

The Journal of
**THE ROYAL
AERONAUTICAL
SOCIETY**



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DECEMBER 1951

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●
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start and
almost
anything



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AT 141

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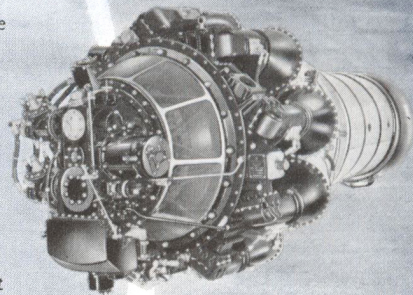
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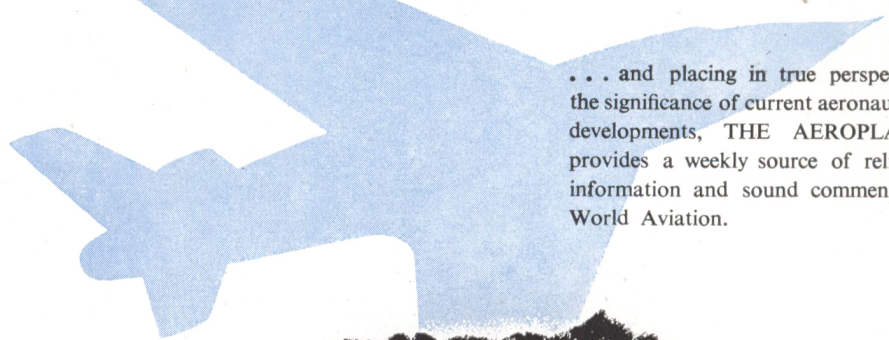
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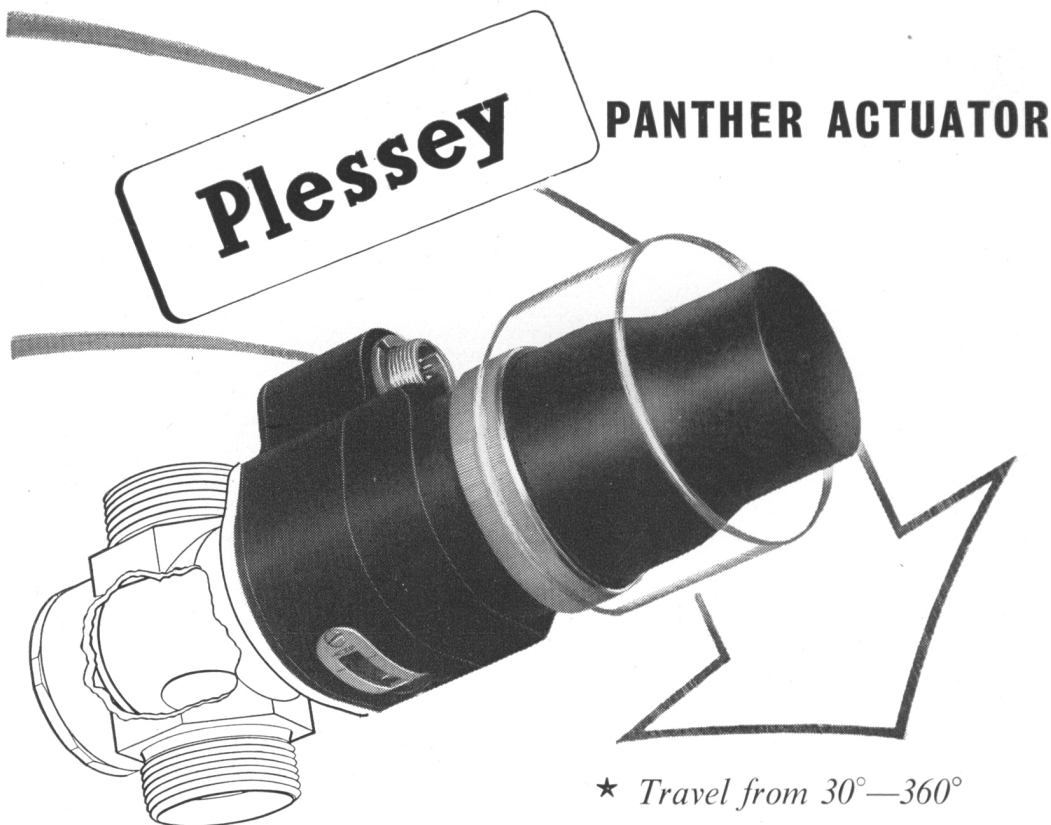
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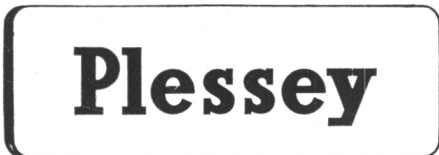
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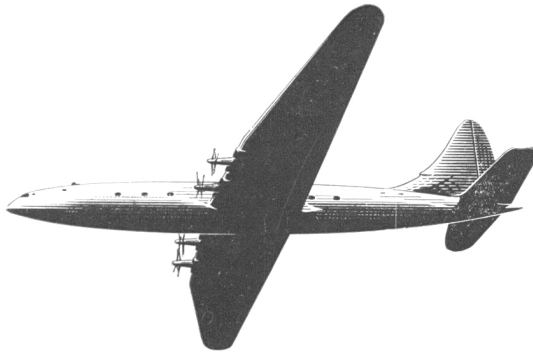
