b. Actual and theoretical sinking speeds.

c. Off-center distance at both the ramp and at touchdown.

d. Actual and theoretical touchdown distances from the ramp.

e. Main gear to ramp clearance.

f. Roll angle at touchdown.

All data for the above parameters were obtained from camera coverage of the landing area except airplane approach speed, which was obtained from the ship's AN/SPN-12 radar. The MK VI Mod 0 Fresnel Lens Optical Landing System (FLOLS) was adjusted to maintain approximately the same hook touchdown distance from the ramp for both a $3\frac{1}{2}^{\circ}$ and 4° glide slope setting.

9. Qualitative data were obtained from debriefings, flight reports and questionnaires completed by pilots and LSO's. Quantitative data recorded, with source and associated accuracies, are presented in enclosure (1). Arrested landing data obtained for test airplanes aboard CORAL SEA are contained in enclosure (2). As reported in reference (c), quantitative data were additionally recorded for approximately 890 fleet carrier qualification (CarQual) landings of A3D, A4D, F3H and FJ-4B airplanes, utilizing a WOD of 25 to 40 kt. These CarQual data do not constitute a part of this report and will be forwarded separately to BuWeps upon completion of analysis of the airplane landing parameters.

10. Enclosure (3) contains a tabulated summary of landings made on each carrier by test airplanes. Enclosure (10) presents the methods used for determining glide slope presentation at touchdown with respect to the angle deck, the theoretical sinking speed and the theoretical touchdown distance. Abbreviations and symbols contained herein are listed in enclosure (11).

RESULTS AND DISCUSSION

Airflow Disturbance

11. Airflow disturbance aft of the ramp and in the landing area is one of the most significant adverse influences on the pilot's ability to make a precise final approach and landing. Airflow disturbance aft of the ramp, or "burble", may be generally described as a downdraft of varying intensity immediately aft of the ramp, followed by a resultant updraft of varying and shifting location in the vicinity of 1000 ft

astern. "Burble" and airflow disturbance in the landing area are caused by the relationship of fixed and variable factors, some of which are sufficiently within the operational commander's control to minimize their adverse effects. Ship design characteristics vary considerably among classes and exert a significant influence on the air mass through which the pilot must fly. The magnitude and direction of the WOD is the most significant variable influencing airflow disturbances. It has been determined that for a given magnitude of WOD that the airflow in the landi..g area is steadiest when the relative wind direction is parallel to the angled deck centerline. Starboard recovery crosswinds are accompanied by relative wind velocities in the landing area considerably lower than those recorded by superstructure mounted anemometers. Airflow conditions in the landing area improve when the magnitude of the WOD is reduced. The "burble" aft of the ramp becomes stronger when: the magnitude of WOD increases; the angle between the relative wind and the angle deck centerline increases; the natural wind component increases for a given WOD. Other variable factors influencing airflow disturbance include flight deck spot, aircraft exhaust or prop wash over the deck and natural turbulence. Enclosure (12) is a compilation of selected reports pertaining to WOD surveys and tests, which directly relate to airflow disturbances.

12. Glide slope and lateral corrections required by the pilot increase with increased WOD. Upon first entering the "burble" with high WOD (above 35 kt) airplanes generally experience a significant upward displacement from the glide slope followed by a downward displacement near the carrier ramp. The downdraft effect is also a function of the airplane's position on the glide slope at the time of transiting the downdraft; a low position results in a deeper penetration of the "burble" and maximum downdraft effect. All pilots reported that regardless of the model airplane being flown, the tendency for the airplane to go low on the glide slope increased considerably as WOD increased above 25 kt and 15 kt for jet and propeller airplanes, respectively. The pilot control requirement is greater for low approach airspeed and lower wing loading airplanes. To counteract the tendency of the airplane to go low during high values of WOD, all pilots anticipated the effects of downdraft by adding power approximately 400 ft from the ramp. The amount of power addition varied among airplanes of different models. Generally, an increase of about 4-6% RPM was sufficient to maintain glide slope for jet airplanes at WOD values in excess of 25 kt.

Variations in Carrier Landing Conditions

13. Variations in WOD require pilots to compensate for differences in the airflow pattern aft of the ship and in the landing area (paragraphs 11 & 12), alter the 180° position and change the power setting utilized on the glide path for a fixed Optical Landing System (OLS) glide slope. It is highly desirable that these variables be minimized, and pilots be made aware of any significant deviation from expected landing conditions.

14. The turn off the 180° position was delayed 8 to 10 sec at low WOD (20-25 kt) in comparison to approaches with 30-35 kt WOD to allow 25-30 sec in a one-mile final approach.

15. Airplane approach power settings which are optimum and to which the pilots have become accustomed should be maintained relatively constant. This is synonymous to maintaining the glide path of the airplane relative to the air mass (airplane rate of descent) relatively constant. By maintaining the same approach power settings at low WOD values, trim requirements and wave-off (WO) capability remain the same, except that the WO maneuver should be initiated earlier because of increased closure rate. Shipboard airplane power settings will remain approximately the same as those utilized for field carrier landing practice (FCLP) if OLS glide slope angles are adjusted in the following manner:

Approach Speed - 100 kt		Approach Speed - 135 kt	
WOD, kt	Glide Slope Setting, deg	WOD, kt	Glide Slope Setting, deg
0	3	0	3
15	3½	20	3½
25	4	35	4

For jet airplanes, a 3½° glide slope is recommended for 25 kt WOD and a 4° glide slope for WOD values greater than 30 kt. There is a greater tendency for airplanes to be low at the ramp with WOD above 30 kt when using a 3½° vice a 4° glide slope setting. This is attributed to a deeper penetration of the "burble" with the lower glide slope.

Analysis of Airplane Landing Parameters

16. Enclosure (4) is a summary of the analysis of the airplane landing parameters investigated aboard CORAL SEA at both WOD conditions. Quantitative data for this analysis are based upon 307 landings conducted by three model A4D and two model F8U airplanes. Enclosures (7) and (8) contain the frequency distribution of the parameters for the A4D and the F8U airplanes, respectively. Paragraphs 17 through 24, below, discuss the results of landing parameter analysis of the CORAL SEA tests. The term "deviation", as used in this report, includes at least 99 per cent of all the variates and represents 3σ (where σ is the standard deviation).

17. Sinking Speed. The use of a 25 kt WOD and $3\frac{1}{2}^{o}$ glide slope angle theoretically provides a 0.5 fps reduction in sinking speed from that resulting from a 35 kt WOD and 4^{o} glide slope angle. The model A4D airplanes' average sinking speed data in enclosure (4) conform with theory, having a 12.0 fps average sinking speed at 25 kt WOD and a value of 12.5 fps with 35 kt WOD. The model F8U airplane, however, experienced the same average sinking speed, 14.0 fps, for both the 25 kt and 35 kt WOD values. Considering the related parameter of deviation in sinking speed, both airplanes experienced a deviation of 1 fps less with a 25 kt WOD.

Deviation in Sinking Speed

	25 kt WOD	35 kt WOD
A4D	4.5 fps	5.5 fps
F8U	5.0 fps	6.0 fps

The sinking speed data of enclosure (4) indicate there is less probability of exceeding maximum design sinking speed when using a 25 kt WOD.

18. Frequency of High Landing Gear Loads (Sinking Speed/Roll Angle Parameters). Reference (e) specifies that with a 7^{o} roll angle the airplane ultimate sinking speed is reduced by 50%. Enclosure (9) contains a comparison of the actual sinking speed/roll angle combinations with 25 kt and 35 kt WOD. The per cent of ultimate sinking speed/roll angle envelope was determined by the method contained in enclosure (10). The

average percent of ultimate of these parameters for the A4D airplanes with 25 kt WOD is 56.0% and with 35 kt WOD is 61.0%. For the F8U airplanes the average percent of ultimate is 64.5% with 25 kt WOD and 68.5% with 35 kt WOD. The deviation, in percent of ultimate, is 16.0% less with 25 kt WOD than with 35 kt WOD for the A4D, and 12.0% less with 25 kt WOD than with 35 kt WOD for the F8U. The use of a 25 kt WOD, as compared to a value of 35 kt, reduces the frequency of high landing gear loads for jet airplanes.

19. Control of Airplane Approach Speed. As indicated in enclosure (4), the deviation from desired approach speed was slightly less with a 25 kt WOD than with a 35 kt WOD for both model airplanes.

20. Control of Alignment. For both models tested, the overall tendency was to be right of the centerline under both WOD conditions. Four of the five airplanes (three A4D and one F8U) experienced less deviation in line-up at touchdown at 25 kt WOD, and the other F8U airplane experienced the same deviation for both WOD conditions (enclosure (4)).

21. Landing Dispersion. Data analysis determines that the average main gear touchdown distance from the theoretical for the A4D airplanes was approximately 50 ft short for 25 kt WOD and 40 ft short for 35 kt WOD. The A4D data also show the deviation from the theoretical touchdown distance to be larger for 25 kt WOD (100 ft) than for 35 kt WOD (85 ft). The model F8U airplane average touchdown distance was closer to the theoretical with 25 kt WOD (5 ft short) than with 35 kt WOD (15 ft short), but the deviation was the same (120 ft) for both WOD values. The use of a 25 kt WOD therefore indicates a 15 ft increase in touchdown deviation for recovery of the model A4D airplane, with the average touchdown distance from the theoretical being 10 ft further aft (at 50 ft short). For the model F8U airplane, with 25 kt WOD, although no change in deviation was experienced, the average touchdown distance was 10 ft farther forward (at 5 ft short of the theoretical).

22. Bolter Rate. The method of determining the bolter rate during touch-and-go landings is contained in enclosure (10). The three A4D airplanes had a 1.5% bolter rate with 35 kt WOD and a 3.0% bolter rate with 25 kt WOD. The two F8U airplanes' bolter rate was 7.0% with 35 kt WOD and 12.5% with 25 kt WOD. By eliminating the first period of touch-and-go

landings by each pilot, the F8U bolter rate was 11.5% with 25 kt WOD and 8.0% with 35 kt WOD, while the A4D bolter rate was 4.5% with 25 kt WOD and 1.5% with 35 kt WOD. Analyzing the bolter rate in this manner appreciably decreases the number of landings with 25 kt WOD, since two A4D airplanes and one F8U airplane utilized this WOD condition for their first period. However, both models would have experienced a higher bolter rate with 25 kt WOD than with 35 kt WOD had arrestments been made on all landings.

23. Closure Rate. For a constant approach airspeed of 135 kt, for example, a 25 kt WOD results in an approximate 10% increase in rate of closure above that for a 35 kt WOD. The resultant disadvantage of a higher closing speed on wave-off initiation has been previously discussed. The larger deviation of the model A4D airplane from the theoretical touchdown and the increased bolter rate of both the A4D and F8U airplanes are considered largely attributable to the approximately 10% higher relative closure speed associated with a 10 kt reduction in WOD.

24. Main Gear to Ramp (MG/R) Clearance. Sufficient data are not available to compare the MG/R clearance at the two WOD conditions, although it appears that this clearance was slightly higher than the theoretical for both WOD conditions. When using a $3\frac{1}{2}^{\circ}$ glide slope for a 25 kt WOD, approximately 2 ft less MG/R clearance will be afforded than for the 4° glide slope previously recommended for a 35 kt WOD. Where limited distance exists from the ramp to the No. 1 pendant, the reduced glide slope angle occasioned by a lower WOD presents a disadvantage of the 25 kt WOD, particularly for deck motion in pitch.

Operational Considerations

25. Frequency of Prevailing Wind Values. A WOD that can be predictively utilized operationally must be considered with respect to the prevailing surface winds over the oceans. Tabulated in enclosure (6) are the average annual surface wind percentage frequencies in various carrier operating areas. The surface wind is 16 kt or less in the tabulated operating areas 65% of the time. A WOD of 25 kt can therefore be more consistently obtained than one of 35 kt. Prevailing surface winds, required speed for steerage and carrier capability to make rapid changes in speed decrease the

possibility of using 15 kt WOD for propeller operations, since 57% of the time the surface winds are greater than 10 kt in the operating areas. It is indicated that from a standpoint of prevailing surface winds, the use of a 25 kt WOD would greatly increase flexibility of jet carrier operations, and that although desirable for predominantly propeller operations, a 15 kt WOD will be available less often.

26. Increased Engaging Speed. The disadvantage of a 25 kt WOD in increased closure rate (paragraph 23) is also manifested in a like increase in arresting gear engaging speed. During these tests the average deviation in approach speed was less for a 25 kt WOD than for a 35 kt WOD. However, for both WOD values examined, the model A4D and F8U airplanes maintained an average approach speed approximately 4 kt higher than that recommended. It is reasonable to assume that fleet operations will encounter some recoveries when averages are to some degree higher than those determined under test conditions reported herein. Reduction in WOD will result in an equal increase in engaging speed plus the algebraic variation by individual pilots from recommended approach airspeed. The tendency is normally to be too fast.

27. Arresting Gear Capabilities for Increased Engaging Speeds. Enclosure (5), pages 1 and 2, list the minimum WOD requirements for various airplane/arresting gear combinations. These WOD requirements are based on the recommended approach speed at the maximum arrested landing gross weight. When the minimum WOD values listed in enclosure (5) are increased by 4 kt, it is evident that:

a. Only carriers equipped with MK 7, Mod 2-3 Constant Runout Arresting Gear (CROAG) with operative sheave dampers can utilize a 25 kt WOD for all carrier-based airplanes when at the maximum arrested landing gross weight.

b. Carriers equipped with MK 7, Mod 1-3 CROAG with operative sheave dampers can utilize a 25 kt WOD for the majority of carrier-based airplanes at gross weights less than the maximum.

c. Carriers equipped with any MK 7 CROAG without sheave dampers cannot utilize a 25 kt WOD for the majority of carrier-based airplanes.

28. Desirability of Standardization of WOD for Individual Carriers. From the pilot's point of view, the not uncommon practice of increasing the WOD for night operations is undesirable, since the pilot experiences different airflow conditions than he is normally accustomed to during day operations. The most desirable practice would be to standardize the prescribed WOD for all operations (day, night, routine recoveries and CarQual) in order to reduce the number of variables affecting the pilot during all carrier approaches. The value of WOD established should be that considered to be optimum in light of all previously mentioned factors that pertain to the particular ship. Emphasis should be placed on meticulously minimizing cross-wind during recoveries and avoiding an increase in WOD for night operations. Where group composition is predominantly jet, a standardized optimum WOD should be established as close to 25 kt as all considerations will permit. When the CVS composition is predominantly propeller aircraft and surface winds permit, a standardized optimum WOD of as near to 15 kt as is practicable should be established. For present carrier operations, if day and night recoveries can be standardized and maintained at a particular optimum WOD value for individual ships, although not necessarily as low as 25 kt, it is concluded that safety of recovery operations can be improved.

29. Present Application of Optimum WOD. An optimum WOD is that relative wind over the angle deck, with minimum practicable cross-wind component, which will minimize pilot control problems in the "burble", and at the same time prove operationally feasible from a standpoint of airplane/arresting gear structural limitations, prevailing surface winds and operationally acceptable landing parameters. It has been determined that a 25 kt WOD meets many, although not all, of these criteria. Recovery operations must take into consideration deviations in airplane approach speed and overall accuracy of the AN/SPN-12 equipment, which is at best to within ± 3%. Air group training level and individual ship's arresting gear capability are major considerations. It is recommended that type commanders, fleet commanders and commanding officers be informed of the merits of a lower WOD, where feasible, and that utilization of a WOD that is optimum for a particular carrier be established with a view toward maintaining as low a value of WOD as is considered practicable.

30. Future Considerations. The increased application of an optimum WOD for future carrier operations is dependent upon continued developmental effort. For example, the approach power compensator (APC), recently evaluated in the model F8U-1 airplane, will provide a significant improvement in approach airspeed control. Future installation of higher capacity arresting gear is a requirement to permit the use of lower values of WOD for some carriers. Continued emphasis on the many areas of the carrier landing improvement program will contribute toward more effective utilization of a WOD that is realistically optimum.

CONCLUSIONS

31. It is concluded that:

a. From the pilot's viewpoint alone, 25 kt WOD for all jet airplanes and 15 kt WOD for all propeller airplanes (WOD parallel to the angled deck centerline) is optimum (paragraphs 11 and 12).

b. Any operationally feasible reduction in WOD that is standardized as optimum for individual carriers, and is near as practicable to 25 kt for jet and 15 kt for propeller airplanes, will improve safety of recovery operations (paragraph 28).

c. It is desirable to standardize the prescribed WOD for all operations for an individual carrier, within the limitations imposed by operational considerations (paragraphs 13, 15 and 28).

d. Prevailing surface winds preclude standardization ~~of~~ 15 kt WOD ~~for~~ propeller aircraft (paragraph ~~25~~).

e. OLS glide slope setting should be adjusted as a function of WOD to maintain airplane approach power setting relatively constant (paragraph 15).

f. For jet airplane recoveries, a $3\frac{1}{2}^{\circ}$ glide slope is required for 25 kt WOD, and a 4° glide slope is required for WOD values in excess of 30 kt (paragraph 15).

g. For propeller airplane recoveries, a $3\frac{1}{2}^{\circ}$ glide slope is satisfactory for a 15 kt WOD, and a 4° glide slope is desirable for a 25 kt WOD (paragraph 15).

32. As a result of comparative evaluation of WOD values of 35 kt and 25 kt for jet airplanes, it is concluded that, in addition to pilot control considerations, the following advantages of a 25 kt WOD are realized:

a. Reduction in the frequency of high landing gear loads (paragraphs 17 and 18).

b. Less deviation in alignment during the final approach and touchdown (paragraph 21).

c. Improved flexibility of recovery operations (paragraph 25).

d. Improved approach airspeed control (paragraph 19).

33. As a result of comparative evaluation of WOD values of 35 kt and 25 kt for jet airplanes, it is concluded that the following disadvantages result from the approximately 10% increase in closure rate when using a 25 kt WOD:

a. Requirement to initiate wave-off earlier in the approach (paragraph 15).

b. Slight degradation in both average main gear touchdown distance from the theoretical as well as in touchdown deviation from the theoretical (paragraphs 21 and 23).

c. Increased bolter rate (paragraphs 22 and 23).

d. Airplane and/or arresting gear structural limits being exceeded on some carriers (paragraphs 26 and 27).

RECOMMENDATIONS

35. It is recommended that:

a. Emphasis be placed on reducing WOD values from those presently in use for fleet recovery operations to standardized WOD values for individual carriers as near to 25 kt for jet airplanes and 15 kt for propeller airplanes as is operationally practicable.

b. The varied adverse effects on the pilot of crosswind normal to the angle deck centerline be emphasized, and continuing action be taken to minimize crosswind during fleet recovery operations.

c. Emphasis be continued on design criteria and developmental effort to improve shipboard airflow characteristics and equipment utilized during the approach and recovery of aircraft.

PAUL H. RAMSEY

F G Edwards

F. G. EDWARDS
By direction

RA1200001
(RSSH-31003)
FT2222-176

DATA RECORDED AND ASSOCIATED ACCURACIES OF DATA

External Instrumentation

Item	Recorded by	Overall Accuracy (±)
Approach speed	AN/SPN-12 radar	3%
Engaging speed	AN/SPN-12 radar; Mitchell camera	3%
Wind-Over-Deck		
Velocity	Calibrated boom anemometer	1 kt
Direction	Calibrated boom anemometer	3 deg
Sinking speed	Mitchell camera; cameraflex	2 fps
Airplane pitch attitude	Mitchell camera; cameraflex	1 deg
Airplane roll angle with respect to angle deck	Cameraflex	1 deg
Main gear touchdown distance	Mitchell camera	2 ft
	Cameraflex	5 ft
Off-center distance		
Ramp	Cameraflex	1 ft
Touchdown	Cameraflex	1 ft
Main gear to ramp clearance	Cameraflex	1 ft
Surface wind	Ship's aerology Log books	3 kt

Calculated

Item	Method	Overall Accuracy (±)
Airplane gross weight	Add associated fuel weight to basic airplane weight	200 lb
Theoretical main gear touchdown distance	See enclosure (10)	-10 to-15 ft

Item	Calculated Method	Overall Accuracy (±)
Theoretical sinking speed	See enclosure (10)	2 fps
Bolter rate	See enclosure (10)	2%

Item	Observed	Overall Accuracy (±)
Ship's pitch and roll		1/3 deg
Arresting gear weight setting		500 lb

Model F8U-2 Airplane, BuNo 145557

ARRESTED LANDING TABULATED DATA

MK 7 Mod 2-3 CROAG with Sheave and Anchor Dampers

USS CORAL SEA (CVA-43)

