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The White Tern May be Unable to Hover in Still Air.—Many terns obtain prey by skillful plunge-dives from air to water. Such dives are often preceded by periods of hovering, an energetically expensive activity. Hovering in still air (true hovering) may require more power than is available for more than a few strokes. Sustained hovering is characteristic of few birds and impossible for large ones (Pennycuick 1975, Rayner 1979) and numerous "apparent hoverers" may be able to remain stationary only in the presence of wind. The limits to flight performance in diverse species are ecologically important and the occurrence of true hovering is interesting because the physiological requirements are severe, but the necessary observations can be readily specified. Dunn (1973) showed that the hunting performance of Sandwich Terns (*Sterna sandvicensis*) and Common Terns (*S. hirundo*) improved as wind speed increased from low to moderate (0.5 to 7 m/s) and suggested that the difficulty of controlled flying at low airspeeds was one possible cause.

Here I report observations of White Terns (*Gygis alba*) suggesting that this species may be unable to hover in still air. The terns were observed on several islands during a 6-day visit to the Northern Marianas (Western Pacific) in August 1979. Seven fresh specimens obtained by R. Clapp on the island of Guguan were weighed on a Pesola spring balance and the area of one extended wing of each was outlined on paper.

White Terns commonly approached me closely and appeared to examine me as an intruder. Often the tern scarcely paused in its onward flight, but on several occasions it maintained a steady position within a few meters of my head for 15–60 s. At these times a wind was always blowing. On one windless occasion the tern behaved differently and sustained its behavior long enough for some measurements of its flight performance.

On 9 August, I disturbed a pair of White Terns from their perch in a tree on the steep west face of East Island in the Maug group. It was a calm day and, among the trees, completely windless. One member of the pair circled repeatedly in my vicinity as I stood at the edge of a small gap among the trees and shrubs. This behavior continued for nearly 2 min until ended apparently as a result of my inadvertent movement. During this time, instead of remaining stationary, the tern flew at a constant, low forward velocity, over an unchanging horizontal circular flight path, at a constant height of about 3 m above the steeply-sloping ground. I estimated the position of the flight path by reference to surrounding vegetation during the observation and subsequently measured it on the ground. The diameter was 4.2 m. I timed the tern with a stopwatch through 7 circuits, which it completed in 35 s, thus at an airspeed of about 2.6 m/s.

I interpret these slow circlings as the result of the bird attempting to maintain a particular distance from me, while unable to hover under the prevailing windless conditions. The constancy of position and velocity of the circular flights suggest that the bird was moving at its lowest conveniently-sustainable airspeed. The marked difference in behavior between windless and windy conditions leads me to reject an alternative explanation of the circling as a result of an approach-avoidance conflict.

This suggestion, that White Terns are unable to hover in still air, can be related to the performance of a better-known species of similar size, the Common Tern. On the basis

of mechanical estimates (and data from Greenewalt 1962), Rayner (1979) indicated that this species should be fully capable of sustained true hovering. The power required for hovering increases with increase in wing-disc loading (the ratio of body weight to area swept out by the wings in a wingbeat cycle). The two species are similar in weight (White 121 g; Common 118 g) but the White Tern has shorter wings (semispan 348 mm, in contrast to Common 414 mm) and thus the White Tern has a higher disc-loading (3.1 N/m^2 compared to 2.1 N/m^2 for the Common Tern). Common Terns do hover in still air, but rarely for more than a few seconds. The dearth of appropriate measurements of performance stems in part from the changeability of flight characteristics. Hunting Common Terns often maintain their position over a stationary school of fish, but individuals usually make many rapid small changes in altitude and attitude with frequent back-and-forth movements on a small scale. Flight-speeds of Common Terns recorded on windless days in or near Tern colonies averaged 9.09 m/s (min 4.5; $n = 6$) (Schnell and Hellack 1979). The morphological differences between species are consistent with the conclusion that the White Tern is poorly suited to sustained hovering in still air.

I thank C. J. Ralph and R. Clapp for making the trip possible, and the U.S. Forest Service for financial support.

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