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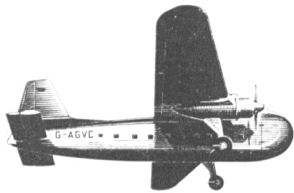


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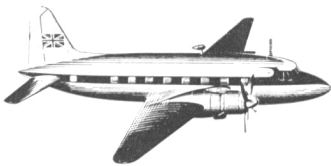
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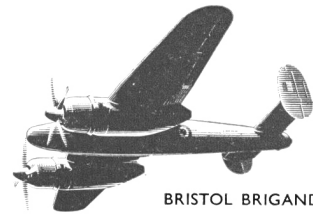


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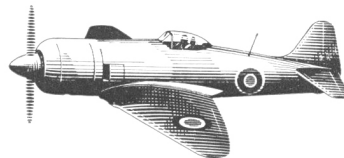
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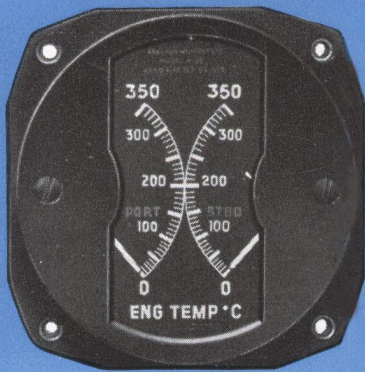
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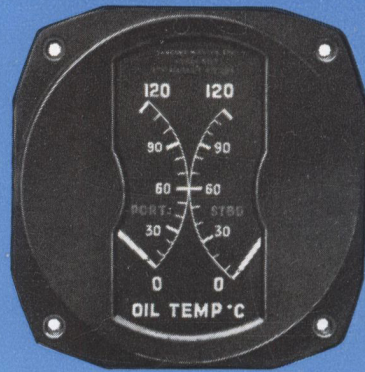
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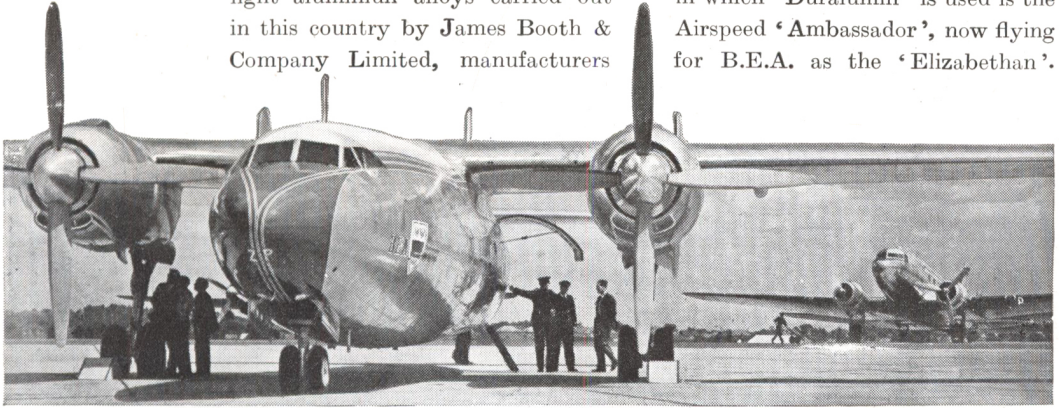
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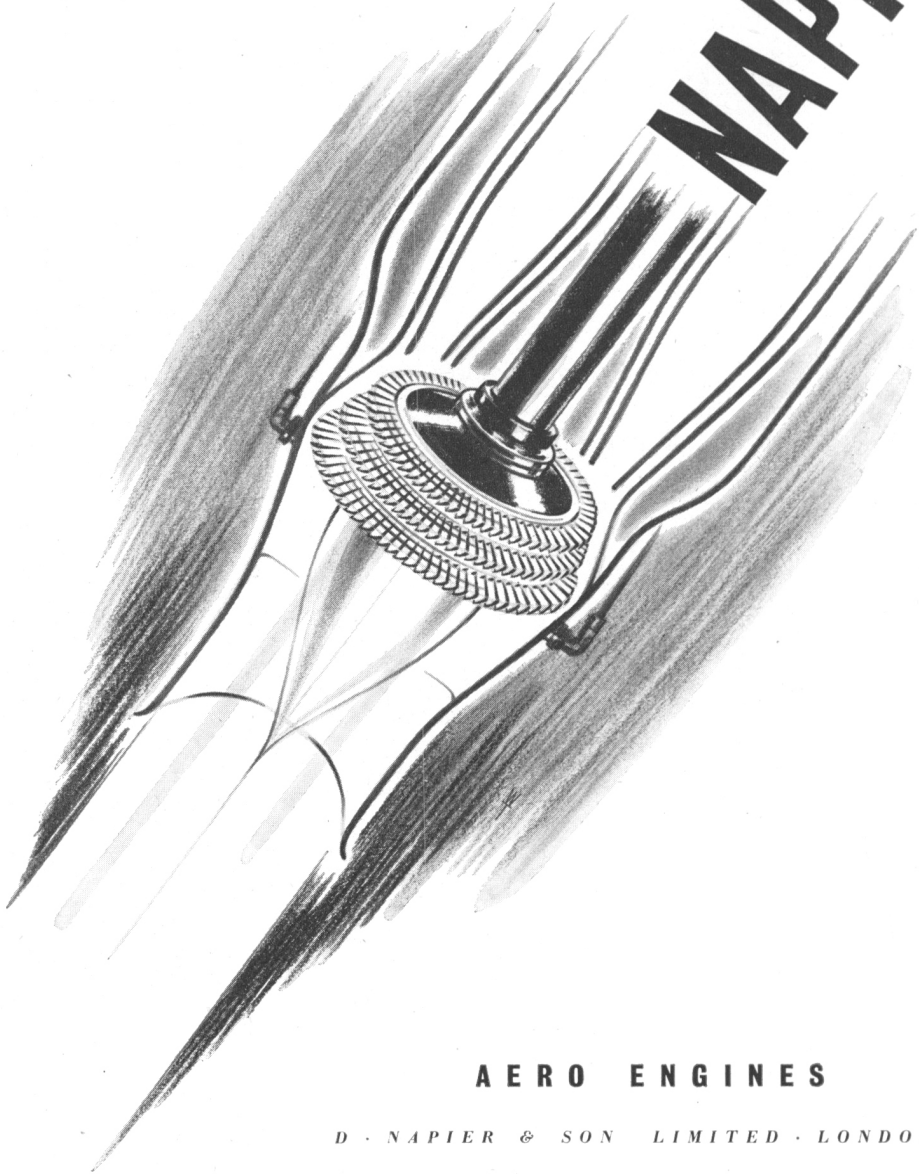