LANDING NUMBER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
TYPE LANDING		T&G				[illegible]	A	T&G								A	T&G			A	T&G					
FUEL	(lb)	4600	4300	4100	[illegible]	[illegible]	[illegible]	4600	4300	[illegible]	3800	3500	3300	3100	2700	2300	4400	4300	4100	3300	4500	4300	4100	3900	3700	3500
AIRPLANE GROSS WEIGHT	(lb)	[illegible]	22700	[illegible]	[illegible]	21900	[illegible]	[illegible]	[illegible]	[illegible]	22200	22900	21700	21500	21100	20700	22800	22700	22500	21700	22900	22700	22500	22300	22100	21900
ARRESTING GEAR WEIGHT SETTING	(lb)	22000	22000	22000	21500	21500	21000	[illegible]	[illegible]	[illegible]	[illegible]	21000	21000	21000	21000	20500	22000	22000	21500	21000	22000	22000	21500	21500	21500	21000
WIRE NO.		-	-	-	-	-	4	-	-	-	-	-	-	-	-	3	-	-	-	3	-	-	-	-	-	-
BASIC GLIDE SLOPE ANGLE	(°)	3½						4									3½				4					
LENS ROLL ANGLE	(°)	4 1/4						3									4 1/4				3					
SHIP'S PITCH (- STERN DOWN)	(°)	[illegible]				-0.3	-0.1	[illegible]	[illegible]	[illegible]				-0.1			-0.2	-0.4	-0.2	-0.3			-0.2	-0.3	-0.1	-0.2
SHIP'S ROLL (- ROLL STBD)	(°)	-0.4	-0.8	[illegible]	[illegible]	[illegible]	[illegible]	-1.4	[illegible]	-1.4	[illegible]	[illegible]	[illegible]	-1.3	-1.2	-1.2	-0.8	-0.6	-0.9	-0.5	-0.2	-0.2	-0.4	-0.4	-0.2	-0.4
WIND-OVER-DECK																										
VELOCITY	(kt)	25		[illegible]		[illegible]	[illegible]	33		[illegible]	[illegible]		35	33	34		29	28	26	25	33	36	35		34	
DIRECTION	(°)	[illegible]			[illegible]		[illegible]										345			350						345
SURFACE WIND (APPROX)	(kt)	16			[illegible]			18									[illegible]				15		13		11	
APPROACH SPEED	(kt)	145	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	140	[illegible]	[illegible]	[illegible]	141	140	139	139	[illegible]	144	[illegible]	[illegible]	[illegible]	144	143	143	144	146
ENGAGING SPEED	(kt)	[illegible]	120	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	107	106	107	105	105	[illegible]	[illegible]	[illegible]	[illegible]	113	[illegible]	108	108	110	112
PITCH ATTITUDE	(°)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.8	[illegible]	[illegible]	7.4	[illegible]	3.3	6.3	3.5	5.2	3.3	4.3	5.2
AIRPLANE ROLLANGLE W/RESP TO ANGLE DECK (- PORT)	(°)	[illegible]	[illegible]	-1.9	[illegible]	-1.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-1.9	[illegible]	[illegible]	-1.8	-1.4	[illegible]	-1.9	-2.9	-0.7	-2.7	-1.0	-2.6	-4.0	[illegible]	[illegible]
SINKING SPEED	(fps)																									
MITCHELL CAMERA		-	-	12.8	-	[illegible]	-	-	-	-	-	-	16.4	-	-	-	-	15.7	[illegible]	13.3	13.9	-	14.9	-	11.4	15.5
CAMERAFLEX		15.3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	16.7	[illegible]	15.9	13.6	13.6	14.0	15.8	15.3	15.9	[illegible]	13.8	13.6	11.4	13.5
THEORETICAL		[illegible]	13.5	[illegible]	13.6	[illegible]	[illegible]	[illegible]	13.4	[illegible]	[illegible]	[illegible]	13.6	13.5	13.1	13.6	11.0	13.6	13.1	13.3	14.4	13.8	13.5	13.9	11.4	14.0
MAIN GEAR TOUCHDOWN DISTANCE	(ft)																									
ACTUAL		169	[illegible]	207	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	139	[illegible]	166	169	256	201	208	204	167	156	193	173	202	187
THEORETICAL		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	217	215	220	213	219	204	214	[illegible]	200	213	202	216	201	202
MAIN GEAR TO RAMP CLEARANCE	(ft)	11.5	[illegible]	[illegible]	[illegible]	[illegible]	14.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11.5	[illegible]	8.0	11.0	-	-	12.5	14.5	12.5	12.0	13.0	12.5	12.0	13.5
OFF-CENTER DISTANCE (- PORT)	(ft)																									
RAMP		1.0	-1.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-1.5	-0.5	-0.5	1.5	-	-	-2.5	-1.5	5.5	-1.0	4.0	2.0	-1.5	3.0
TOUCHDOWN		1.0	2.0	3.0	[illegible]	[illegible]	[illegible]	[illegible]	7.0	[illegible]	[illegible]	[illegible]	1.0	[illegible]	2.0	4.0	12.0	10.0	6.0	0.0	-3.0	4.0	1.0	2.0	3.0	0.0

LANDING NUMBER		26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
TYPE LANDING		T&G	A	T&G					A	T&G					A	T&G								A	T&G	
FUEL	(lb)	3300	2700	[illegible]	[illegible]	4000	[illegible]	[illegible]	3100	[illegible]	[illegible]	[illegible]	3800	3500	3100	4400	4200	4000	3900	3700	3100	2700	2500	2100	4000	3800
AIRPLANE GROSS WEIGHT	(lb)	21700	21100	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	21500	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	21500	22800	22600	22400	22300	22100	21500	[illegible]	20900	20500	22400	22200
ARRESTING GEAR WEIGHT SETTING	(lb)	21000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	21000	22000	21500	21500	21500	21500	21000	21000	20500	20500	21500	21500
WIRE NO.		-	3	-	-	-	-	-	1	-	-	-	-	-	3	-	-	-	-	-	-	-	-	1	-	-
BASIC GLIDE SLOPE ANGLE	(°)	4		4												4										
LENS ROLL ANGLE	(°)	3		[illegible]												3										
SHIP'S PITCH (-STERN DOWN)	(°)	-0.2		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]		[illegible]	[illegible]	-0.2	-0.1		0.0	-0.1			0.0	-0.1	-0.2	-0.1	-0.2	-0.1
SHIP'S ROLL (-ROLL STBD)	(°)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-1.3	[illegible]	-0.6	-1.5	-1.0	-1.0	-1.1	-1.2	-0.9	[illegible]	[illegible]	-1.4	-0.9	-0.4	-0.5	-1.0
WIND OVER DECK																										
VELOCITY	(kt)	35	33	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	26	[illegible]	26	25	26	36	34	36	34	38	39	34	36	33	34	33
DIRECTION	(°)	350		345		350	355	[illegible]							345									350		
SURFACE WIND (APPROX)	(kt)	19		16						18			20												27	
APPROACH SPEED	(kt)	[illegible]	137	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	143	[illegible]	141	141	143	[illegible]	[illegible]	141	144	141	141	140	138	145	144
ENGAGING SPEED	(kt)	107	104	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	112	117	116	115	107	[illegible]	109	[illegible]	106	[illegible]	107	104	105	111	111
PITCH ATTITUDE	(°)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.1	2.1	[illegible]	1.1	3.1	7.1	[illegible]	[illegible]	5.2	4.1	2.8	2.1
AIRPLANE ROLLANGLE W/ RESP TO ANGLE DECK (- PORT)	(°)	-2.4	-2.0	-1.2	[illegible]	-2.1	-1.2	-1.5	-1.0	-1.6	-4.5	-3.5	-4.0	-4.0	-3.3	-3.7	-2.6	-5.2	-2.1	-1.7	[illegible]	-3.0	-2.6	0.7	-2.4	-3.0
SINKING SPEED	(fps)																									
MITCHELL CAMERA		-	-	12.6	[illegible]	-	-	15.0	[illegible]	15.4	-	-	15.4	[illegible]	14.7	[illegible]	-	14.9	15.0	13.8	-	10.7	13.9	15.6	-	12.8
CAMERAFLEX		15.9	[illegible]	[illegible]	14.3	[illegible]	[illegible]	17.0	[illegible]	-	[illegible]	15.4	13.4	[illegible]	14.2	15.0	15.4	[illegible]	16.3	14.8	13.7	10.6	13.4	13.4	11.4	13.5
THEORETICAL		[illegible]	[illegible]	13.4	11.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	13.4	13.4	12.7	13.4	[illegible]	13.7	13.3	13.3	12.5	13.4	13.3	12.9	14.0	13.9
MAIN GEAR TOUCHDOWN DISTANCE	(ft)																									
ACTUAL		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	261	[illegible]	[illegible]	-	-	176	163	212	172	183	196	174	218	155	245	182	157	244	278
THEORETICAL		215	[illegible]	216	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	-	216	218	210	217	206	224	211	192	211	215	205	202	215	217
MAIN GEAR TO RAMP CLEARANCE	(ft)	10.5	[illegible]	13.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11.5	[illegible]	11.0	9.0	19.0	15.5	17.0	[illegible]	14.0	16.5	-	16.0	-	-	-	-
OFF-CENTER DISTANCE (- PORT)	(ft)																									
RAMP		1.0	-1.5	[illegible]	[illegible]	-3.0	[illegible]	0.5	[illegible]	-3.0	1.0	-1.5	-2.0	-1.5	-2.5	-2.0	-4.0	-1.5	-1.5	-4.0	-	-1.5	-	-	-	-
TOUCHDOWN		3.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5.0	5.0	7.0	4.0	5.0	4.0	6.0	6.0	8.0	2.0	9.0	7.0	7.0	9.0

RA1200001
(RSSH-31003)
FT2222-176

Model F8U-2 Airplane, BuNo 145557

ARRESTED LANDING TABULATED DATA

MK 7 Mod 2-3 CROAG with Sheave and Anchor Dampers

USS CORAL SEA (CVA-43)

LANDING NUMBER		51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69
TYPE LANDING		T&G							A	T&G										A
FUEL	(lb)	3700	3500	3300	3100	2900	1700	1500	1400	4400	4200	4100	3900	3700	3500	3300	2700	2500	2100	1900
AIRPLANE GROSS WEIGHT	(lb)	22100	21900	21700	21500	21300	20100	19900	19800	22800	22600	22500	22300	22100	21900	21700	21100	20900	20500	20300
ARRESTING GEAR WEIGHT SETTING	(lb)	21500	21000	21000	21000	21000	20000	20000	20000	22000	22000	21500	21500	21500	21000	21000	21000	20500	20500	20500
WIRE NO.		-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	2
BASIC GLIDE SLOPE ANGLE	(°)	4																		
LENS ROLL ANGLE	(°)	3																		
SHIP'S PITCH (- STERN DOWN)	(°)	-0.2	-0.1			-0.2					-0.1	0.0	-0.1		0.0	-0.2	-0.1		-0.2	-0.1
SHIP'S ROLL (- ROLL STBRD)	(°)	-1.0	-1.0	-1.6	-1.4	-1.0	-0.8	-1.6	-0.9	-0.2	-1.2	-0.2	-0.4	-0.2	-1.1	-0.7	-0.6	-1.1	-0.4	-0.7
WIND-OVER-DECK																				
VELOCITY	(kt)	35		33	34	35	36	39	33	35	34		35	37			38			37
DIRECTION	(°)	350											345	350		345	350			
SURFACE WIND (APPROX)	(kt)	27								25										
APPROACH SPEED	(kt)	144	142	142	142	143	140	141	139	146	145	146	144	144	144	144	142	145	142	140
ENGAGING SPEED	(kt)	109	107	109	108	108	104	106	106	111	111	112	109	107	107	107	104	107	104	103
PITCH ATTITUDE	(°)	3.7	2.3	4.6	2.6	4.7	2.7	4.2	5.2	4.2	6.1	4.0	3.6	2.1	3.8	2.5	4.1	4.1	2.2	4.1
AIRPLANE ROLL ANGLE W/ RESP TO ANGLE DECK (- PORT)	(°)	-2.8	-4.9	-3.7	-3.8	-3.1	-3.1	-4.8	1.2	-2.2	-2.1	0.4	-5.6	-3.5	-2.3	-2.2	-1.7	-3.3	-6.1	-1.5
SINKING SPEED	(fps)																			
MITCHELL CAMERA		16.3	13.5	12.9	-	12.4	-	-	-	14.7	13.2	12.0	15.7	12.8	-	-	15.4	12.8	10.0	11.0
CAMERAPLEX		15.7	11.8	14.4	12.6	12.7	13.9	16.0	12.6	11.7	11.6	14.5	14.9	13.5	15.6	9.9	15.2	14.4	11.2	13.0
THEORETICAL		13.9	13.4	13.9	12.7	13.6	13.2	13.8	13.6	13.8	14.0	13.3	13.3	13.0	13.1	13.6	12.8	13.4	13.0	12.7
MAIN GEAR TOUCHDOWN DISTANCE	(ft)																			
ACTUAL		240	240	228	258	294	198	230	248	190	203	225	231	216	186	256	175	215	224	176
THEORETICAL		214	217	208	217	211	217	215	210	205	198	196	205	222	204	218	204	207	217	205
MAIN GEAR TO RAMP CLEARANCE	(ft)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OFF-CENTER DISTANCE (- PORT)	(ft)																			
RAMP		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOUCHDOWN		3.0	3.0	6.0	3.0	7.0	6.0	5.0	3.0	5.0	1.0	2.0	7.0	3.0	4.0	4.0	1.0	3.0	6.0	6.0

RA1200001
(RSSH-31003)
FT2222-176

Model F8U-1 Airplane, BuNo 143749

ARRESTED LANDING TABULATED DATA

MK 7 Mod 2-3 CROAG with Sheave and Anchor Dampers

USS CORAL SEA (CVA-43)

LANDING NUMBER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
TYPE LANDING		TRO												A	TRO						A	TRO				
FUEL	(lb)	4000	3500	3400	2700	3200	[illegible]	2300	2100	2100	[illegible]	1900	1600	1400	1900	1200	1000	2000	2300	2200	2000	4000	3500	2700	3600	3100
AIRPLANE GROSS WEIGHT	(lb)	22400	21900	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	21400	21000	20700	20600	20400	22400	22200	22100	21800	21500
ARRESTING GEAR WEIGHT SETTING	(lb)	22000	22000	22000	21500	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	21500	21500	21000	20500	20500	20500	22000	22000	22000	22000	21500
WIRE NO.		-	-	-	-	-	-	-	-	-	-	-	-	[illegible]	-	-	-	-	-	-	4	-	-	-	-	-
BASIC GLIDE SLOPE ANGLE	(°)	4													3½							4				
LENS ROLL ANGLE	(°)	1													4 3/4							3				
SHIP'S PITCH (- STERN DOWN)	(°)	[illegible]		-0.1		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	-0.1				-0.4		+0.2		-0.4	-0.2	
SHIP'S ROLL (- ROLL STBD)	(°)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-0.0	[illegible]	[illegible]	[illegible]	+0.5	-0.5	-0.2	+0.5	-0.8	0.1
WIND-OVER-DECK																										
VELOCITY	(kt)	22	24	24	24	22		21	24	24	[illegible]	[illegible]	22	24	27	[illegible]	[illegible]	25		24	23	33	35			
DIRECTION	(°)	350													355	345			350						345	
SURFACE WIND (APPROX)	(kt)	[illegible]					[illegible]		[illegible]						25							27		15		17
APPROACH SPEED	(kt)	[illegible]	140	129	128	[illegible]	125	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	141	[illegible]	142	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	140	[illegible]	142	142	139
ENGAGING SPEED	(kt)	108	106	[illegible]	[illegible]	105	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	108	[illegible]	[illegible]	[illegible]	[illegible]	109	[illegible]	107	107	103
PITCH ATTITUDE	(°)	[illegible]	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6.2	3.7
AIRPLANE ROLL ANGLE W/RESP TO ANGLE DECK (- PORT)	(°)	-2.2	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.5	[illegible]	-1.5	-0.4	-2.8	-2.2	-0.9
SINKING SPEED	(fps)																									
MITCHELL CAMERA		-	-	-	-	-	-	-	-	[illegible]	-	[illegible]	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	-	[illegible]	-	[illegible]	-	18.7	-
CAMERAFLEX		[illegible]	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	15.4	12.0	12.3	19.6	15.3
THEORETICAL		[illegible]	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	13.6	13.3	13.8	13.3	12.7
MAIN GEAR TOUCHDOWN DISTANCE	(ft)																									
ACTUAL		[illegible]	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	245	188	173	196	150
THEORETICAL		[illegible]	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	184	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	202	199	206
MAIN GEAR TO RAMP CLEARANCE	(ft)	[illegible]	-	[illegible]	-	-	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12.0	[illegible]	11.5	18.5	12.0
OFF-CENTER DISTANCE (- PORT)	(ft)																									
RAMP		[illegible]	-	[illegible]	-	-	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-1.0	[illegible]	[illegible]	[illegible]	[illegible]	0.0	[illegible]	-1.5
TOUCHDOWN		[illegible]	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.0	[illegible]	0.0	[illegible]	[illegible]	3.0	4.0	4.0

LANDING NUMBER		26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
TYPE LANDING		T/G		A	TRO					A	TRO				A	TRO										
FUEL	(lb)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1900	1700	3600	1900	3200	3000	2700	2500	2300	2100
AIRPLANE GROSS WEIGHT	(lb)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	22300	22100	22000	21900	21600	21600	21100	20900	20700	20500
ARRESTING GEAR WEIGHT SETTING	(lb)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	22000	22000	22000	22000	21500	21500	21000	21000	20500	20500
WIRE NO.		-	-	[illegible]	-	-	-	-	-	[illegible]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BASIC GLIDE SLOPE ANGLE	(°)	4			3½											4										
LENS ROLL ANGLE	(°)	3			[illegible]											1										
SHIP'S PITCH (- STERN DOWN)	(°)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		0.0	+0.1	+0.2	0.0	+0.2			0.0	-0.1
SHIP'S ROLL (- ROLL STBD)	(°)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-1.2	-1.4	-1.1	-1.1	-1.1	+0.4	-0.9	-1.1	-1.2	-1.4	-0.9
WIND-OVER-DECK																										
VELOCITY	(kt)	34		33	33	[illegible]	[illegible]		[illegible]			35	26	26	25	35	33	36	35	37	36	36	36	38	35	
DIRECTION	(°)	350				[illegible]	[illegible]							345	350	345										
SURFACE WIND (APPROX)	(kt)	[illegible]	11		13						[illegible]													150		345
APPROACH SPEED	(kt)	136	139	137	141	141	[illegible]	140	144	138	140	140	141	137	137	145	140	141	140	144	144	145	142	140	139	142
ENGAGING SPEED	(kt)	102	105	104	128	117	117	117	120	114	110	117	115	112	112	110	109	107	109	107	108	111	106	102	106	107
PITCH ATTITUDE	(°)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.0	4.6	[illegible]	3.5	4.6	[illegible]	5.1	[illegible]	7.1
AIRPLANE ROLL ANGLE W/RESP TO ANGLE DECK (- PORT)	(°)	-2.8	[illegible]	[illegible]	[illegible]	-0.7	[illegible]	-1.7	[illegible]	-2.7	[illegible]	-2.9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-0.7	-0.3	-1.7	-1.5	-2.4	-2.7	-2.9	-2.2
SINKING SPEED	(fps)																									
MITCHELL CAMERA		-	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	12.7	14.5	12.5	10.9	14.4	11.5	12.8	10.2	12.5	-	12.8	11.5	12.0	-	11.9
CAMERAFLEX		15.4	15.7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	14.5	[illegible]	[illegible]	[illegible]	14.0	12.7	11.5	11.2	12.1	10.5	12.1	11.3	12.0	13.4
THEORETICAL		12.5	13.7	12.9	[illegible]	13.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12.9	[illegible]	12.4	14.0	13.9	13.1	13.1	13.2	13.1	13.8	13.2	12.8	12.9	13.3
MAIN GEAR TOUCHDOWN DISTANCE	(ft)																									
ACTUAL		133	186	211	190	184	217	186	235	111	136	189	209	236	172	217	137	197	220	210	235	266	243	204	240	196
THEORETICAL		219	219	186	207	199	206	198	187	197	[illegible]	196	196	200	211	218	192	201	201	212	204	213	197	187	206	190
MAIN GEAR TO RAMP CLEARANCE	(ft)	11.0	15.5	14.5	13.0	10.5	15.0	14.5	15.5	9.5	10.5	12.0	15.5	14.0	14.0	13.0	7.0	13.5	17.0	20.0	16.0	19.0	9.5	12.5	18.0	16.0
OFF-CENTER DISTANCE (- PORT)	(ft)																									
RAMP		1.0	0.0	2.5	-2.5	0.5	-1.5	-1.5	2.5	0.5	1.5	-2.0	-1.5	0.0	1.0	-1.0	-0.5	-1.0	-1.0	-3.5	-3.5	-3.0	-0.5	-2.5	0.0	-1.5
TOUCHDOWN		0.0	4.0	2.0	2.0	0.0	4.0	0.0	8.0	3.0	3.0	3.0	1.0	1.0	0.0	4.0	2.0	-2.0	5.0	2.0	5.0	3.0	1.0	2.0	0.0	3.0

Model F8U-1 Airplane, BuNo 143749

ARRESTED LANDING TABULATED DATA

MK 7 Mod 2-3 CROAG with Sheave and Anchor Dampers

USS CORAL SEA (CVA-43)

LANDING NUMBER		51	52	53	54	55	56	57	58	59	60
TYPE LANDING		T&G	A	T&G	→	B	A	T&G	→	→	A
FUEL	(lb)	1900	1800	4200	3900	3700	3600	3900	3700	3500	3100
AIRPLANE GROSS WEIGHT	(lb)	20300	20200	22600	22300	22100	22000	22300	22100	21900	21500
ARRESTING GEAR WEIGHT SETTING	(lb)	20500	20000	22000	22000	22000	22000	22000	22000	22000	21500
WIRE NO.		-	2	-	-	-	4	-	-	-	4
BASIC GLIDE SLOPE ANGLE	(°)	4	→	→	→	→	→	→	→	→	→
LENS ROLL ANGLE	(°)	3	→	→	→	→	→	→	→	→	→
SHIP'S PITCH (-STERN DOWN)	(°)	-0.1	→	0.0	-0.1	→	→	→	0.0	-0.1	-0.2
SHIP'S ROLL (-ROLL STRBD)	(°)	-1.0	-1.2	-1.6	-1.0	-0.8	-1.7	-0.4	-0.4	-1.0	-0.4
WIND-OVER-DECK											
VELOCITY	(kt)	35	37	35	34	→	→	→	35	→	36
DIRECTION	(°)	345	→	350	→	→	→	→	→	→	→
SURFACE WIND (APPROX)	(kt)	20	→	27	→	→	→	25	→	→	→
APPROACH SPEED	(kt)	138	133	150	141	147	140	142	140	140	137
ENGAGING SPEED	(kt)	103	96	115	107	113	106	108	105	105	101
PITCH ATTITUDE	(°)	6.1	7.1	4.0	6.1	4.6	4.6	7.9	3.8	8.1	5.2
AIRPLANE ROLL ANGLE W/RESP TO ANGLE DECK (- PORT)	(°)	-2.5	-3.1	-4.5	-6.8	-2.8	-3.9	-2.7	-1.9	-2.8	-7.5
SINKING SPEED	(fps)										
MITCHELL CAMERA		13.0	10.1	12.7	14.7	-	13.0	16.5	-	15.9	13.4
CAMERAFLEX		12.6	10.7	14.11	15.4	13.2	13.5	16.5	14.1	13.7	14.7
THEORETICAL		13.7	12.1	14.4	13.6	13.3	13.6	12.6	12.5	13.3	12.7
MAIN GEAR TOUCHDOWN DISTANCE	(ft)										
ACTUAL		206	172	217	202	261	248	198	183	208	224
THEORETICAL		196	193	206	196	203	209	190	199	187	202
MAIN GEAR TO RAMP CLEARANCE	(ft)	16.5	11.0	-	-	-	-	-	-	-	-
OFF-CENTER DISTANCE (- PORT)	(ft)										
RAMP		-1.5	12.5	-	-	-	-	-	-	-	-
TOUCHDOWN		3.0	-5.0	0.0	6.0	5.0	-1.0	-1.0	0.0	0.0	8.0

Model A4D-2 Airplane, BuNo 142678

ARRESTED LANDING TABULATED DATA

MK 7 Mod 2-3 CROAG with Sheave and Anchor Dampers

USS CORAL SEA (CVA-43)

LANDING NUMBER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
TYPE LANDING		TAG							A	TAG	A	TAG					A	TAG							A	TAG
FUEL	(lb)	2600	2400	2700	2000	1900	1600	1500	3400	1800	1500	3200	2400	2500	2400	2200	1800	3000	2600	2600	2400	2200	2000	1900	1600	3200
AIRPLANE GROSS WEIGHT	(lb)	12800	12400	12200	12000	11700	11600	11500	11400	12800	11500	13300	13200	12500	12400	12300	11900	12900	12900	12600	12400	12200	12000	11900	11600	13200
ARRESTING GEAR WEIGHT SETTING	(lb)	13000	13000	13000	12500	12500	12000	12000	12000	14000	12000	14000	14000	13000	13000	13000	12500	14000	13500	13000	13500	13000	13000	12500	12000	14000
WIRE NO.		-	-	-	-	-	-	-	2	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-
BASIC GLIDE SLOPE ANGLE	(°)	3½										3½						4								3½
LENS ROLL ANGLE	(°)	6 1/4										6 3/4						4 3/4								6 3/4
SHIP'S PITCH (- STERN DOWN)	(°)	-0.2									+0.2	-0.4	+0.2		-0.1	+0.2	-0.3	-0.1	+0.3		+0.2		-0.1	+0.2		+0.4
SHIP'S ROLL (- ROLL STBD)	(°)	-0.4	-0.7	-0.5	+1.4	-0.8	-1.1	0.4	0.5	+1.0	-1.2	-0.9	-0.5	-0.7	-0.4	-1.2	+1.0	-0.5	-0.7	-1.2	-2.0	+0.9	-0.7	0.0	-0.8	0.5
WIND-OVER-DECK																										
VELOCITY	(kt)	25		25	25					31	30	27		29	27	25	26	35			34		15	34	33	34
DIRECTION	(°)	350		350	350	355	355					348					356				345	356			345	350
SURFACE WIND (APPROX)	(kt)	14				11		8		20		[illegible]						19								16
APPROACH SPEED	(kt)	125	125	122	122	116	117	122	122	127	120	130	111	130	126	126	125	127	130	127	127	121	121	124	121	130
ENGAGING SPEED	(kt)	101	101	96	97	92	91	95	93	94	95	103	104	101	99	101	99	94	95	92	84	94	88	92	80	106
PITCH ATTITUDE	(°)	-	10.8	9.2	12.2	10.3	11.6	10.2	10.2	-	11.2	10.4	9.2	10.2	10.3	10.2	7.9	11.6	9.2	9.8	9.8	10.4	10.9	7.3	9.2	9.4
AIRPLANE ROLL ANGLE W/RESP TO ANGLE DECK (+ PORT)	(°)	-	-2.2	1.9	-1.4	4.8	9.2	+0.7	-0.3	-	+1.6	-1.9	0.7	-0.8	0.8	2.4	+1.7	0.2	0.7	-2.0	+0.9	+0.2	1.6	-1.1	-1.8	0.8
SINKING SPEED	(fps)																									
MITCHELL CAMERA		-	14.7	-	10.2	-	-	13.4	-	-	13.2	-	10.1	11.1	11.2	10.4	-	-	15.6	14.4	-	-	-	-	-	13.1
CAMERAFLEX		-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	12.1	12.1	12.1	11.2	12.4	11.8	11.6	14.5	11.5	11.7	11.3	11.0	12.8	14.8	13.4
THEORETICAL		-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	10.2	11.6	11.4	11.6	11.2	11.5	11.2	11.1	11.7	11.2	11.2	10.9	11.0	11.3	11.9
MAIN GEAR TOUCHDOWN DISTANCE	(ft)																									
ACTUAL		-	150	164	171	166	143	159	151	-	128	166	190	222	204	205	211	185	171	186	152	147	152	152	151	201
THEORETICAL		-	240	240	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	251	251	240	243	243	253	273	240	246	238	232	225	234	235	244
MAIN GEAR TO RAMP CLEARANCE	(ft)	-	-	-	-	-	-	-	-	-	17.5	20.4	16.5	16.5	17.5	17.0	17.0	12.0	15.5	16.0	14.0	14.5	-	12.0	14.5	-
OFF-CENTER DISTANCE (- PORT)	(ft)																									
RAMP		-	-	-	-	-	-	-	-	-	1.2	-1.0	4.0	8.0	6.5	1.0	4.0	4.0	2.0	4.0	2.5	2.5	-	5.5	4.0	-
TOUCHDOWN		-	-1.0	1.0	1.0	-2.0	-1.0	2.0	1.0	-	1.0	1.0	-1.0	1.0	3.0	1.0	-1.0	1.0	2.0	1.0	2.0	5.0	-3.0	-1.0	0.0	-2.0
LANDING NUMBER		26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
TYPE LANDING		TAG		A	TAG							A	TAG								A	TAG				
FUEL	(lb)	3000	2600	2100	3400	2200	2000	2200	1900	2000	1800	3400	3000	3200	2900	2600	2100	2100	2400	1800	1500	2500	2000	2100	2000	1600
AIRPLANE GROSS WEIGHT	(lb)	13000	12600	12100	13300	12300	12500	12700	12400	12000	11600	13400	12800	12500	12900	12600	12300	12200	12900	11800	11500	12500	12500	12300	12000	11600
ARRESTING GEAR WEIGHT SETTING	(lb)	13500	13500	13000	14000	14000	13000	13500	13000	13000	12000	13500	14000	14000	13000	13000	13000	12500	12500	12000	12000	13500	13000	12500	12000	12000
WIRE NO.		-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-
BASIC GLIDE SLOPE ANGLE	(°)	3½										3½	4													
LENS ROLL ANGLE	(°)	6 1/4										6 3/4	4 3/4													
SHIP'S PITCH (- STERN DOWN)	(°)	-0.1	-0.4	-0.3	-0.2			-0.1						-0.2		-0.1				0.0	-0.1	+0.2		+0.1	-2.9	-0.2
SHIP'S ROLL (- ROLL STBD)	(°)	-0.8	-0.4	-0.5	-0.4	-0.5	-0.1	-0.8	-1.0	-1.6	-1.1	-0.9	-1.6	-1.7	-1.1	-1.0	-1.0	-1.2	-1.1	-0.8	-1.6	-2.0	-1.1	-1.5	+1.4	+1.3
WIND-OVER-DECK																										
VELOCITY	(kt)	34	25	25	27	25		28	22				37	28						34	35	34	35	34	34	34
DIRECTION	(°)	350	345		350						345											350				
SURFACE WIND (APPROX)	(kt)	16					18				20											25				
APPROACH SPEED	(kt)	125	121	121	129	127	126	126	125	126	114	122	120	129	125	125	125	126	122	122	121	121	120	124	122	121
ENGAGING SPEED	(kt)	105	106	105	107	102	102	100	100	101	99	92	91	93	91	99	99	92	86	88	86	92	81	90	86	87
PITCH ATTITUDE	(°)	11.1	11.4	[illegible]	[illegible]	[illegible]	8.2	9.4	10.2	9.1	9.4	11.1	7.1	8.0	9.4	-	10.2	10.1	11.1	10.0	9.2	11.2	10.2	9.1	10.9	9.2
AIRPLANE ROLL ANGLE W/RESP TO ANGLE DECK (+ PORT)	(°)	-1.2	4.1	0.8	0.8	+4.2	-1.9	-1.4	-0.6	-0.3	-0.3	-0.8	-0.5	-1.8	0.2	-	-1.8	+0.8	-0.9	0.2	+0.4	-0.8	-0.6	0.0	-4.2	-0.6
SINKING SPEED	(fps)																									
MITCHELL CAMERA		9.2	11.0	7.5	14.4	15.1	-	-	12.2	13.0	13.1	16.2	-	11.1	15.2	-	12.1	13.4	13.5	13.7	-	12.1	12.0	15.0	12.6	11.1
CAMERAFLEX		10.3	11.9	11.9	14.0	10.2	10.7	11.7	12.4	11.2	11.3	11.5	11.1	13.9	12.2	-	11.5	11.8	12.2	11.0	11.0	11.1	10.8	11.5	12.0	12.1
THEORETICAL		11.2	11.0	11.4	11.2	11.2	11.0	10.8	11.8	11.1	10.8	10.4	11.3	11.7	11.4	-	11.1	11.0	10.8	10.5	10.5	12.2	10.7	11.7	12.8	11.1
MAIN GEAR TOUCHDOWN DISTANCE	(ft)																									
ACTUAL		212	166	179	166	174	175	148	149	198	208	172	196	238	200	-	177	186	188	195	111	198	162	184	196	169
THEORETICAL		232	236	225	246	234	243	230	238	244	241	235	238	239	236	-	229	230	228	223	227	239	234	237	261	238
MAIN GEAR TO RAMP CLEARANCE	(ft)	15.0	11.0	12.0	13.5	15.0	9.5	10.5	-	12.0	15.5	-	18.0	22.5	16.0	-	14.5	17.5	16.0	17.5	11.0	-	-	-	-	-
OFF-CENTER DISTANCE (- PORT)	(ft)																									
RAMP		5.5	1.5	1.5	-0.5	-2.0	2.5	4.0	-	2.5	-0.5	-	1.0	-1.0	6.0	-	0.0	1.0	-2.5	4.0	0.0	-	-	-	-	-
TOUCHDOWN		-3.0	1.0	-4.0	1.0	2.0	-1.0	-2.0	7.0	1.0	3.0	-2.0	2.0	4.0	-2.0	-	5.0	2.0	4.0	-4.0	1.0	-5.0	1.0	4.0	-5.0	-1.0

RA1200001
(RSSH-31003)
FT2222- 176

Model A4D-2 Airplane, BuNo 142678

ARRESTED LANDING TABULATED DATA

MK 7 Mod 2-3 CROAG with Sheave and Anchor Dampers

USS CORAL SEA (CVA-43)

LANDING NUMBER		51	52	53	54	55	56	57	58	59	60	61	62	63
TYPE LANDING		T&G	A	T&G										A
FUEL	(lb)	1500	1400	3500	3200	2800	2500	2400	2200	2100	1600	1500	1400	1300
AIRPLANE GROSS WEIGHT	(lb)	11500	11400	13500	13200	12800	12500	12400	12200	12100	11600	11500	11400	11300
ARRESTING GEAR WEIGHT SETTING	(lb)	12000	12000	14000	14000	13500	13000	13000	13000	12500	12500	12000	12000	12000
WIRE NO.		-	4	-	-	-	-	-	-	-	-	-	-	1
BASIC GLIDE SLOPE ANGLE	(°)	4												
LENS ROLL ANGLE	(°)	4 3/4												
SHIP'S PITCH (- STERN DOWN)	(°)	-0.1		-0.2		-0.1	0.0		-0.2	0.0	-0.1	0.0	-0.1	-0.1
SHIP'S ROLL (- ROLL STRBD)	(°)	-1.0	-1.0	-0.7	0.3	-0.2	-0.3	-1.1	-0.5	-1.0	-0.4	0.1	-0.5	-1.0
WIND-OVER-DECK														
VELOCITY	(kt)	35		36	34		35	37		36	39	38	36	37
DIRECTION	(°)	350		355	350	345		359	355	350				
SURFACE WIND (APPROX)	(kt)	25												
APPROACH SPEED	(kt)	117	121	130	130	130	126	127	124	119	126	117	119	116
ENGAGING SPEED	(kt)	82	86	94	96	96	91	90	87	83	87	79	83	79
PITCH ATTITUDE	(°)	10.1	12.1	8.8	12.1	6.1	11.0	6.0	11.2	10.0	12.1	9.0	12.1	9.1
AIRPLANE ROLL ANGLE W/ RESP TO ANGLE DECK (- PORT)	(°)	-1.8	0.0	-1.1	-1.1	0.6	2.7	1.0	-1.2	1.6	0.8	-1.2	-0.9	-3.1
SINKING SPEED	(fps)													
MITCHELL CAMERA		11.7	10.8	-	13.0	11.4	12.7	12.9	13.6	13.0	13.1	11.6	10.0	13.7
CAMERAFLEX		11.1	11.2	12.8	13.4	13.6	11.7	10.8	14.2	13.5	10.9	10.3	10.6	13.2
THEORETICAL		10.2	11.8	11.9	11.4	11.8	11.0	10.9	10.8	10.1	10.7	9.3	10.2	9.8
MAIN GEAR TOUCHDOWN DISTANCE	(ft)													
ACTUAL		162	172	188	179	299	170	209	160	160	171	157	174	143
THEORETICAL		229	227	235	220	234	217	235	228	225	220	219	221	232
MAIN GEAR TO RAMP CLEARANCE	(ft)	-	-	-	-	-	-	-	-	-	-	-	-	-
OFF-CENTER DISTANCE (- PORT)	(ft)													
RAMP		-	-	-	-	-	-	-	-	-	-	-	-	-
TOUCHDOWN		-1.0	-2.0	-2.0	10	-1.0	-1.0	0.0	3.0	-6.0	2.0	1.0	0.0	3.0

RA1200001
(RSSH-31003)
FT2222- 176

Model A4D-2 Airplane, BuNo 142120

ARRESTED LANDING TABULATED DATA

MK 7 Mod 2-3 CROAG with Sheave and Anchor Dampers

USS CORAL SEA (CVA-43)

LANDING NUMBER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
TYPE LANDING		T&G							A	T&G				A	T&G			A	T&G							
FUEL	(lb)	3800	3700	3400	3200	2900	2700	2500	1500	4000	3800	3600	2600	2400	3500	3200	2800	2500	3900	3800	3600	3300	3100	2800	2500	2200
AIRPLANE GROSS WEIGHT	(lb)	13300	13200	12900	12700	12400	12200	12000	11000	13500	13300	13300	12100	11900	13000	12700	12300	12500	13400	13300	13100	12800	12600	12300	12000	11700
ARRESTING GEAR WEIGHT SETTING	(lb)	14000	14000	14000	14000	13500	13000	13000	12000	14000	14000	14000	13000	13000	14000	14000	13500	13000	14000	14000	14000	14000	13500	13500	13000	13000
WIRE NO.		-	-	-	-	-	-	-	1	-	-	-	-	2	-	-	-	1	-	-	-	-	-	-	-	-
BASIC GLIDE SLOPE ANGLE	(°)	4								3½																
LENS ROLL ANGLE	(°)	4 3/4								6 3/4																
SHIP'S PITCH (-STERN DOWN)	(°)	-0.2		-0.3	-0.2			-0.2		-0.4	-0.3	-0.2		-0.3	-0.4	-0.2	-0.3		-0.2	-0.1	-0.2	-0.1		-0.3	-0.1	
SHIP'S ROLL (-ROLL STRBD)	(°)	-0.9	-1.4	-1.5	-1.0	-1.3	-1.1	-1.0	-1.4	-0.4	-0.5	-0.4	-0.7	-0.2	0.9	0.8	0.4	0.9	-0.9	-0.8	-0.3	-1.5	-0.7	-0.1	-0.9	-1.0
WIND OVER DECK																										
VELOCITY	(kt)	33		32	34	33	36	33	35	27	28		27	25	22	25	23	26		25			24	25	26	25
DIRECTION	(°)	350								342				350		355	350	345	350			345	350			
SURFACE WIND (APPROX)	(kt)	20						18		13					16				18							
APPROACH SPEED	(kt)	132	130	125	129	127	125	122	126	135	134	133	135	129	129	129	127	125	130	131	130	125	125	126	124	124
ENGAGING SPEED	(kt)	96	97	98	95	94	89	88	92	108	106	105	108	104	107	104	104	[illegible]	104	106	105	100	101	101	98	99
PITCH ATTITUDE	(°)	8.1	7.4	8.2	7.8	8.7	7.3	9.1	9.3	4.4	5.3	5.7	5.2	4.8	8.4	5.2	8.3	10.3	10.2	8.1	7.8	5.1	9.1	10.3	10.1	6.1
AIRPLANE ROLL ANGLE W/ RESP TO ANGLE DECK (- PORT)	(°)	-1.3	-1.4	-1.9	-4.0	0.9	-5.4	-2.3	0.7	0.0	-1.8	-2.2	-1.0	0.9	1.4	1.4	0.0	-4.8	-3.6	2.6	-3.6	-2.4	-2.3	0.0	-2.3	-0.2
SINKING SPEED	(fps)																									
MITCHELL CAMERA		-	-	-	-	-	-	-	11.4	[illegible]	13.5	-	13.8	-	11.8	13.1	14.7	11.9	10.7	15.1	-	12.6	12.5	14.4	12.4	-
CAMERAFLEX		15.2	17.7	14.8	15.4	14.9	[illegible]	16.3	11.8	[illegible]	11.8	15.0	15.7	14.0	12.0	14.1	14.2	12.5	12.5	15.2	10.3	12.1	12.1	14.4	12.8	13.1
THEORETICAL		11.5	[illegible]	11.1	[illegible]	11.9	[illegible]	11.4	[illegible]	[illegible]	[illegible]	11.5	12.2	11.7	12.0	10.7	11.6	10.5	11.7	11.5	11.5	11.1	10.9	11.3	13.0	10.7
MAIN GEAR TOUCHDOWN DISTANCE	(ft)																									
ACTUAL		179	206	185	225	[illegible]	239	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	208	188	192	226	170	146	177	182	228	224	178	214	234	184
THEORETICAL		238	243	245	239	239	[illegible]	[illegible]	[illegible]	263	257	251	[illegible]	248	244	244	243	234	242	242	244	255	238	241	237	249
MAIN GEAR TO RAMP CLEARANCE	(ft)	-	22.0	-	22.5	17.5	[illegible]	16.[illegible]	18.5	21.5	17.0	20.5	22.5	12.0	14.0	18.0	-	-	-	-	16.0	15.0	13.0	18.5	17.5	-
OFF-CENTER DISTANCE (-PORT)	(ft)																									
RAMP		-	-3.5	-	1.5	2.0	-3.5	3.5	1.5	-1.5	2.5	3.5	4.0	3.5	5.0	5.0	-	-	-	-	-3.0	3.5	-0.5	4.5	-1.0	-
TOUCHDOWN		1.0	2.0	-6.0	-1.0	-5.0	5.0	-5.[illegible]	-5.0	2.0	1.0	-1.0	0.0	-3.0	0.0	1.0	-3.0	2.0	-7.0	-4.0	5.0	1.0	0.0	-2.0	-5.0	-3.0

LANDING NUMBER		26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
TYPE LANDING		A	T&G										A	T&G						A	T&G		A
FUEL	(lb)	1900	4100	4000	3900	3600	3500	3300	2600	2400	2200	2100	1800	2700	2500	2300	2100	2000	1800	1500	3500	3300	3000
AIRPLANE GROSS WEIGHT	(lb)	11400	13600	13500	13400	13100	13000	12800	12100	11900	11700	11600	11300	12200	12000	11800	11600	11500	11300	11000	13000	12800	12500
ARRESTING GEAR WEIGHT SETTING	(lb)	12500	14000	14000	14000	14000	14000	13500	13000	13000	13000	12500	12500	13000	13000	13000	12500	12500	12500	12000	14000	14000	13500
WIRE NO.		1	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	4	-	-	2
BASIC GLIDE SLOPE ANGLE	(°)	3½	4																				
LENS ROLL ANGLE	(°)	6 3/4	4 3/4																				
SHIP'S PITCH (-STERN DOWN)	(°)	0.0	-0.1	-0.2	0.0	-0.5		-0.1	0.0	-0.1		0.0	-0.2	-0.1	-0.2			-0.1	-0.2	-0.1	-0.2	0.0	
SHIP'S ROLL (-ROLL STRBD)	(°)	-1.0	-1.1	-1.0	-1.4	-1.3	-1.2	-1.3	-1.2	-1.2	-1.3	-1.1	-1.3	-1.2	-0.8	-1.1	-1.4	-0.9	-1.1	-1.5	-1.2	-0.3	0.3
WIND OVER DECK																							
VELOCITY	(kt)	26	35			36			37	35			37	36	33		35		33	35	39	38	37
DIRECTION	(°)	345												350					345	350		345	350
SURFACE WIND (APPROX)	(kt)	20												27									
APPROACH SPEED	(kt)	123	127	135	134	134	130	130	129	126	124	123	125	127	125	127	124	128	124	123	130	126	130
ENGAGING SPEED	(kt)	97	92	100	99	98	94	94	92	91	89	88	88	91	92	94	89	93	91	88	91	88	93
PITCH ATTITUDE	(°)	10.0	5.6	6.2	4.5	5.5	6.0	8.1	5.0	5.1	8.1	7.0	5.7	7.6	7.2	4.7	8.2	7.1	7.2	4.6	10.2	8.0	10.0
AIRPLANE ROLL ANGLE W/ RESP TO ANGLE DECK (- PORT)	(°)	-0.6	-0.9	-5.3	-2.1	-2.0	-1.8	-8.4	-1.1	-3.8	-3.5	-0.8	-6.3	0.8	-2.4	-4.6	-1.0	1.0	-3.3	-0.3	-3.5	0.2	-4.6
SINKING SPEED	(fps)																						
MITCHELL CAMERA		12.9	16.3	16.6	14.4	15.3	14.6	15.1	14.0	15.0	13.1	12.0	15.2	-	16.4	13.1	15.6	11.0	13.6	-	13.6	7.5	17.5
CAMERAFLEX		11.4	15.8	17.4	15.5	15.5	14.7	15.9	12.7	12.9	12.5	12.8	14.5	12.5	14.4	12.8	14.4	9.1	12.1	12.0	14.6	10.0	17.3
THEORETICAL		10.4	11.5	12.8	12.5	13.4	12.8	11.6	11.3	11.3	11.4	10.8	11.2	11.5	11.7	12.1	12.1	11.3	11.6	11.1	11.6	10.5	10.7
MAIN GEAR TOUCHDOWN DISTANCE	(ft)																						
ACTUAL		151	236	234	213	229	216	206	236	224	203	223	219	215	197	248	170	200	162	228	183	167	176
THEORETICAL		233	241	243	241	258	256	236	239	243	236	233	239	236	239	247	241	236	241	246	235	225	215
MAIN GEAR TO RAMP CLEARANCE	(ft)	-	25.0	24.0	19.0	20.5	19.0	20.5	20.5	20.5	18.5	17.5	22.0	-	-	-	-	-	-	-	-	-	-
OFF-CENTER DISTANCE (-PORT)	(ft)																						
RAMP		-	-6.0	-1.5	6.0	5.0	6.5	6.0	3.5	6.5	5.5	2.0	1.0	-	-	-	-	-	-	-	-	-	-
TOUCHDOWN		-5.0	8.0	1.0	-1.0	-1.0	-2.0	2.0	1.0	1.0	-2.0	0.0	4.0	-5.0	-1.0	-2.0	-10.0	-10.0	3.0	1.0	-1.0	-6.0	5.0

Model A4D-2 Airplane, BuNo 142089

ARRESTED LANDING TABULATED DATA

MK 7 Mod 2-3 CROAG with Sheave and Anchor Dampers

USS CORAL SEA (CVA-43)

LANDING NUMBER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
TYPE LANDING		TAG								A	TAG	A	T&G					A	T&G							A
FUEL	(lb)	2700	2500	2300	2200	2000	1800	1600	1500	[illegible]	[illegible]	2200	2500	2200	2000	2000	1800	1600	2900	3400	1500	1200	2900	2600	2300	2800
AIRPLANE GROSS WEIGHT	(lb)	[illegible]	12900	12100	12000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11900	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	13900	13600	13700	13400	12700	12400
ARRESTING GEAR WEIGHT SETTING	(lb)	13500	12000	12000	12000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12000	12000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	13500	13000	13000	12500
WIRE NO.		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	3
BASIC GLIDE SLOPE ANGLE	(°)	3										3	3						3							
LENS ROLL ANGLE	(°)	4 3/4									4 3/4	4 3/4	4 3/4						4 3/4							
SHIP'S PITCH (- STERN DOWN)	(°)	[illegible]	[illegible]	[illegible]			[illegible]		[illegible]	[illegible]	[illegible]	-0.1	[illegible]		[illegible]		[illegible]	[illegible]		[illegible]	-0.3	-0.2	-0.1	-0.3	-0.7	
SHIP'S ROLL (- ROLL STBD)	(°)	-0.7	0.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-0.6	-0.6	-0.8	+0.4	-1.1
WIND-OVER-DECK																										
VELOCITY	(kt)	25		26	[illegible]	29		25	29		[illegible]	34	[illegible]			29	28	27	28			34			33	
DIRECTION	(°)	350			355		350					355	345						360	345					360	
SURFACE WIND (APPROX)	(kt)	10									15	17	11						11		10		11		11	
APPROACH SPEED	(kt)	111	129	122	128	121	131	127	[illegible]	[illegible]	138	127	[illegible]	[illegible]	[illegible]	131	131	[illegible]	136	130	[illegible]	131	132	133	131	134
ENGAGING SPEED	(kt)	106	101	107	102	105	[illegible]	[illegible]	[illegible]	[illegible]	91	93	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	98	97	88	99	98	101
PITCH ATTITUDE	(°)	6.6	7.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11.2	8.1	10.1	9.8	11.2
AIRPLANE ROLL ANGLE W/ RESP TO ANGLE DECK (+ PORT)	(°)	2.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.0	-1.8	-2.2	-0.5	+2.6
SINKING SPEED	(fps)																									
MITCHELL CAMERA		-	-	-	-	-	-	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	11.7	9.7	[illegible]	-	12.9
CAMERAFLEX		13.7	14.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	8.9	[illegible]	12.1	13.4
THEORETICAL		11.9	11.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11.9	12.9	13.1	13.2
MAIN GEAR TOUCHDOWN DISTANCE	(ft)																									
ACTUAL		143	121	138	147	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	190	176	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	198	207	245	201	196
THEORETICAL		250	245	240	242	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	236	231	228
MAIN GEAR T' RAMP CLEARANCE	(ft)	-	17.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	17.5	15.5	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	[illegible]	-	16.5	-	18.0
OFF-CENTER DISTANCE (+PORT)	(ft)																									
RAMP		-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	[illegible]	-	-1.6	-	+3.0
TOUCHDOWN		1.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9.0	7.0	2.0	6.0	5.0
LANDING NUMBER		26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
TYPE LANDING		TAG			A	TAG																			A	TAG
FUEL	(lb)	1600	1400	2900	2600	1800	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2200	2000	1700	1600	1500	3600
AIRPLANE GROSS WEIGHT	(lb)	14000	13800	11300	13000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12600	12400	12100	12000	11900	14000
ARRESTING GEAR WEIGHT SETTING	(lb)	14000	14000	11900	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	13000	12500	12500	12000	12000	14000
WIRE NO.		-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
BASIC GLIDE SLOPE ANGLE	(°)	3																								
LENS ROLL ANGLE	(°)	4 1/4														4 1/4										
SHIP'S PITCH (- STERN DOWN)	(°)	-0.5	-0.4	-0.3	-0.4	[illegible]	[illegible]	[illegible]		[illegible]		[illegible]				-0.2	[illegible]	0.0	-0.1					0.3	-0.1	
SHIP'S ROLL (- ROLL STBD)	(°)	0.7	0.9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-1.1	-1.1	[illegible]	-1.2	-1.3	-1.1	-1.1	-1.0	-1.0	-1.0	-1.2	-0.9	-1.3	+1.0	-1.5
WIND-OVER-DECK																										
VELOCITY	(kt)	24	26	23	25	28	[illegible]		19	[illegible]	[illegible]	25	[illegible]		30	37	33	37	36	35	38	34	36	34	35	34
DIRECTION	(°)	350				340		350				345		355	345							350	345	350	348	350
SURFACE WIND (APPROX)	(kt)	16				17									15											25
APPROACH SPEED	(kt)	135	131	130	130	131	128	129	127	[illegible]	[illegible]	130	124	127	128	129	135	131	[illegible]	133	131	124	126	130	131	129
ENGAGING SPEED	(kt)	109	105	107	105	105	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	105	98	102	98	98	100	96	97	97	93	96	102	96	96	95
PITCH ATTITUDE	(°)	12.5	11.4	10.3	10.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6.0	7.1	[illegible]	8.2	10.1	7.0	5.5	10.1	10.1	8.2	9.1	6.4	5.0	12.1	10.1
AIRPLANE ROLL ANGLE W/ RESP TO ANGLE DECK (+ PORT)	(°)	-4.8	-4.2	-4.5	-2.0	-4.3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-4.7	-5.2	[illegible]	[illegible]	-5.1	-3.4	0.8	-4.7	[illegible]	0.0	2.2	[illegible]	-4.9	-0.9	-4.6
SINKING SPEED	(fps)																									
MITCHELL CAMERA		11.0	12.1	11.3	12.2	11.3	-	-	-	11.8	[illegible]	12.9	12.1	-	10.0	-	12.7	10.7	10.9	11.3	-	10.7	7.8	11.1	11.0	11.6
CAMERAFLEX		11.6	11.6	11.0	11.7	11.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12.4	12.1	11.0	9.9	12.1	12.7	10.2	11.1	11.4	9.2	10.1	8.2	12.0	10.2	12.0
THEORETICAL		12.5	11.9	12.0	11.8	11.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12.0	12.6	11.4	11.9	11.4	12.2	11.5	11.9	12.2	11.6	12.1	12.2	11.7	12.0	12.1
MAIN GEAR TOUCHDOWN DISTANCE	(ft)																									
ACTUAL		190	192	213	167	206	235	115	166	206	202	226	227	194	243	219	219	190	223	218	241	222	232	218	191	232
THEORETICAL		240	231	244	239	231	246	208	229	247	225	250	247	248	239	212	233	218	225	229	234	235	237	241	205	233
MAINGEAR TO RAMP CLEARANCE	(ft)	15.5	15.5	16.5	17.0	15.5	16.0	-	13.0	-	-	15.0	-	-	-	11.5	20.3	18.5	-	16.0	17.5	19.5	-	22.5	-	-
OFF-CENTER DISTANCE (- PORT)	(ft)																									
RAMP		1.0	1.0	0.0	-1.0	-1.5	-0.5	-	-0.5	-	-	-4.0	-	-	-	-3.0	-4.0	-5.5	-	-2.0	-4.5	-2.5	-	-2.5	-	-
TOUCHDOWN		-1.0	0.0	-1.0	4.0	2.0	2.0	5.0	0.0	7.0	1.0	0.0	2.0	4.0	2.0	2.0	3.0	2.0	5.0	2.0	4.0	1.0	3.0	3.0	4.0	6.0

Model A4D-2 Airplane, BuNo 142089

ARRESTED LANDING TABULATED DATA

MK 7 Mod 2-3 CROAG with Sheave and Anchor Dampers

USS CORAL SEA (CVA-43)

LANDING NUMBER		51	52	53	54	55	56	57	58	59	60
TYPE LANDING		T&G							A	T&G	
FUEL	(lb)	2600	2400	2000	1800	1700	1600	1500	1400	3100	2800
AIRPLANE GROSS WEIGHT	(lb)	13000	12800	12400	12200	12100	12000	11900	11800	13500	13200
ARRESTING GEAR WEIGHT SETTING	(lb)	13000	13000	12500	12500	12500	12000	12000	12000	13500	13000
WIRE NO.		-	-	-	-	-	-	-	2	-	-
BASIC GLIDE SLOPE ANGLE	(°)	4									
LENS ROLL ANGLE	(°)	4 3/4									
SHIP'S PITCH (-STERN DOWN)	(°)	[illegible]	-	-0.1		[illegible]	[illegible]	[illegible]	-0.1	-0.2	-0.1
SHIP'S ROLL (-ROLL STRBD)	(°)	-2.0	-	[illegible]	-1.0	-1.3	[illegible]	[illegible]	-1.2	[illegible]	-0.2
WIND OVER DECK											
VELOCITY	(kt)	36	34	35	34	36	34		35	[illegible]	
DIRECTION	(°)	350									345
SURFACE WIND (APPROX)	(kt)	25									
APPROACH SPEED	(kt)	128	128	128	131	130	131	131	125	129	131
ENGAGING SPEED	(kt)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
PITCH ATTITUDE	(°)	8.7	-	12.1	6.6	7.0	7.1	6.0	[illegible]	7.2	[illegible]
AIRPLANE ROLL ANGLE W/ RESP TO ANGLE DECK (- PORT)	(°)	-2.6	-	-0.7	-3.6	-3.2	-1.4	-6.0	-2.3	-0.6	-2.8
SINKING SPEED	(fps)										
MITCHELL CAMERA		[illegible]	-	[illegible]	-	-	-	-	[illegible]	[illegible]	[illegible]
CAMERAFLEX		[illegible]	13.1	[illegible]	[illegible]	13.9	[illegible]	[illegible]	12.3	13.5	11.3
THEORETICAL		[illegible]	-	11.5	[illegible]	11.5	12.2	12.2	[illegible]	11.8	11.8
MAIN GEAR TOUCHDOWN DISTANCE	(ft)										
ACTUAL		236	-	187	213	225	222	209	174	238	200
THEORETICAL		243	-	227	238	234	240	236	226	233	219
MAIN GEAR TO RAMP CLEARANCE	(ft)	-	-	-	-	-	-	-	-	-	-
OFF-CENTER DISTANCE (-PORT)	(ft)										
RAMP		-	-	-	-	-	-	-	-	-	-
TOUCHDOWN		6.0	4.0	2.0	1.0	1.0	2.0	3.0	2.0	7.0	5.0

LANDING NUMBER		61	62	63	64	65	66	67	68
TYPE LANDING									A
FUEL	(lb)	2500	2300	2100	2000	1700	1500	1400	1300
AIRPLANE GROSS WEIGHT	(lb)	12900	12700	12500	12400	12100	11900	11800	11700
ARRESTING GEAR WEIGHT SETTING	(lb)	13000	13000	12500	12500	12000	12000	12000	12000
WIRE NO.		-	-	-	-	-	-	-	3
BASIC GLIDE SLOPE ANGLE	(°)								
LENS ROLL ANGLE	(°)								
SHIP'S PITCH (-STERN DOWN)	(°)	-0.2				-0.1	-0.2	0.0	-0.1
SHIP'S ROLL (-ROLL STRBD)	(°)	-0.5	-0.8	-1.5	-0.7	-1.0	-0.5	-0.3	-0.9
WIND OVER DECK									
VELOCITY	(kt)	36			37	38	40	37	35
DIRECTION	(°)	350		345	350				345
SURFACE WIND (APPROX)	(kt)								
APPROACH SPEED	(kt)	128	128	125	132	129	129	132	130
ENGAGING SPEED	(kt)	92	92	89	95	91	89	95	95
PITCH ATTITUDE	(°)	10.2	8.2	9.2	7.2	[illegible]	10.2	3.5	10.1
AIRPLANE ROLL ANGLE W/ RESP TO ANGLE DECK (- PORT)	(°)	-3.1	-3.3	-2.5	-1.6	-2.8	-0.3	-0.3	-3.2
SINKING SPEED	(fps)								
MITCHELL CAMERA		13.6	15.0	14.1	-	14.3	11.8	12.9	13.2
CAMERAFLEX		[illegible]	14.9	15.1	12.3	12.3	11.2	11.0	12.3
THEORETICAL		11.6	11.7	11.8	12.0	11.4	11.3	11.2	11.7
MAIN GEAR TOUCHDOWN DISTANCE	(ft)								
ACTUAL		177	194	192	228	211	206	228	198
THEORETICAL		230	237	239	239	225	230	237	229
MAIN GEAR TO RAMP CLEARANCE	(ft)	-	-	-	-	-	-	-	-
OFF-CENTER DISTANCE (-PORT)	(ft)								
RAMP		-	-	-	-	-	-	-	-
TOUCHDOWN		8.0	3.0	-3.0	3.0	2.0	4.0	5.0	-1.0

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SUMMARY OF OPTIMUM WIND-OVER-DECK LANDINGS

USS MIDWAY (CVA-41)
USS RANGER (CVA-61)
USS CORAL SEA (CVA-43)
USS SARATOGA (CVA-60)

Aircraft Carrier	Model Airplane	BuNo	Touch & Go's	Arrests	Bolters
CVA-41	F8U-1	143749	42	7	5
	A4D-2	142678	41	8	3
	A3D-2P	142668	21	9	3
	TF-1	136766	28	2	0
CVA-61	F8U-2	145588	49	6	1
	A4D-2	142678	44	6	0
	F4D-1	139143	28	4	0
CVA-43	F8U-2	145557	59	9	1
	F8U-1	143749	51	8	1
	A4D-2	142678	54	9	0
	A4D-2	142120	40	7	0
	A4D-2	142089	59	9	0
CVA-60	F8U-1	143749	3	1	0
			*14	*2	*0
	A4D-2	142089	8	1	0
			*10	*2	*0
TOTAL			551	90	14

*Night Landings

Enclosure (3)

SUMMARY OF AIRPLANE LANDING PARAMETER ANALYSIS
USS CORAL SEA (CVA-43)

AIRPLANE BUNO	678			120			089			ALL			557			749			ALL		
WIND-OVER-DECK (kt)	25	35	ALL	25	35	ALL	25	35	ALL	25	35	ALL	25	35	ALL	25	35	ALL	25	35	ALL
APPROACH SPEED (kt)																					
$\overline{V_A}$	126	124	125	129	127	128	130	130	130	128	127	128	144	142	143	140	139	140	142	141	141
$3\sigma_{V_A}$	13	12	11	11	11	11	5	7	6	11	13	12	7	6	8	8	12	11	9	11	11
$\overline{\Delta V_A}$	+2	+1	+2	+4	+5	+5	+5	+5	+5	+4	+3	+4	+5	+5	+5	+4	+4	+4	+4	+4	+4
$3\sigma_{\Delta V_A}$	8	7	8	8	8	8	7	12	11	10	13	11	5	9	7	7	9	8	6	9	8
N	26	37	63	18	29	47	28	40	68	72	106	178	22	47	69	18	43	61	40	90	130
SINKING SPEED (fps)																					
$\overline{V_S}$	12.0	12.5	12.5	13.0	14.0	13.5	12.5	12.0	12.5	12.5	13.0	13.0	14.0	14.0	14.0	14.0	14.5	14.5	14.0	14.0	14.0
$3\sigma_{V_S}$	4.0	4.0	4.0	4.0	6.0	5.5	5.0	4.5	4.5	4.5	5.5	6.0	4.5	5.0	5.5	5.5	7.0	6.5	5.0	6.0	6.0
N_{V_S}	25	35	60	18	29	47	28	40	68	71	104	175	22	47	69	18	41	59	40	88	128
$\overline{\Delta V_S}$	+0.5	+1.5	+1.0	+1.5	+2.5	+2.0	+1.0	0.0	+0.5	+1.0	+1.5	+1.0	+1.0	+0.5	+0.5	+1.5	+1.0	+1.0	+1.0	+1.0	+1.0
$3\sigma_{\Delta V_S}$	4.0	4.0	4.0	4.0	6.0	5.5	4.5	4.5	4.5	4.5	5.5	4.5	4.5	5.5	5.0	5.5	7.0	6.5	5.0	6.0	6.0
$N_{\Delta V_S}$	25	35	60	18	29	47	28	39	67	71	103	174	22	47	69	18	41	59	40	88	128
OFF-CENTER DISTANCE AT TOUCHDOWN (ft)																					
$\overline{X}$	0	0	0	-1	-1	-1	+2	+3	+3	+1	+1	+1	+5	+4	+4	+1	+2	+2	+3	+3	+3
$3\sigma_X$	8	9	8	9	13	11	6	7	7	7	11	10	8	8	8	6	7	7	9	8	9
N	25	35	60	18	29	7	28	40	68	71	104	175	22	47	69	17	41	58	39	88	127
MAIN GEAR TOUCHDOWN DISTANCE FROM RAMP (ft)																					
$\overline{Z}$	185	175	180	205	205	205	195	210	200	195	195	195	205	200	200	200	190	195	205	195	200
$3\sigma_Z$	115	90	100	105	85	90	105	60	85	110	[illegible]	110	105	115	115	125	110	120	115	115	115
$\overline{\Delta Z}$	-55	-55	-55	-40	-35	-40	-50	-25	-35	-50	-40	-40	-10	-10	-10	0	-15	-10	-5	-15	-10
$3\sigma_{\Delta Z}$	105	85	95	90	80	85	100	60	90	100	85	95	105	115	115	135	120	125	120	120	120
N	25	35	60	18	29	47	27	39	66	70	103	173	20	47	67	17	41	58	37	88	125
OFF-CENTER DISTANCE AT RAMP (ft)																					
$\overline{Y}$	+1.5	+1.5	+1.5	+2.0	+2.0	+2.0	-1.5	-2.0	-1.5	+1.5	+0.5	+1.0	-1.5	-0.5	-1.5	-0.5	-1.5	-1.0	-1.0	-1.0	-1.0
$3\sigma_Y$	7.0	9.5	8.5	8.0	11.0	[illegible]	4.5	4.0	4.5	7.5	10.5	9.0	4.0	7.0	4.5	6.0	5.5	5.5	4.5	6.0	5.0
N	15	16	31	12	17	29	21	15	28	46	48	94	20	23	37	18	20	37	38	52	90
MAIN GEAR TO RAMP CLEARANCE (ft)																					
$\overline{MG/R}$	15.0	15.5		17.0	20.0		14.5	17.0		15.5	17.5		14.5	13.5		14.5	15.0		14.5	14.5	
$3\sigma_{MG/R}$	11.5	10.5		9.5	9.0		8.0	8.0		10.5	10.5		[illegible]	7.5		10.5	11.0		10.0	10.0	
N	15	16	31	12	17	29	21	15	28	[illegible]	48	94	20	23	37	17	20	37	38	52	90
AIRPLANE ROLL ANGLE (deg)																					
$\overline{\phi}$	-0.5	-0.5	-0.5	-1.0	-2.5	-2.0	-1.5	-2.5	-2.0	-1.0	-1.5	-1.5	-2.5	-3.0	[illegible]	-2.0	-3.0	-2.5	-2.0	-3.0	-2.5
$3\sigma_\phi$	3.5	3.5	3.5	6.0	7.0	7.0	5.0	5.0	5.0	5.5	6.0	5.5	3.5	4.5	4.5	5.0	4.5	5.0	4.5	4.5	4.5
N	24	35	59	18	29	47	27	39	66	69	103	172	22	47	69	18	41	60	40	[illegible]	[illegible]

Enclosure (4)

MINIMUM WOD REQUIREMENTS FOR MOST CRITICAL JET AIRPLANES

Arresting Gear	Airplanes	Max Arrested Landing Wt (lb)	Recommended Approach Spd (kt)	Min WOD Required (kt) Glide Slope Angle 4°	3½°	Limit Based On
MK7, Mod 1-3 95'Span without Sheave Dampers	F8U-1P	22,000	144	34	34	Arresting Gear Capacity
	F8U-1/-2	22,000	139	29	29	Arresting Gear Capacity
	A3D-1/-2	50,000	131	27	27	Arresting Gear Capacity
MK7, Mod 1-3 120'Span without Sheave Dampers	F8U-1P	22,000	144	29	29	Arresting Gear Capacity
	F8U-1/-2	22,000	139	24	24	Arresting Gear Capacity
	A3D-1/-2	50,000	131	23	23	Arresting Gear Capacity
MK7, Mod 2-3 without Sheave Dampers	F8U-1P	22,000	144	27	27	Arresting Gear Capacity
	F8U-1/-2	22,000	139	22	22	Arresting Gear Capacity
	A3D-1/-2	50,000	131	22	22	Arresting Gear Capacity
MK7, Mod 1-3 95'Span with Sheave Dampers	A4D-2	13,750	131	24	24	Hook Strength
	A3D-1/-2	50,000	131	23	23	Arresting Gear Capacity
	F4D-1	19,700	135	25	20	Landing Gear Strength
MK7, Mod 1-3 120'Span with Sheave Dampers	A3D-1/-2	50,000	131	23	23	Arresting Gear Capacity
	F4D-1	19,700	135	25	20	Landing Gear Strength
	A4D-2	13,750	131	21	20	Landing Gear Strength
MK7, Mod 2-3 with Sheave Dampers	F4D-1	19,700	135	25	20	Landing Gear Strength
	A3D-1/-2	50,000	131	21	16	Landing Gear Strength
	A4D-2	13,750	131	21	16	Landing Gear Strength

NOTE:
1. Recommended approach speed extracted from applicable flight handbooks.
2. Minimum WOD required determined from the limit engaging speed contained in Aircraft Recovery Bulletins effective 2 Jan 1962.
3. Data excludes the model FJ-4 series, F9F-8 series and F11F-1 airplanes.

MINIMUM WOD REQUIREMENTS FOR MOST CRITICAL PROPELLER AIRPLANES

Arresting Gear	Airplanes	Max Arrested Landing Wt (lb)	Recommended Approach Spd (kt)	Min WOD Req'd (kt)	Limit Based On
MK5, Mod 3	AD-5W	17,500	100	16	Hook Strength
	S2F-3	24,200	95	12	Hook Strength
MK7, Mod 1-3 95'Span without Sheave Dampers	AD-5W	17,500	100	17	Hook Strength
	S2F-3	24,200	95	13	Hook Strength
MK7, Mod 1-3 120'Span without Sheave Dampers	AD-5W	17,500	100	14	Hook Strength
	S2F-3	24,200	95	10	Hook Strength and Airplane Accel.
MK7, Mod 2-3 without Sheave Dampers	AD-5W	17,500	100	15	Hook Strength
	S2F-3	24,200	95	11	Airplane Accel.
MK7, Mod 1-3 95'Span with Sheave Dampers	AD-5W	17,500	100	13	Hook Strength
	S2F-3	24,200	95	9	Airplane Accel.
MK7, Mod 1-3 120'Span with Sheave Dampers	AD-5W	17,500	100	18	Hook Strength
	S2F-3	24,200	95	14	Airplane Accel.
MK7, Mod 2-3 with Sheave Dampers	AD-5W	17,500	100	10	Hook Strength
	S2F-3	24,200	95	5	Airplane Accel.

NOTE: 1. Recommended approach speed extracted from applicable flight handbooks.
2. Minimum WOD required determined from limit engaging speed contained in Aircraft Recovery Bulletins effective 2 Jan 1962.

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FT2222-176

ANNUAL PERCENTAGE FREQUENCY OF SURFACE WIND IN CARRIER OPERATING AREAS

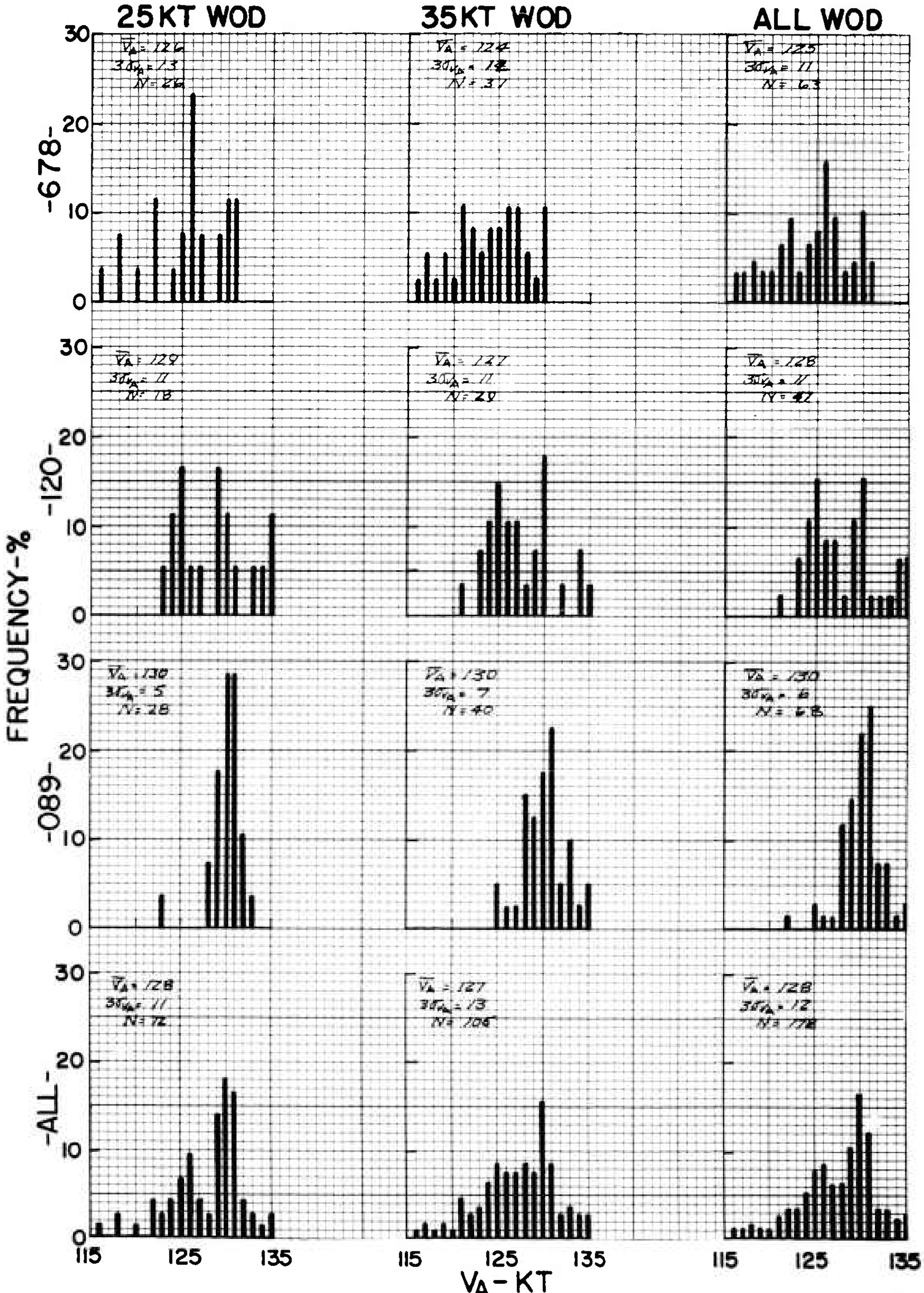
Operating Area	10 Kt or Less	16 Kt or Less
San Diego-Los Angeles	46	75
Los Angeles-San Francisco	43	67
East Formosa Coast	50	69
East Okinawa Coast	25	55
East Japan Coast	37	61
Southeast Asia Coast		
(22°N 118°E)	59	70
(18°N 108°E)	59	81
(12°N 112°E)	51	63
(7°N 108°E)	57	83
(9°N 102°E)	73	90
Norfolk-Jacksonville	27	53
Jacksonville-Gtmo	56	82
East Mediterranean	66	83
West Mediterranean	61	78
North Atlantic		
(58°N 18°W)	20	42
(53°N 33°W)	21	44
(53°N 18°W)	18	40
(43°N 42°W)	22	35
(33°N 48°W)	35	63
(43°N 17°W)	32	58
ALL	43.0	64.5

Data obtained from Naval Weather Service, Anacostia, 1 Feb 1962.

Enclosure (6)

Model A4D-2 Airplane
BuNo 142678, 142120 and 142089

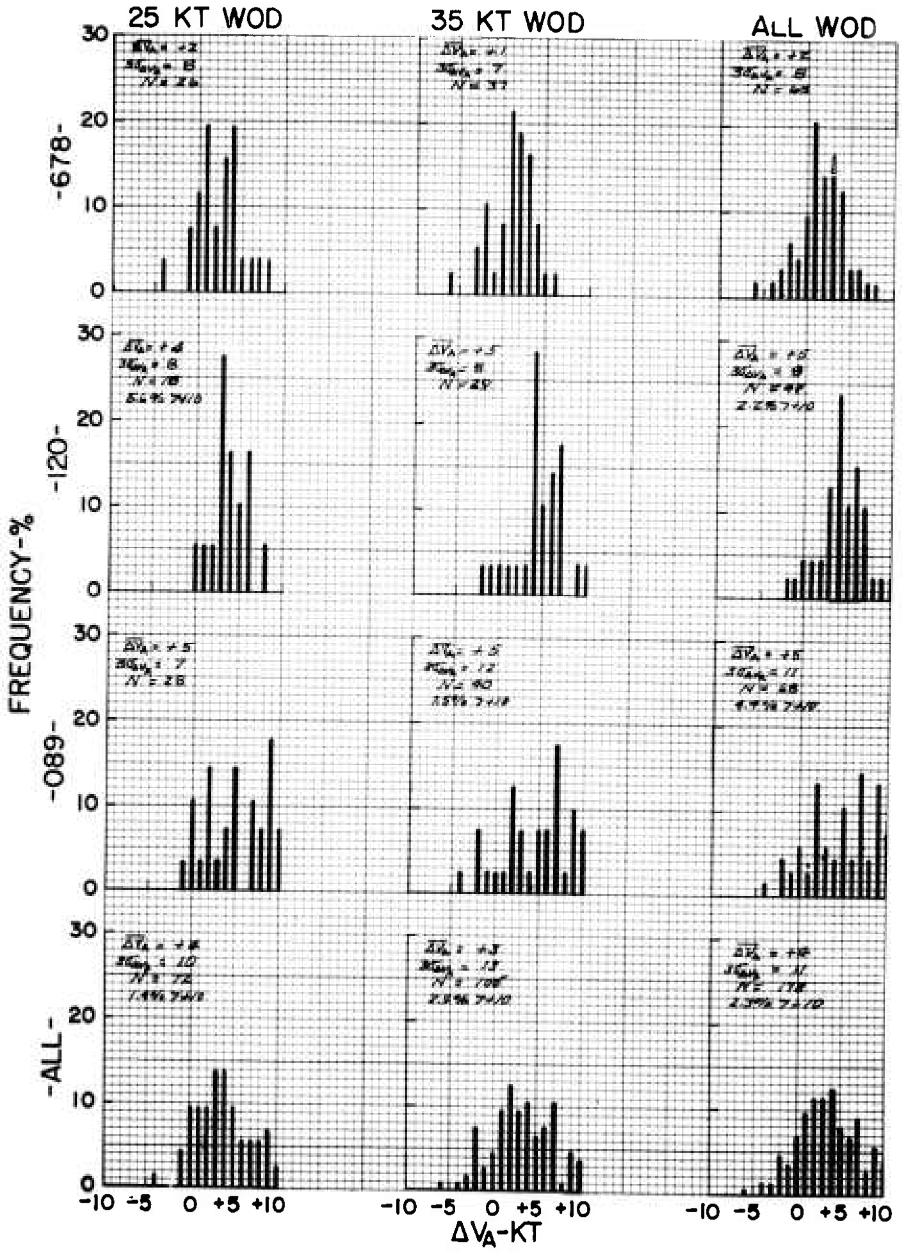
FREQUENCY DISTRIBUTION OF AIRPLANE
APPROACH SPEED



RA1200001
(RSSH-31003)
FT2222-17

Model A4D-2 Airplane
BuNo 142678, 142120 and 142089

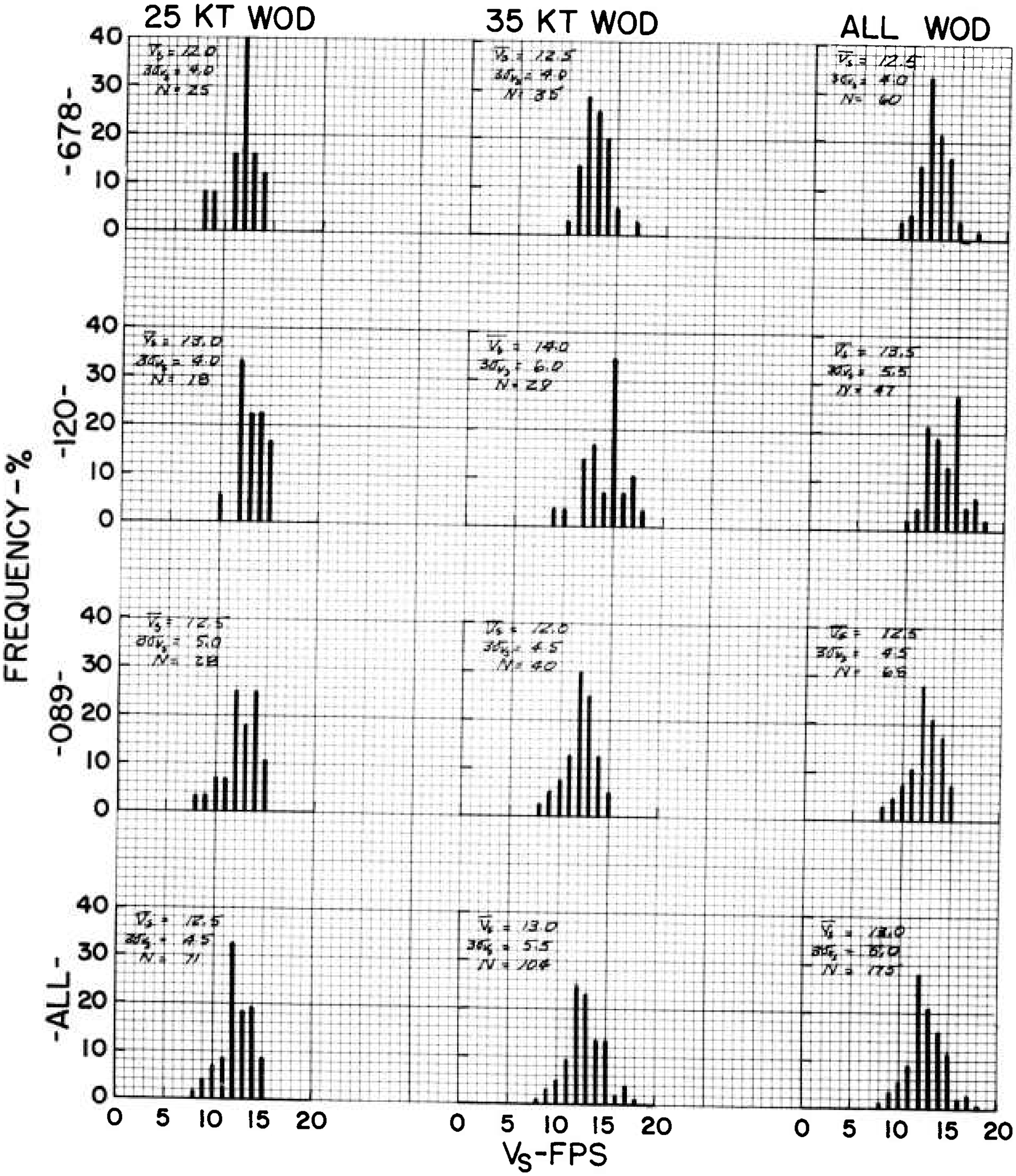
FREQUENCY DISTRIBUTION OF DEVIATION FROM
RECOMMENDED AIRPLANE APPROACH SPEED



RA1200001
(RSSH-31003)
FT2222-176

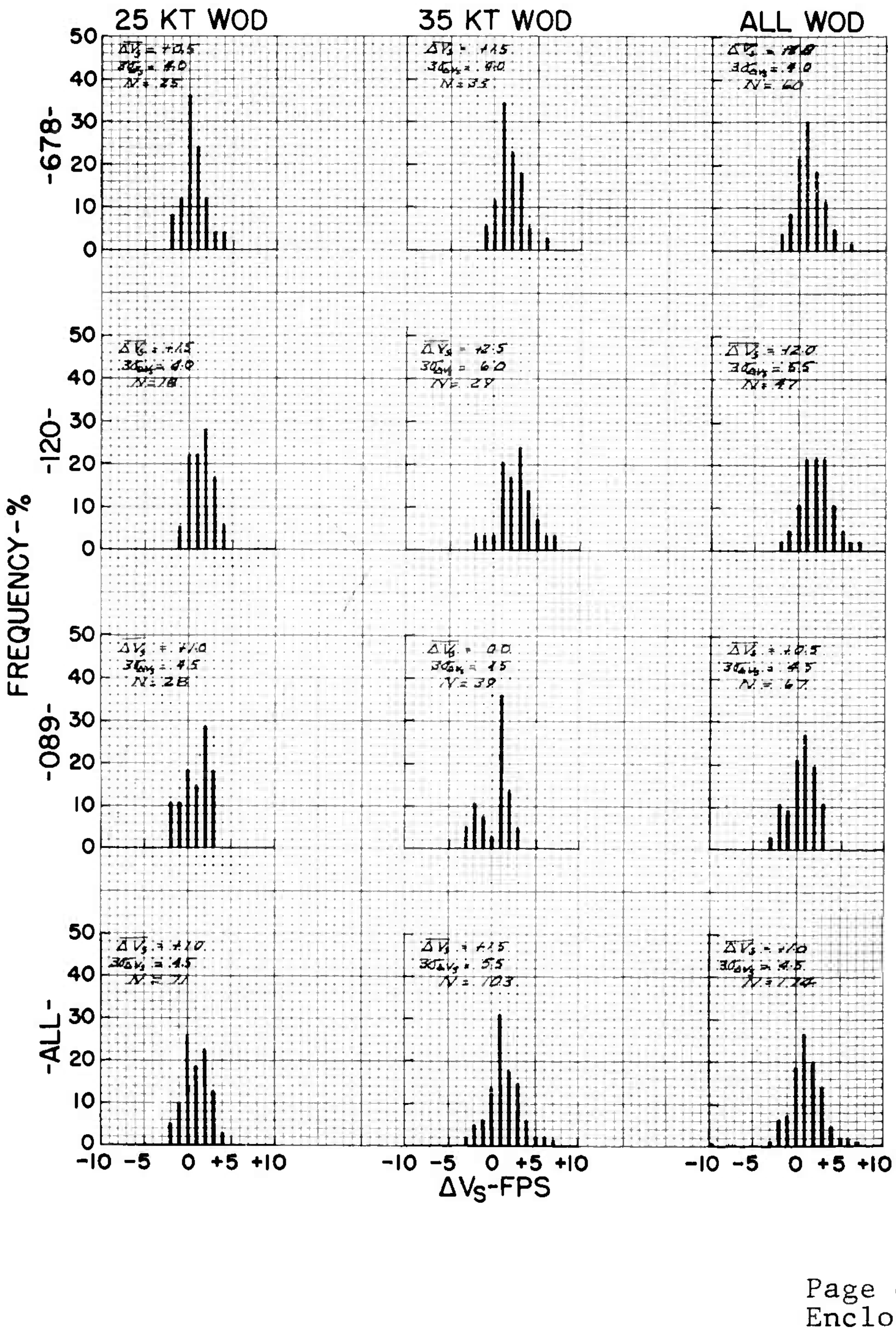
Model A4D-2 Airplane
BuNo 142678, 142120 and 142089

FREQUENCY DISTRIBUTION OF AIRPLANE SINKING SPEED



Model A4D-2 Airplane
BuNo 142678, 142120 and 142089

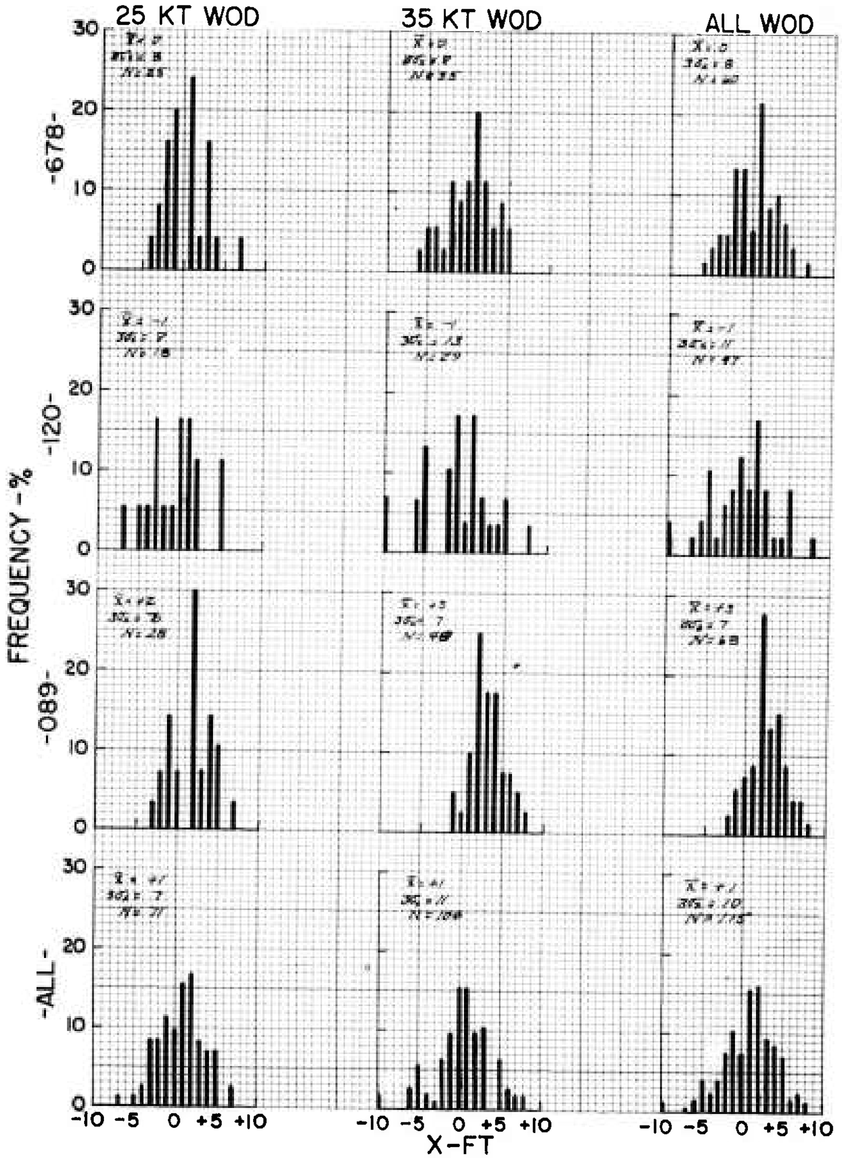
FREQUENCY DISTRIBUTION OF DEVIATION FROM
THEORETICAL AIRPLANE SINKING SPEED



Model A4D-2 Airplane
BuNo 142678, 142120 and 142089

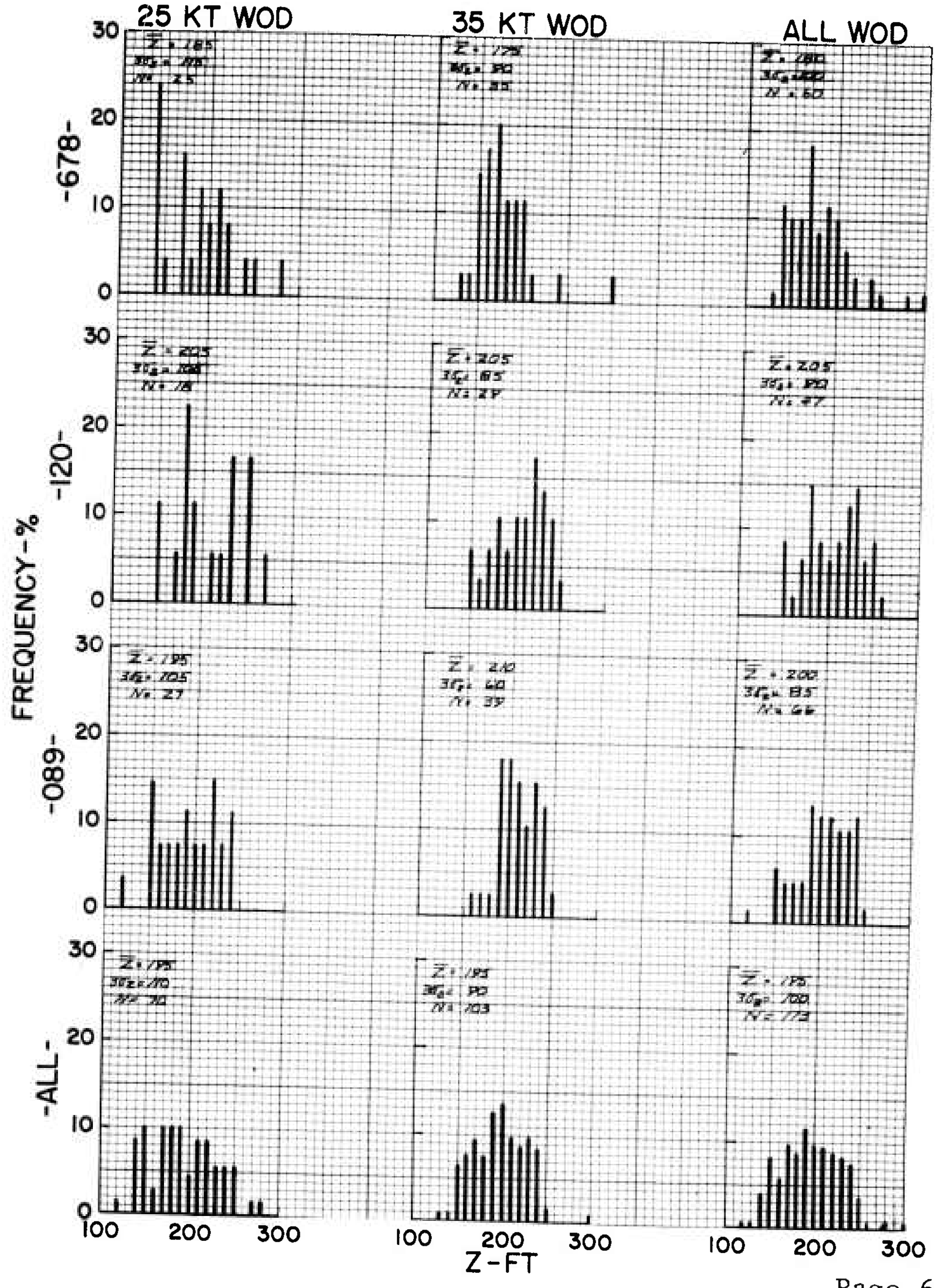
FREQUENCY DISTRIBUTION OF AIRPLANE
OFF-CENTER DISTANCE AT TOUCHDOWN

LEGEND: + Starboard
- Port



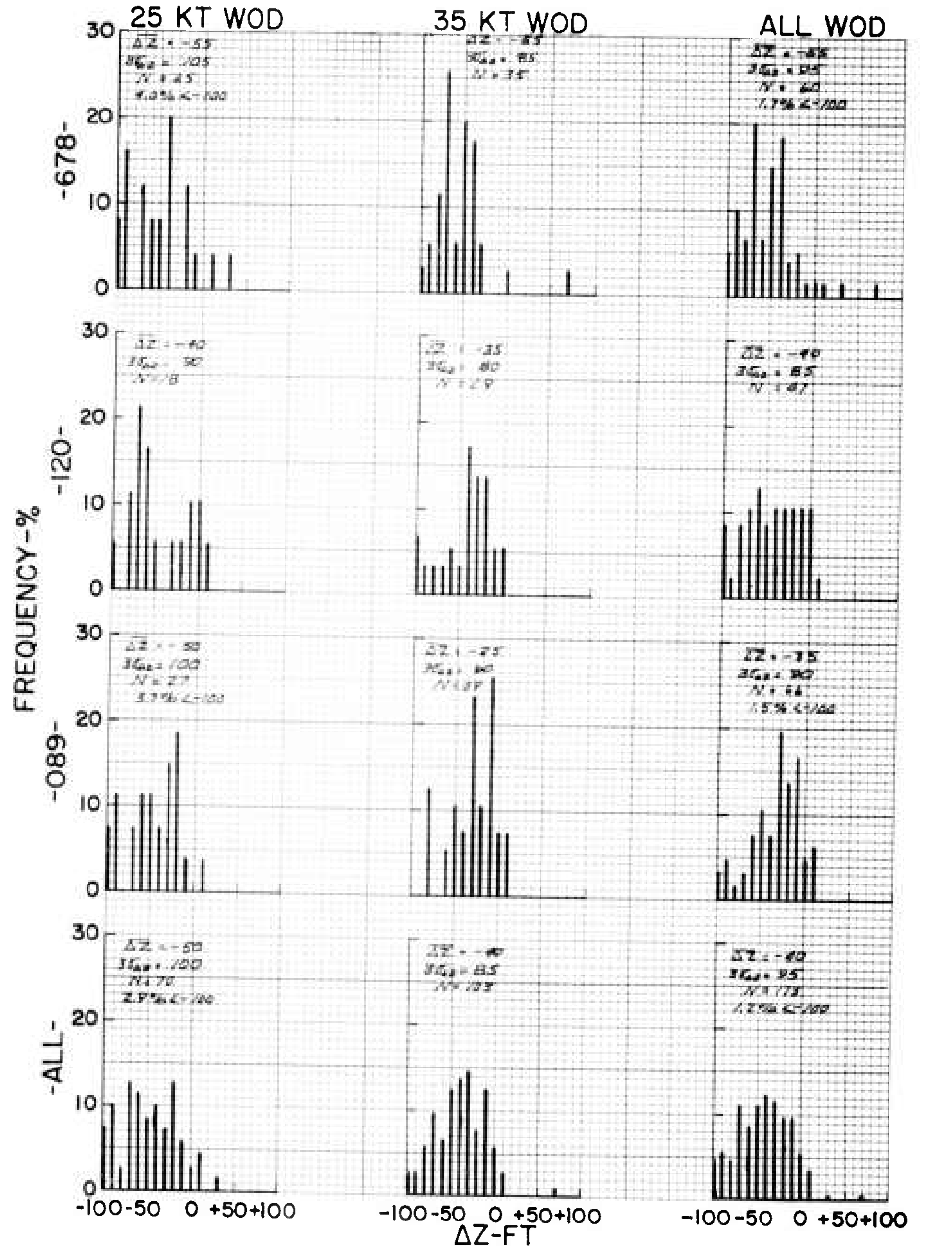
Model A4D-2 Airplane
BuNo 142678, 142120 and 142089

FREQUENCY DISTRIBUTION OF AIRPLANE
MAIN GEAR TOUCHDOWN DISTANCE FROM RAMP



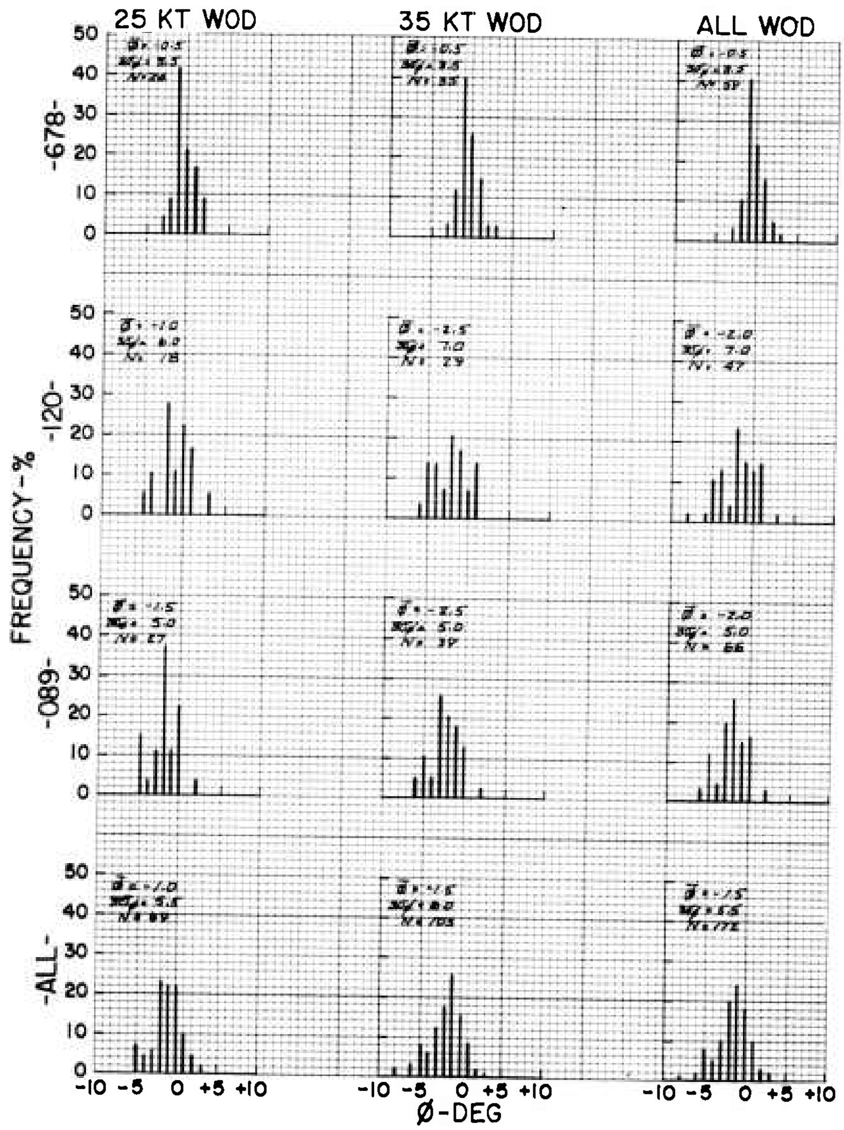
Model A4D-2 Airplane
BuNo 142678, 142120 and 142089

FREQUENCY DISTRIBUTION OF DEVIATION FROM
THEORETICAL AIRPLANE MAIN GEAR TOUCHDOWN DISTANCE
FROM RAMP



Model A4D-2 Airplane
BuNo 142678, 142120 and 142089

FREQUENCY DISTRIBUTION OF AIRPLANE
ROLL ANGLE



LEGEND: + Starboard
- Port

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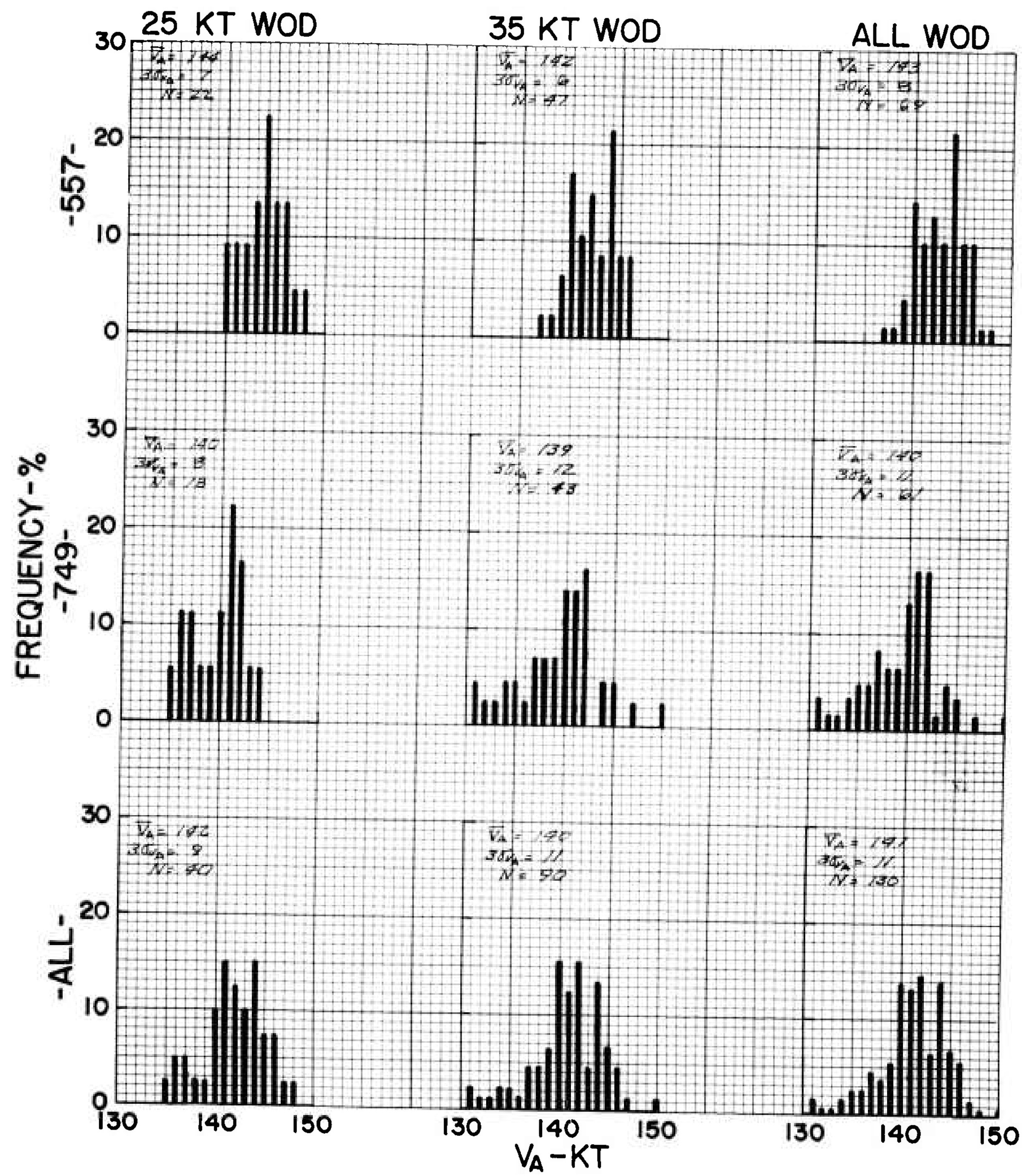
(RSSH-31003)
FT2222-176

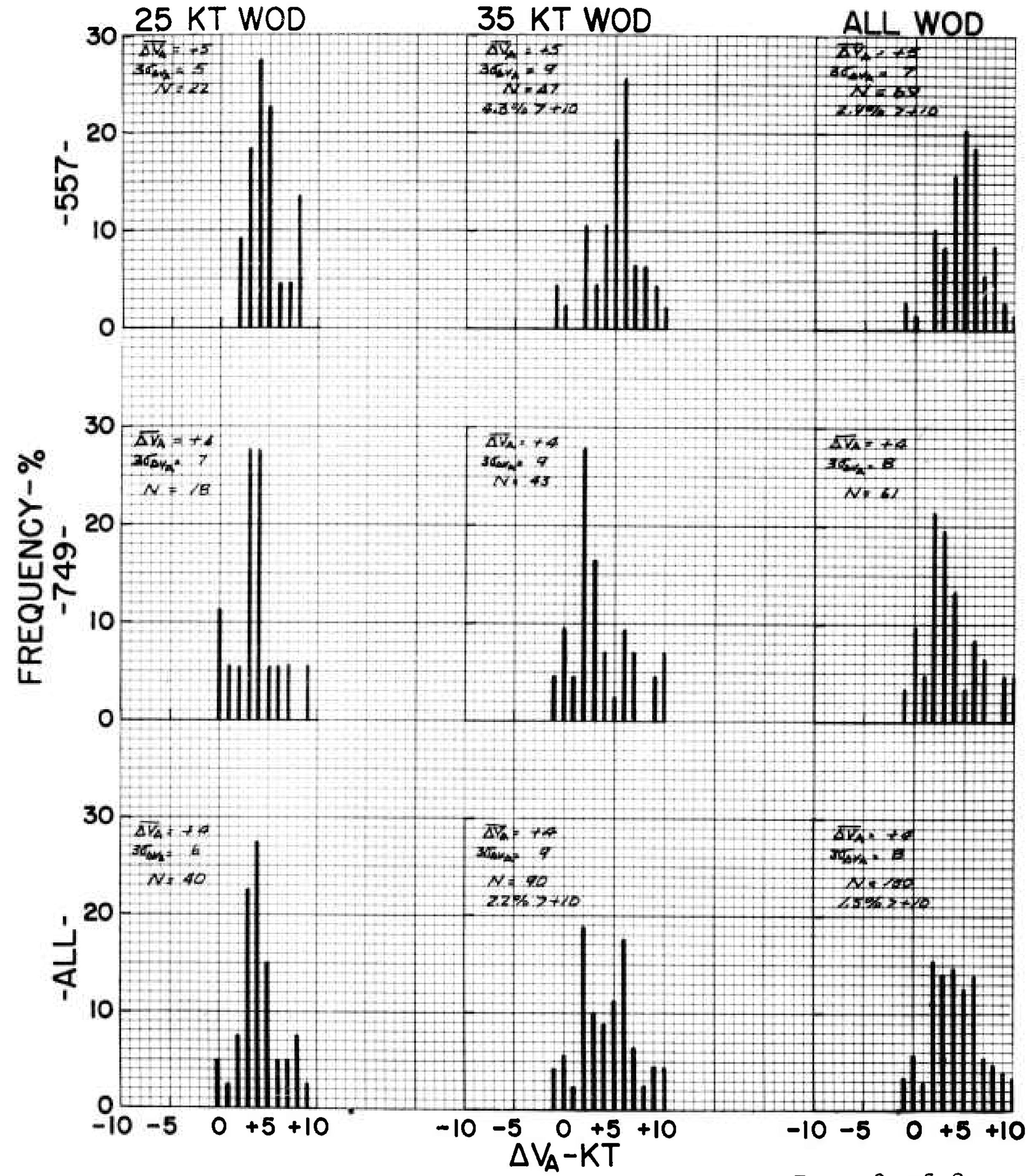
Model F8U-2 Airplane, BuNo 145557
Model F8U-1 Airplane, BuNo 143749

FREQUENCY DISTRIBUTION OF AIRPLANE
APPROACH SPEED



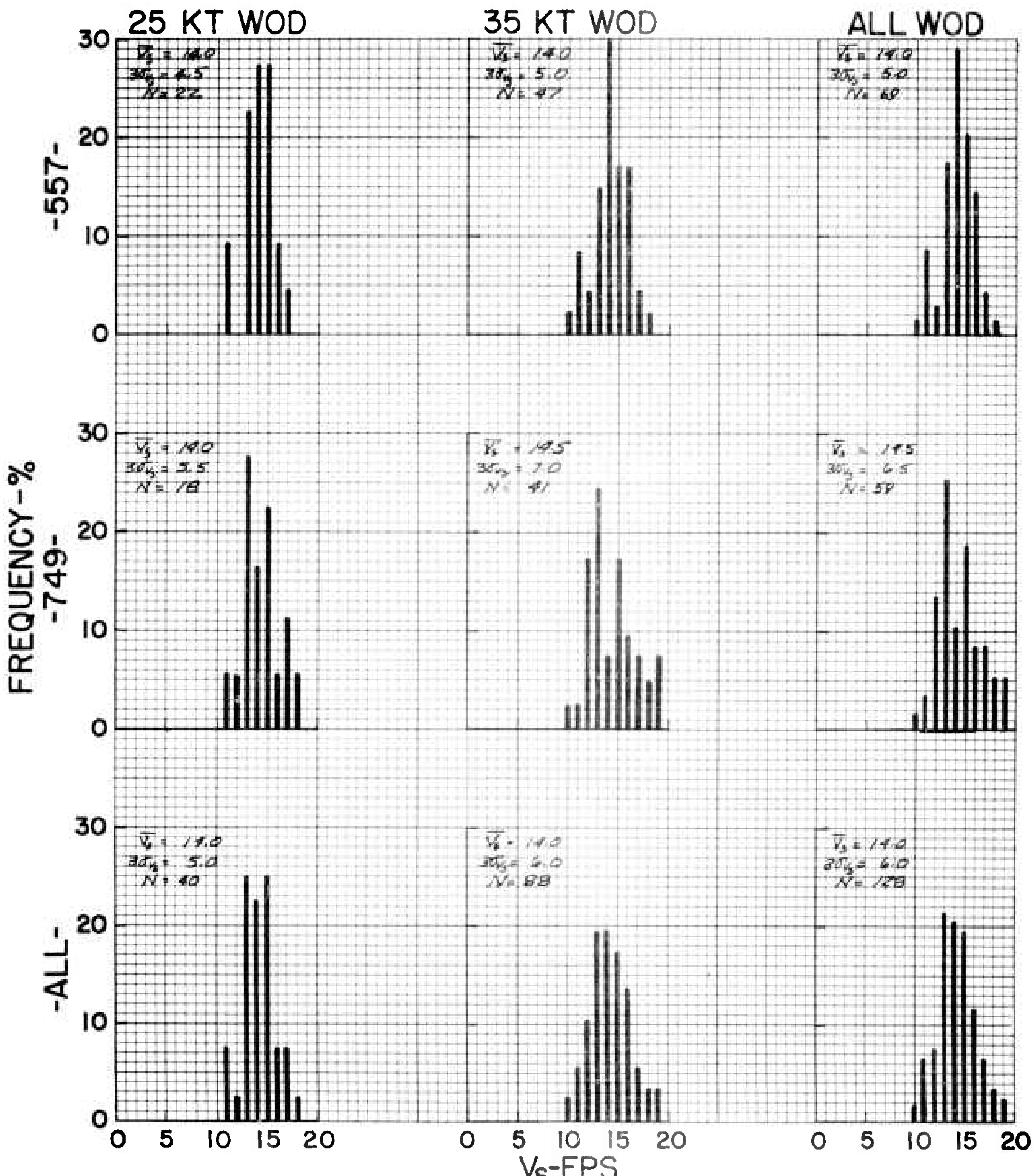
Model F8U-2 Airplane, BuNo 145557
Model F8U-1 Airplane, BuNo 143749

FREQUENCY DISTRIBUTION OF DEVIATION FROM RECOMMENDED AIRPLANE APPROACH SPEED



Model F8U-2 Airplane, BuNo 145557
Model F8U-1 Airplane, BuNo 143749

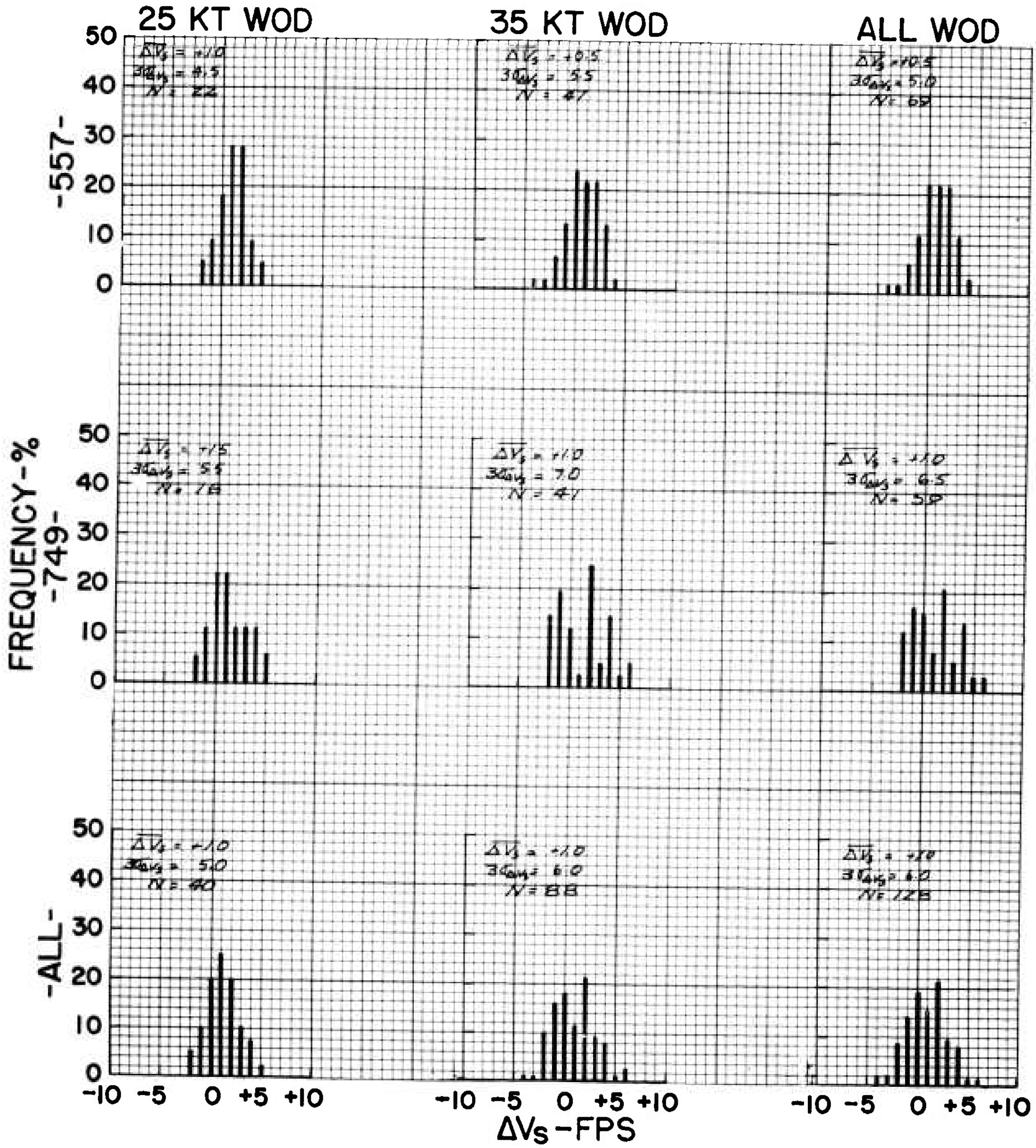
FREQUENCY DISTRIBUTION OF AIRPLANE
SINKING SPEED



RA1200001
(RSSH-31003)
FT2222- 176

Model F8U-2 Airplane, BuNo 145557
Model F8U-1 Airplane, BuNo 143749

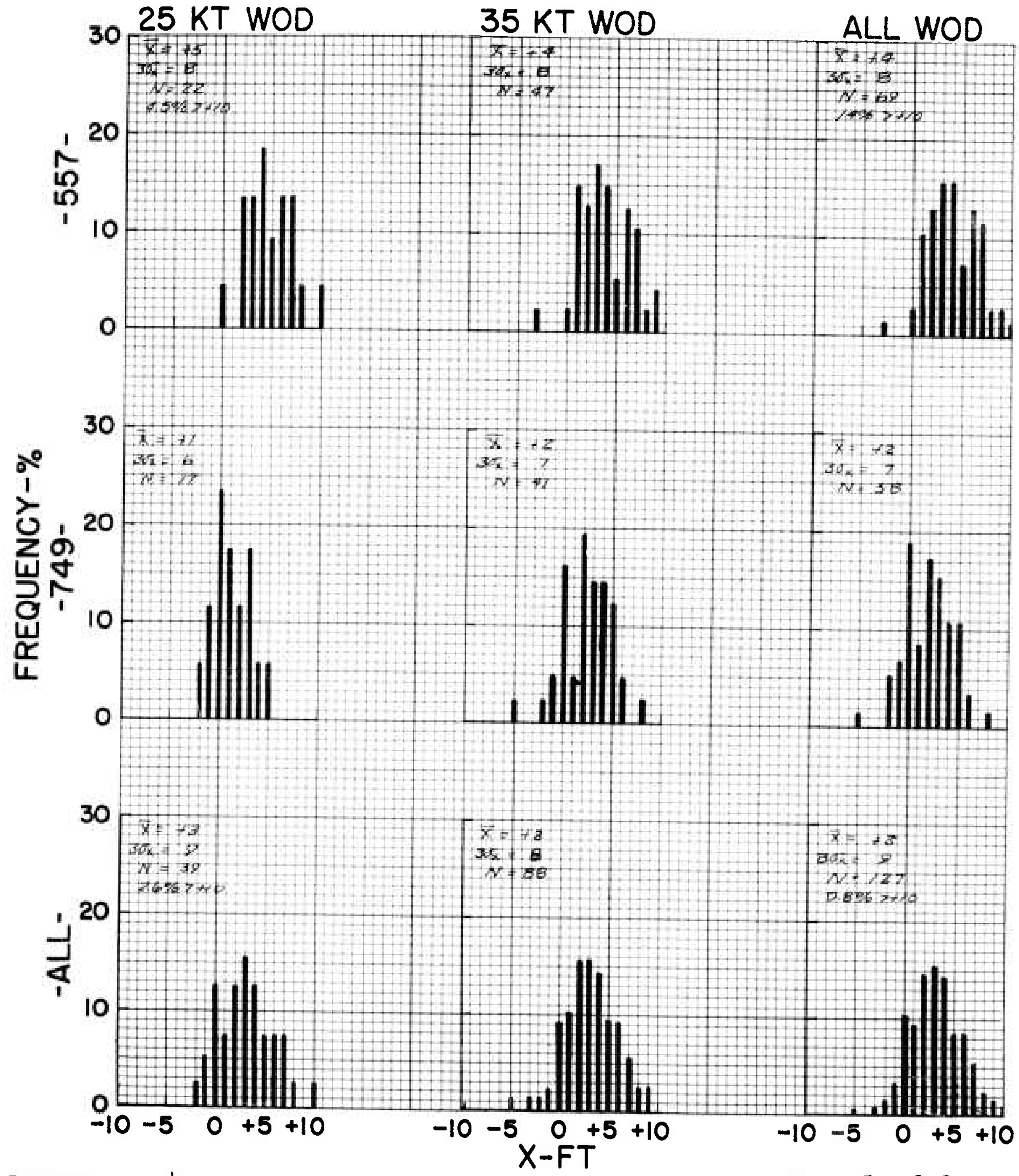
FREQUENCY DISTRIBUTION OF DEVIATION FROM
THEORETICAL AIRPLANE SINKING SPEED



RA1200001
(RSSH-31003)
FT2222-176

Model F8U-2 Airplane, BuNo 145557
Model F8U-1 Airplane, BuNo 143749

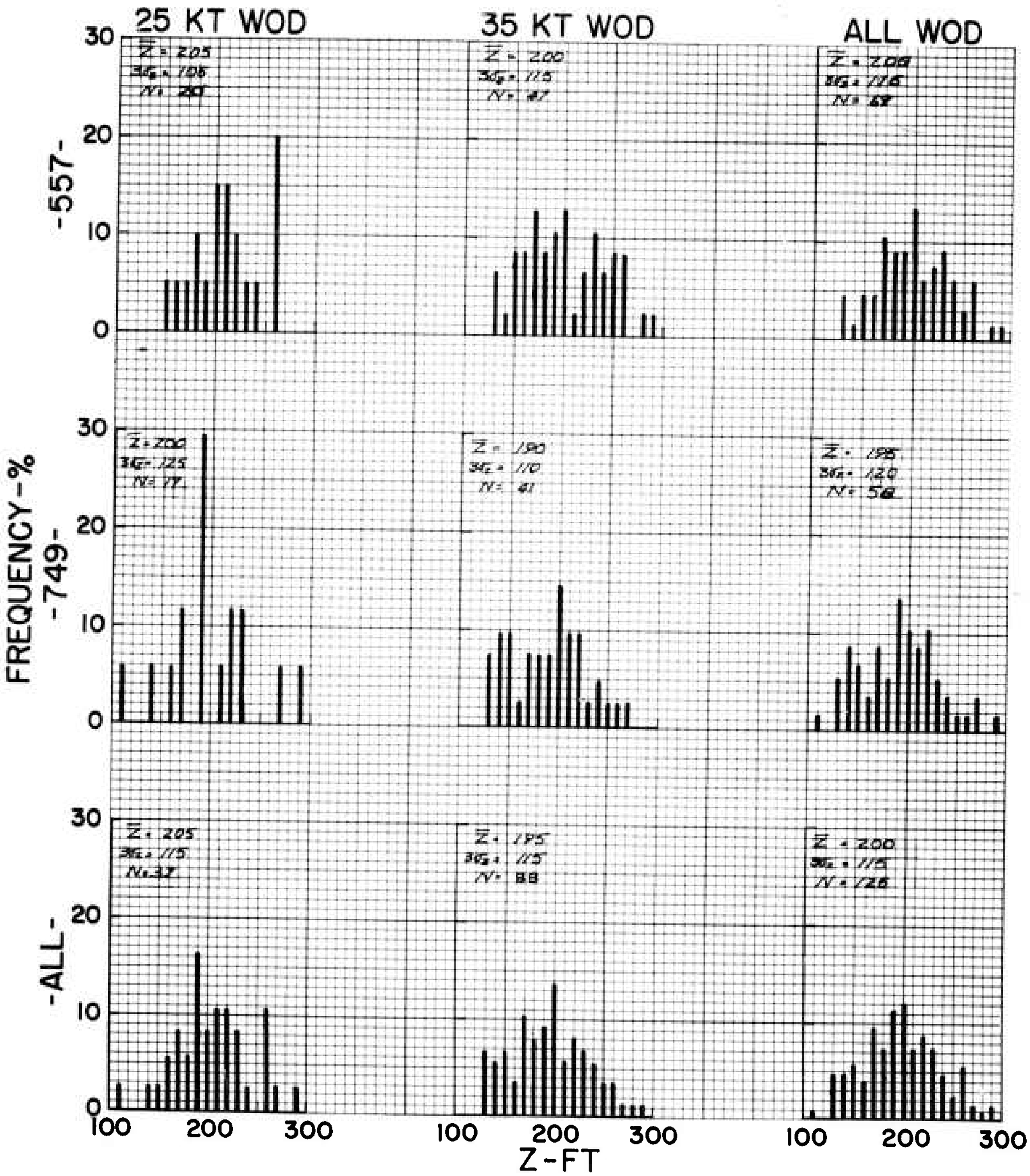
FREQUENCY DISTRIBUTION OF AIRPLANE
OFF-CENTER DISTANCE AT TOUCHDOWN



LEGEND: + Starboard
- Port

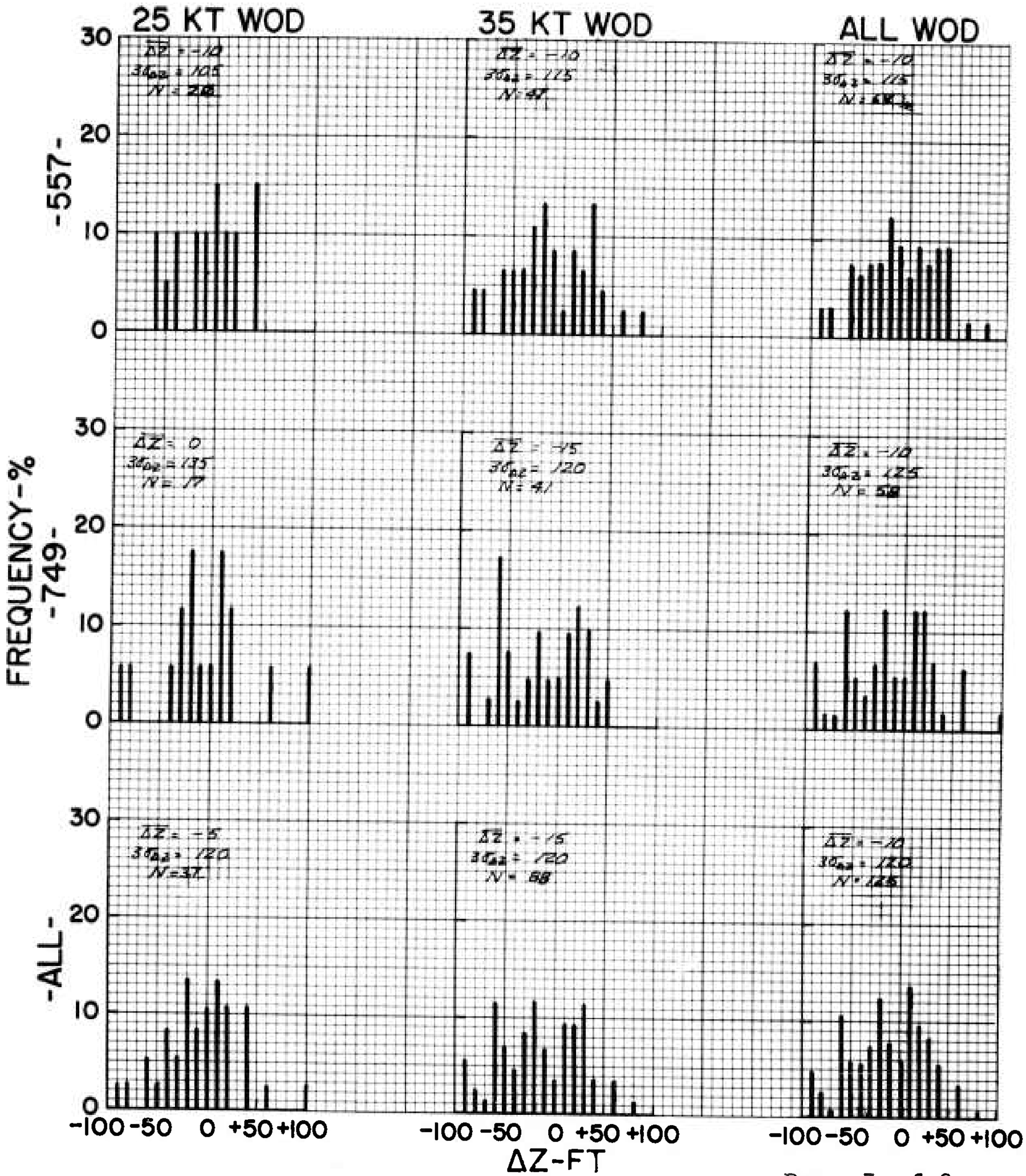
Model F8U-2 Airplane, BuNo 145557
Model F8U-1 Airplane, BuNo 143749

FREQUENCY DISTRIBUTION OF AIRPLANE
MAIN GEAR TOUCHDOWN DISTANCE FROM RAMP



Model F8U-2 Airplane, BuNo 145557
Model F8U-1 Airplane, BuNo 143749

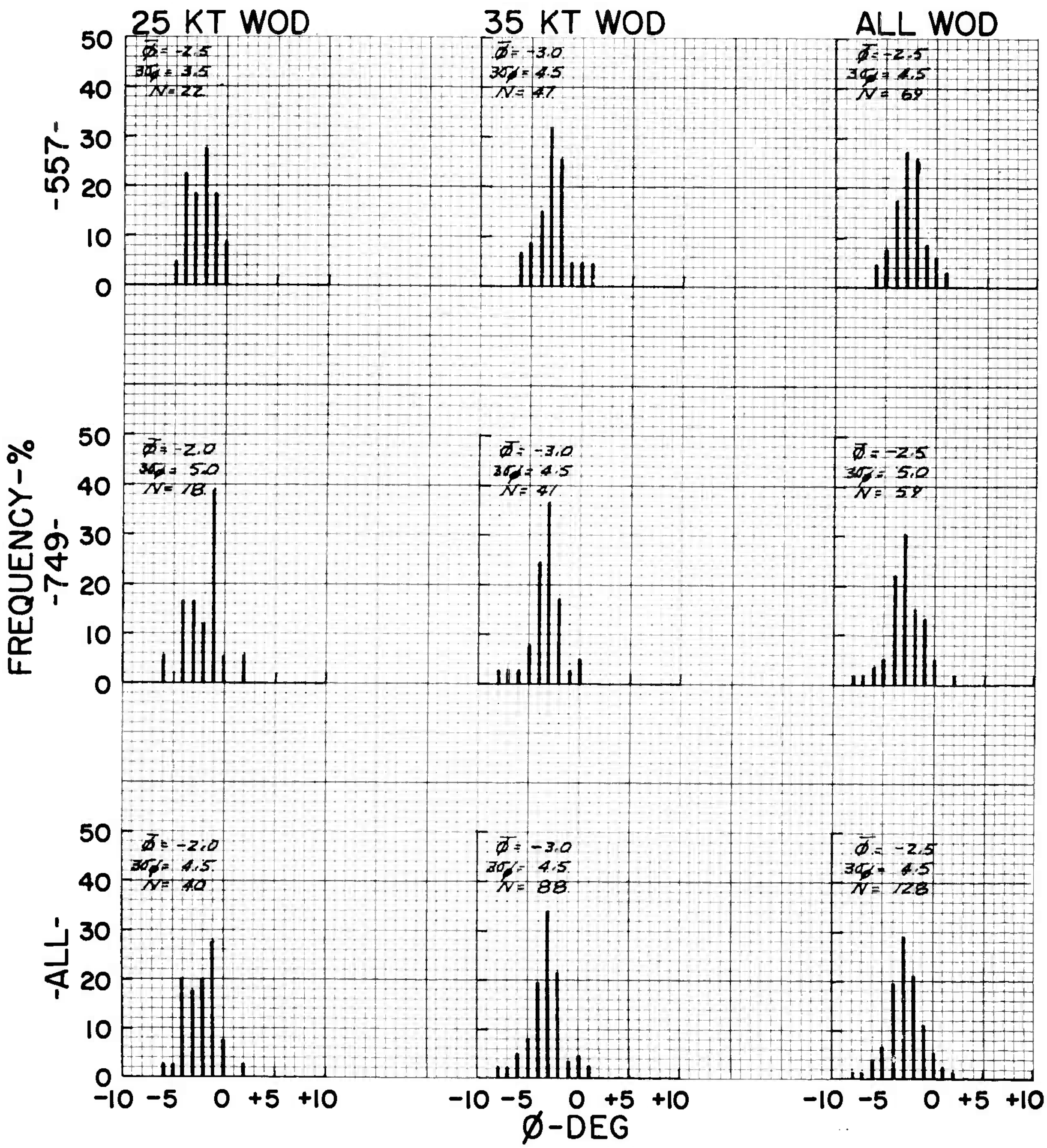
FREQUENCY DISTRIBUTION OF DEVIATION FROM
THEORETICAL MAIN GEAR TOUCHDOWN DISTANCE FROM RAMP



RA1200001
(RSSH-31003)
FT2222- 176

Model F8U-2 Airplane, BuNo 145557
Model F8U-1 Airplane, BuNo 143749

FREQUENCY DISTRIBUTION OF AIRPLANE
ROLL ANGLE

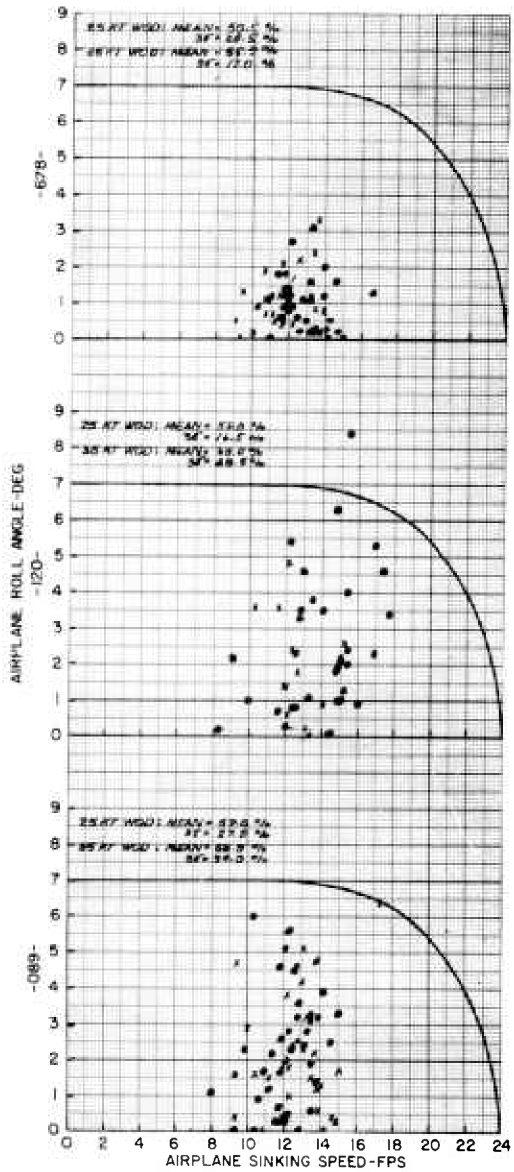


LEGEND: + Starboard
- Port

RA1200001
(RSSH-31003)
FT2222- 176

Model A4D-2 Airplane
BuNo 142678
BuNo 142120
BuNo 142089

COMPARISON OF PER CENT ULTIMATE
SINKING SPEED/ROLL ANGLE ENVELOPE



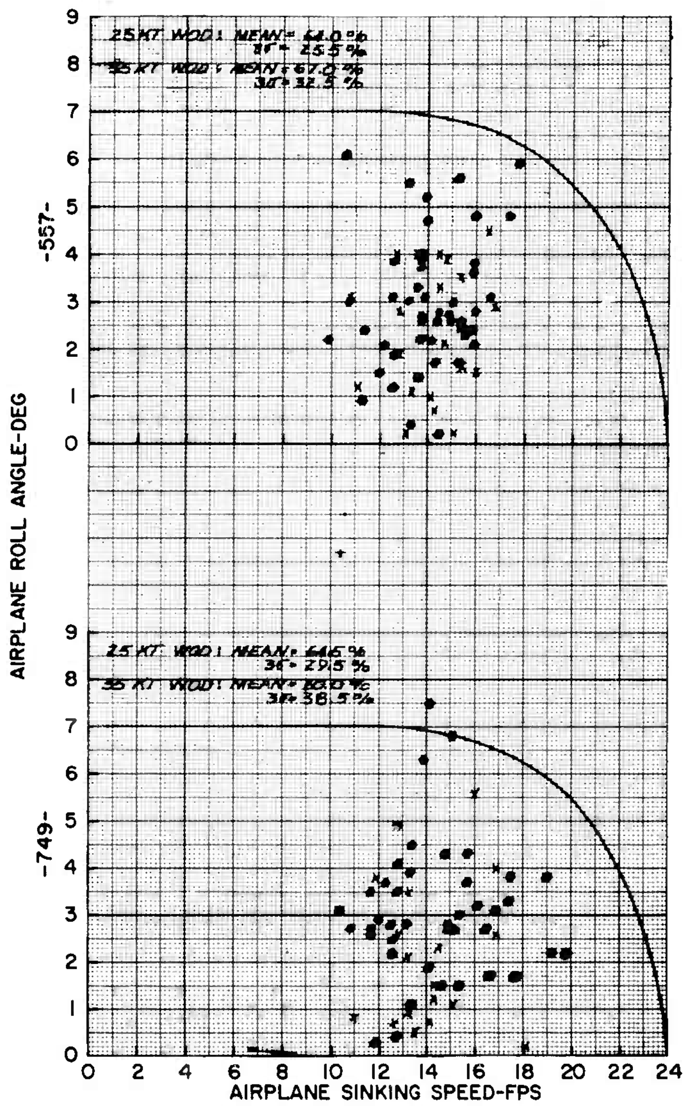
LEGEND: X - 25 kt WOD
● - 35 kt WOD

RA1200001
(RSSH-31003)
FT2222-176

Model F8U-2 Airplane, BuNo 145557

Model F8U-1 Airplane, BuNo 143749

COMPARISON OF PER CENT ULTIMATE
SINKING SPEED/ROLL ANGLE ENVELOPE



LEGEND: X - 25 kt WOD
● - 35 kt WOD

RA1200001
(RSSH-31003)
FT2222-176

DETERMINATION OF EQUATIONS UTILIZED IN THE STATISTICAL ANALYSIS OF AIRPLANE LANDING PARAMETERS

MK VI, MOD 0 FLOLS GLIDE SLOPE

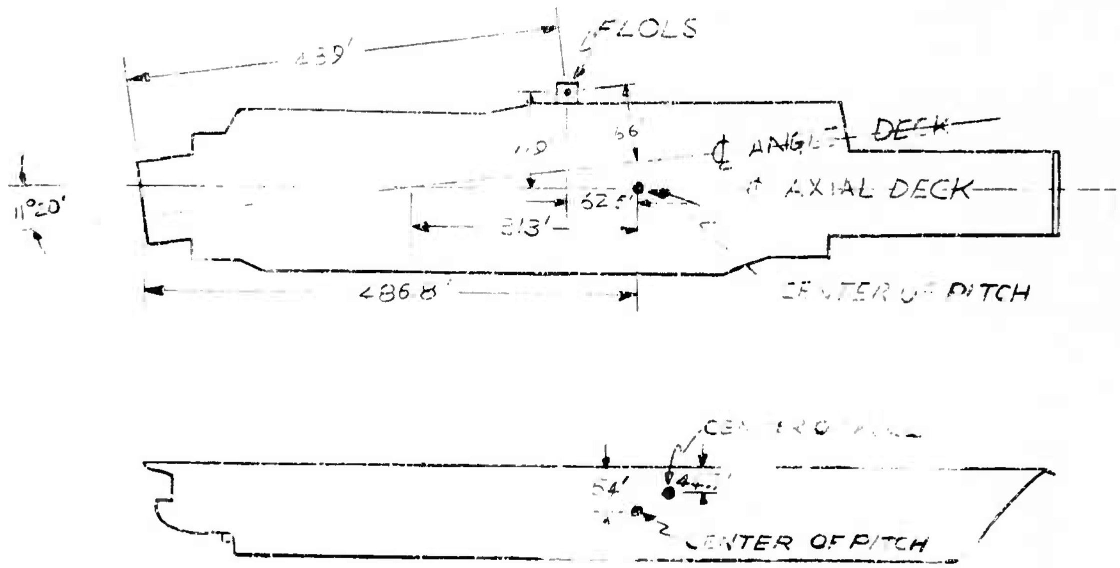


Figure 1

Figure 1 was extracted from NAEF Drawing No 318325 which shows the location of the FLOLS aboard CVA-43 with respect to the flight deck and the pitch and roll axes. The stabilization system will stabilize the glide slope at a point 2500 ft aft of the unit as a result of pitch and roll signals which it receives from the ship's stable elements.

Assuming a stern pitch down:

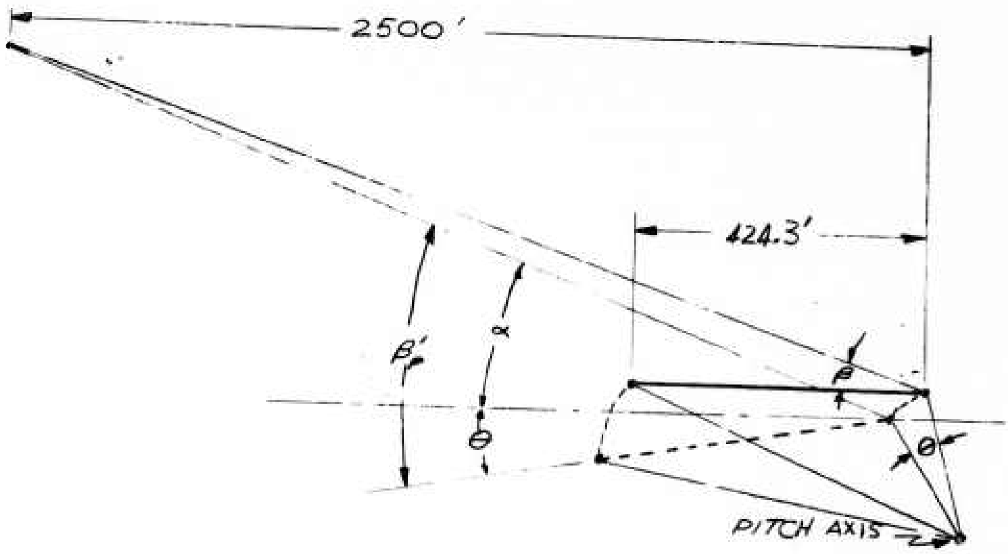


Figure 2

Where, β = OLS glide slope setting, deg

β_p' = glide slope angle with respect to the axial deck resulting from pitch, deg

θ = ship's pitch angle with respect to the axial deck, deg

α = angle between the new glide slope angle and the horizontal, deg

Figure 2 is a side view of the carrier perpendicular to the centerline of the axial deck. It is assumed that the vertical and horizontal translation of the FLOLS resulting from pitch are insignificant when compared to 2500 ft which is utilized in computing α .

$\therefore \beta = \alpha$

It is also assumed in Figure 2 that the angle between the axial deck centerline and the horizontal (θ) is equal to the angle between the angle deck centerline and the horizontal which is nearly correct for small values of θ. Therefore, θ is equal to the new glide slope angle with respect to the angle deck centerline.

$$\beta'_p = \beta \pm \theta \quad \text{; where, } \theta \text{ is positive for a stern pitch down and negative for a stern pitch up.} \qquad (1)$$

The preceding assumptions will result in approximately 0.03-0.05 deg error in determining the value of θ. The new glide slope angle resulting from ship's roll, β'_r, with respect to the angle deck centerline takes into consideration the vertical displacement of the FLOLS and the fact that the centerline of the angle deck does not coincide with the axis of roll. The stern to bow view for a port roll is as follows:

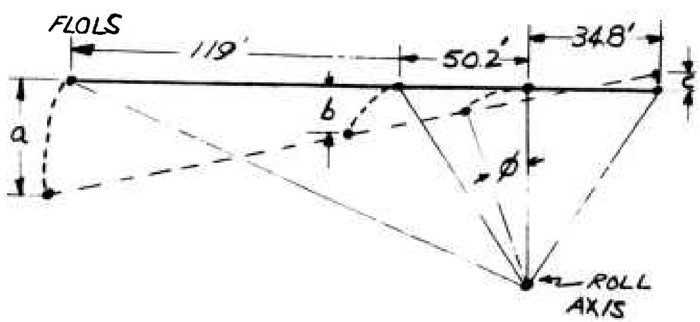
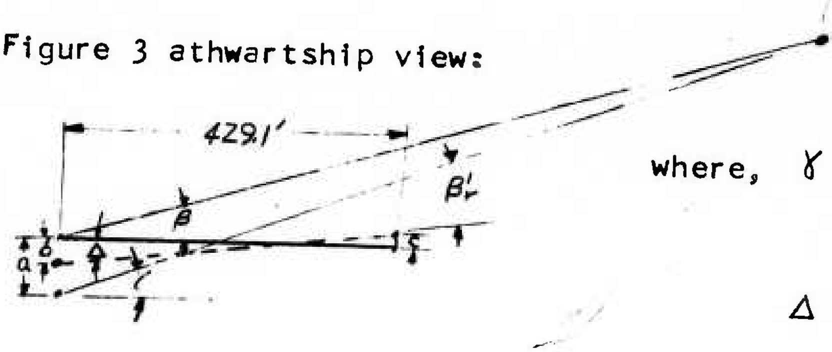


Figure 3

a = vertical displacement of the FLOLS, ft
b = vertical displacement of the angle deck centerline opposite the FLOLS, ft
c = vertical displacement of the angle deck centerline at the ramp, ft
ϕ = ship's roll angle, deg

Figure 3 athwartship view:



where, γ = angle between new glide slope and horizontal, deg

Δ = angle between horizontal and angle deck centerline, deg

β'_r = glide slope angle with respect to centerline of angle deck resulting from roll, deg

Figure 4

From Figure 4:

$$\gamma = \beta + \tan^{-1}\left(\frac{a}{2500}\right) \tag{2}$$

$$\Delta = \sin^{-1}\left(\frac{b-c}{429.1}\right) \tag{3}$$

$$\beta'_r = \beta + \tan^{-1}\left(\frac{a}{2500}\right) - \sin^{-1}\left(\frac{b+c}{429.1}\right) \tag{4}$$

Determining the values of a, b and c for small values of ϕ and substituting in equation (4), the approximate value of β'_r is as follows:

$$\beta_r = \beta \mp \frac{\phi}{7}$$; where, ϕ is positive for a starboard roll and negative for a port roll. (5)

The error in equation (5) is approximately 0.008 deg. To determine the glide slope angle with respect to the angle deck centerline resulting from a combination of pitch and roll, β' , equations (1) and (5) were combined as follows:

$$\beta' = \beta \pm \theta \mp \frac{\phi}{7} \qquad (6)$$

THEORETICAL MAIN GEAR TOUCHDOWN DISTANCE FROM THE RAMP ($MGTD_T$)

The theoretical main gear touchdown distance from the ramp ($MGTD_T$) was determined by first taking into consideration the variation in the optical touchdown distance (OPTD) as a function of the ship's pitch and roll and the eye to ramp (E/R) clearance in the following manner:

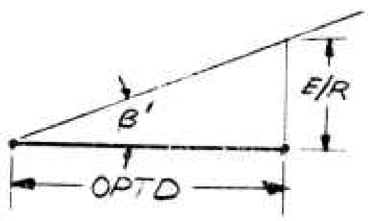


Figure 5

$$OPTD = \frac{E/R}{\tan\beta'} \qquad (7)$$

Where, β' is the resultant glide slope determined from equation (6).

The E/R for a steady deck is a function of the OLS glide slope angle and FLOLS lateral roll angle which was adjusted according to Aircraft Recovery Bulletin 10A. The FLOLS roll angle dial setting is $6\frac{1}{2}^{\circ}$ when there is no lateral roll angle in the FLOLS and it was assumed when this condition existed and the deck was steady (0° ship's pitch and roll) the OPTD is 439 ft forward of the ramp or the location of the FLOLS. Thus, equation (7) was expanded as follows:

$$OPTD = \frac{E/R \pm d}{\tan\beta'} = \frac{439 \tan\beta' \pm d}{\tan\beta'} = 439 \pm \frac{d}{\tan\beta'} \qquad (8)$$

Where, d is the vertical displacement of the glide slope at the centerline of the angle deck which results from adjusting the FLOLS roll angle with the type of airplane. From the FLOLS roll angle settings and Figure 1, the value of d is as follows:

Glide Slope Angle, deg	$3\frac{1}{2}$		4	
Airplane Type	F8U	A4D	F8U	A4D
FLOLS Roll Angle, deg	4 3/4	6 3/4	3	4 3/4
d, ft	-2.0	-0.3	-4.0	-2.0
Predicted Hook to Ramp Distance, ft	11.1	11.3	12.9	12.8

The previous assumption that the centerline of the FLOLS is the OPTD for a steady deck is not correct because of the athwartship camber of the flight deck. According to Aircraft Recovery Bulletin 10-2 the camber at the installation of the FLOLS is 6 in. and the horizontal datum bars are $3\frac{1}{2}$ in. below the flight deck. This error is present in the statistical analysis of the $MGTD_T$ and will vary from 10-15 ft depending upon the OLS glide slope setting and the pitch and roll of the ship.

Equation (8) is then combined with the geometry of the airplane and the actual airplane pitch attitude ($\mathcal{E}$) at touchdown.

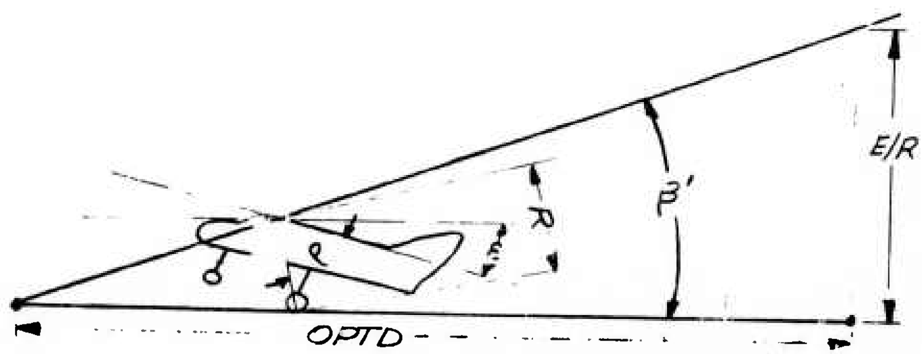


Figure 6

In figure 6 the variables are ε and β' ; R and ρ are constant depending on the airplane type. Combining equation (8) and Figure 6, the following equation is the $MGTD_T$:

$$MGTD_T = 439 \pm \frac{d}{\tan\beta'} - R\left[\frac{\cos(90-\rho-\varepsilon)}{\tan\beta'} + \sin(90-\rho-\varepsilon)\right] \qquad (9)$$

The values of R and ρ are as follows:

Airplane Type	F8U	A4D
R, ft	30.0	16.7
ρ, deg	22.1	39.5

The angle ε was determined from camera coverage of the landing area and β' from the ship's pitch and roll.

BOLTER RATE FOR TOUCH AND GO LANDINGS (BR)

The Bolter Rate for touch and go landings (BR) was found by determining from the airplane geometry the MGTD required for the arresting hook to land 235 ft forward of the ramp (last cross deck pendant). Since the pitch and roll of the ship was negligible, a constant glide slope angle was assumed. Since the MGTD does not vary appreciably with the airplane pitch attitude, it was also assumed constant.

Airplane Type	F8U		A4D	
β', deg	$3\frac{1}{2}$	4	$3\frac{1}{2}$	4
ε, deg	4	4	9	9
$MGTD_{hook\ 235}$, ft	251	250.5	263	260.5

BR was determined from the standard deviation (σ) and the average MGTD ($\overline{MGTD}$) as follows:

$$BR = \frac{MGTD_{hook\ 235} - \overline{MGTD}}{\sigma_{MGTD}} \tag{10}$$

THEORETICAL AIRPLANE SINKING SPEED (V_{St})

The theoretical airplane sinking speed (V_{St}) was determined from the glide slope angle calculated by equation (7) and the airplane engaging speed as follows:

$$V_{St} = V_E\,(1.69)\tan\beta' \tag{11}$$

PERCENT OF ULTIMATE SINKING SPEED/ROLL ANGLE ENVELOPE ($\%V_s/\phi$)

MIL-A-8629 (Aer) specifies that with 7° of airplane roll with respect to the landing surface, the airplane must be designed to withstand 50% of the ultimate sinking speed and that the relationship between roll angle and sinking speed for design purposes is to be as follows:

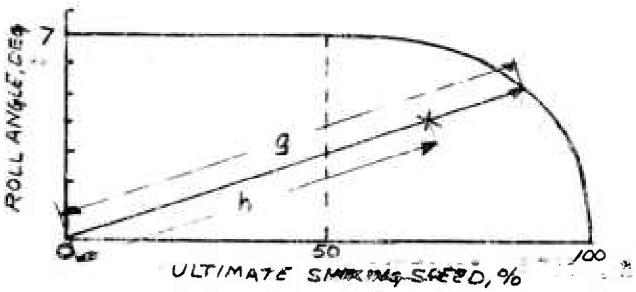


Figure 7

The combination of V_s/ϕ for each landing was plotted on Figure 7 and the $\%V_s/\phi$ was determined as follows utilizing 0° roll angle and 0 fps sinking speed as the common point:

$$\%V_s/\phi = \frac{h}{g} \tag{12}$$

RA1200001
(RSSH-31003)
FT2222- 176

ABBREVIATIONS AND SYMBOLS

T&G - Touch and go landing

B - Bolter

A - Arrested Landing

V_A - Approach Speed, kt

ΔV_A - Actual approach speed minus recommended approach speed from applicable flight handbooks, kt

V_S - Sinking speed (average of Mitchell Camera and Cameraflex Readings) fps

ΔV_S - Actual sinking speed minus theoretical sinking speed, fps

MG/R - Main gear to ramp clearance, ft

X - Off-center distance at touchdown, ft

Y - Off-center distance at the ramp, ft

Z - Main gear touchdown distance from ramp (Cameraflex when Mitchell Camera data are not available), ft

ΔZ - Actual main gear touchdown distance minus theoretical main gear touchdown, ft

ϕ - Airplane roll angle with respect to angle deck, deg

θ - Pitch attitude with respect to the horizontal, deg

N - Number of landings

σ - Standard deviation

$>$ - Greater than
$<$ - Less than
(Used on enclosures (7) and (8) to designate the % landings outside the limits of the curve)

NOTE: A bar over symbol designates the mean.

Enclosure (11)

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BIBLIOGRAPHY OF SELECTED REPORTS
PERTINENT TO "BURBLE" AND WOD VARIATION

1. WIND DIRECTION AND SPEED ACROSS THE FLIGHT DECK OF USS RANGER (CVA 61) (CVA 59 class) (Unclas) by T. K. Kjellman and R. B. Colt. Survey rept Apr 58 by Friez Instrument Div., Bendix Aviation Corp., Baltimore Md. (ASTIA file ref No. AD-162 463 Div. 31,2).

Purpose: Tests at conditions representative of aircraft operations were run aboard USS RANGER to determine how the relative wind direction and velocity differs at various locations on the ship with respect to the yardarm wind detectors.

2. WIND DIRECTION AND SPEED ACROSS THE FLIGHT DECK OF THE USS TICONDEROGA (CVA 14) (CVA 19 Angled Deck Class) (Unclas) by T. K. Kjellman and R. B. Colt. Survey rept Aug 57 by Friez Instrument Div., Bendix Aviation Corp., Baltimore, Md. (ASTIA file ref No. AD-162 465 Div. 31,2).

Purpose: Same as paragraph 1.

3. WIND DIRECTION AND SPEED ACROSS THE FLIGHT DECK OF THE USS VALLEY FORGE (CVS 45) (CVS 9 (Ex CVA 9) Class) (Unclas) by T. K. Kjellman and R. B. Colt. Survey rept Feb 58 by Friez Instrument Div., Bendix Aviation Corp., Baltimore, Md. (ASTIA file ref No. AD-162 464 Div. 2,31).

Purpose: Same as paragraphs 1 and 2.

4. WIND SURVEY OF CVA TYPE CARRIER (Unclas) by T. K. Kjellman. Final Engineering rept on Phase I for Jun 56 - May 58 by Friez Instrument Div., Bendix Aviation Corp., Baltimore, Md. (ASTIA file ref No. AD-162 621 Div. 2,31).

Purpose: Test conditions were chosen to represent winds significant for aircraft operations and true meteorological computations using wind direction and speed across the flight decks of the USS RANGER, USS TICONDEROGA and USS VALLEY FORGE.

5. CARRIER CROSSWIND LAUNCHING AND LANDING OPERATIONS WITH CURRENT NAVY AIRPLANES (Conf), special rept 3 Jan 58. Naval Air Test Center, Patuxent River, Md. Proj. TED No. PTR SI 4291 ser No. FT35-04. (ASTIA file ref No. AD-153 660 Div. 1/2).

Purpose: (Confidential report).

6. CARRIER CROSSWIND LAUNCHING AND LANDING OPERATIONS WITH CURRENT NAVY AIRPLANES (Conf), rept No. 1, 19 Aug 58 by J. J. Olenski and T. P. Dankworth. Naval Air Test Center, Patuxent River, Md. Proj. TED No. PTR SI-4291 ser No. FT35-093. (ASTIA file ref No. AD-307 340L Div. 1/4).

Purpose: (Confidential report).

7. CARRIER CROSSWIND LAUNCHING AND LANDING OPERATIONS WITH CURRENT NAVY AIRPLANES (Conf), rept No. 2 (final) 18 Nov 58 by K. deBooy and T. P. Dankworth. Naval Air Test Center, Patuxent River, Md. Proj. TED No. PTR SI-4291 ser No. FT35-0137. (ASTIA file ref No. AD-305 621L Div. 1/4).

Purpose: (Confidential report).

8. A COMPARISON OF AIRFLOW WITH AND WITHOUT CONSIDERATION FOR ANGULARITY EFFECTS IN THE WAKE OF A CVA-(N)65 AIRCRAFT CARRIER MODEL (Conf) by W. F. Barnett and M. P. Schultz 23 May 60 David Taylor Model Basin Aerodynamics Laboratory Aero. Test A-479.

Purpose: (Confidential report).

9. CARRIER AIRFLOW ANALYSIS CVA 66 GLIDE PATH STUDIES (Unclas) by C. S. Hoover 28 Sep 61. Naval Air Engineering Laboratory (Ship Installations) ENG-6829.

Purpose: The results of a study conducted in the Naval Air Engineering Laboratory (Ship Installations) three-dimensional wind tunnel to investigate the airflow in the wake of the CVA 66, particularly in the glide path of a landing aircraft. Causes of undesirable effects as well as possible corrections are included in the study.

10. NOTE ON THE AIRFLOW OVER AN AIRCRAFT CARRIER (Unclas) by F. O. Ringleb. Naval Air Engineering Laboratory (Ship Installations) SE-05:FOR:mf, undated.

Purpose: Observations and experiments carried out in the three-dimensional smoke tunnel at the Naval Air Engineering Laboratory (Ship Installations) to determine principal factors influencing the airflow astern of the aircraft carrier.