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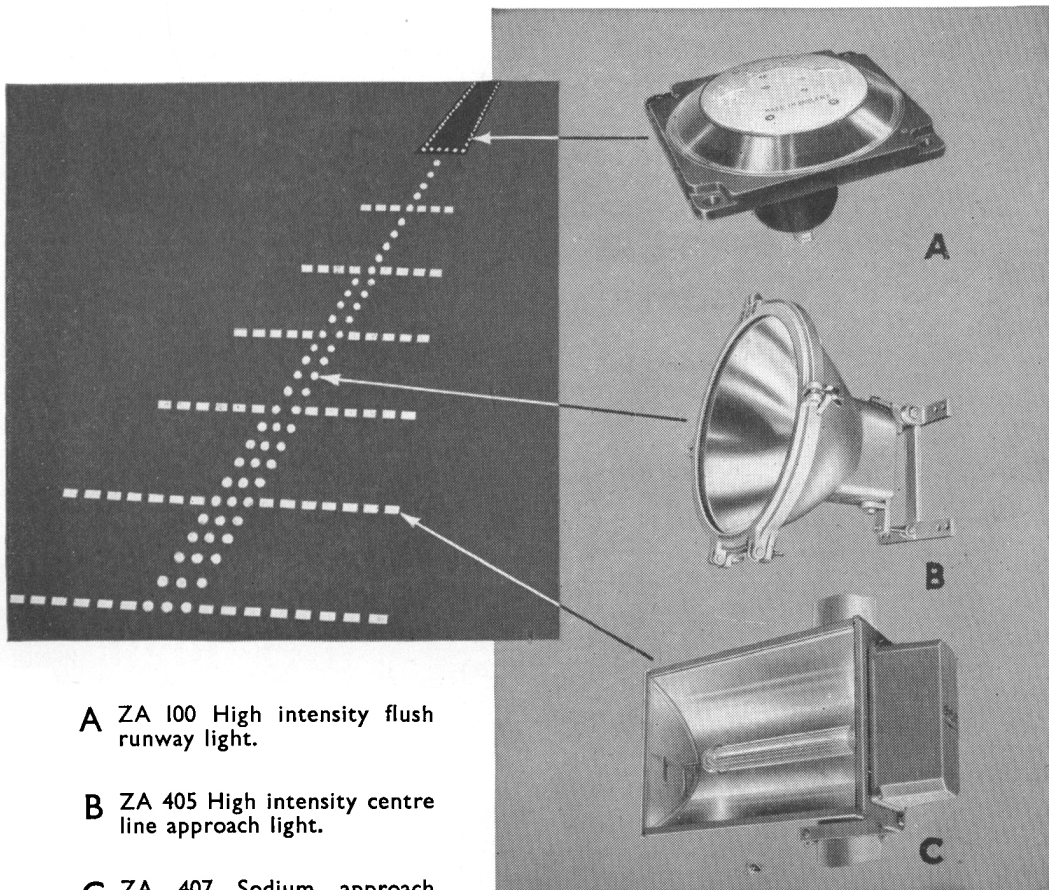


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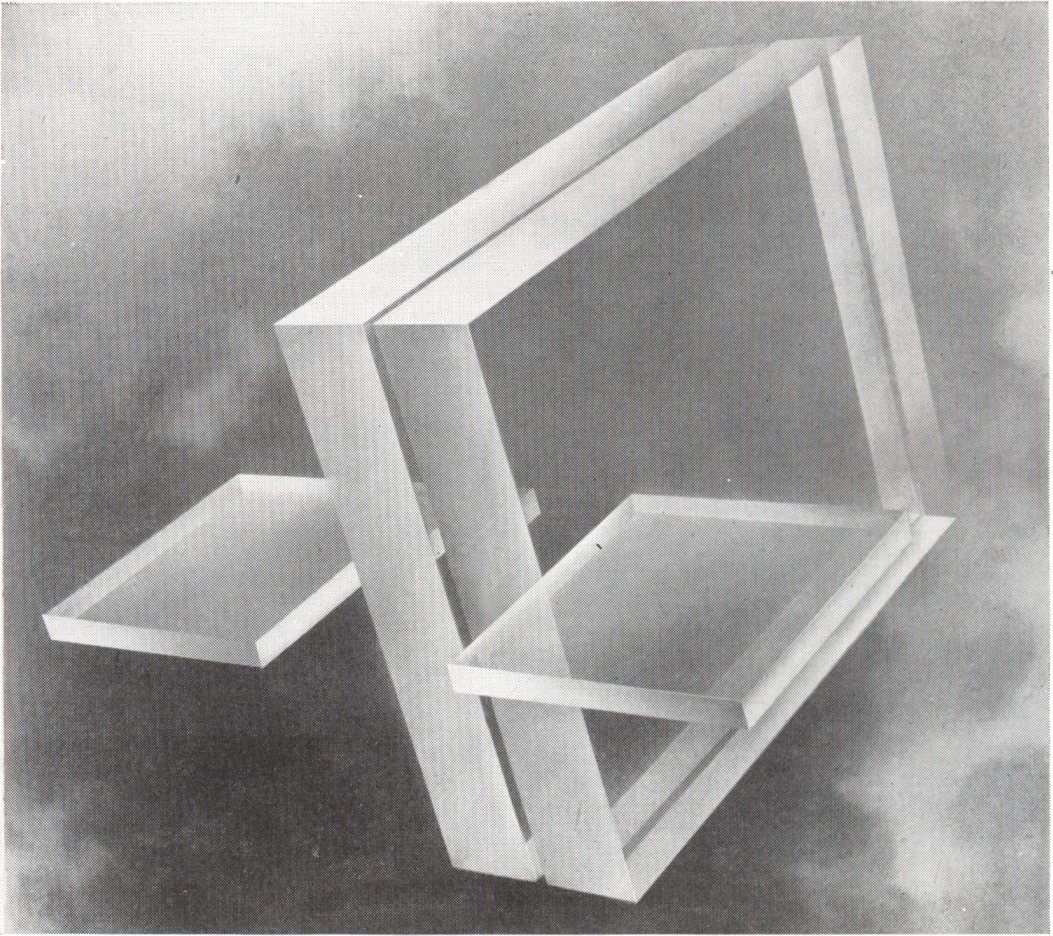
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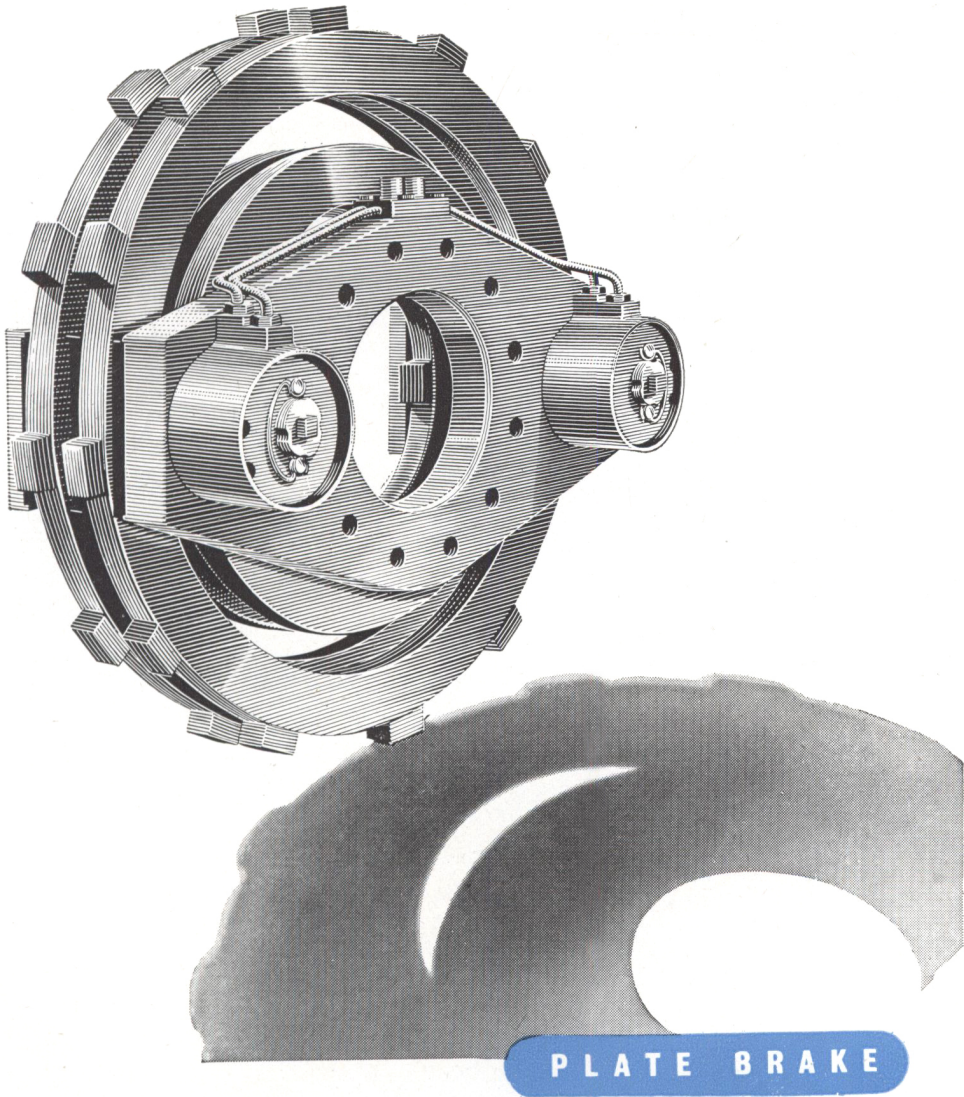
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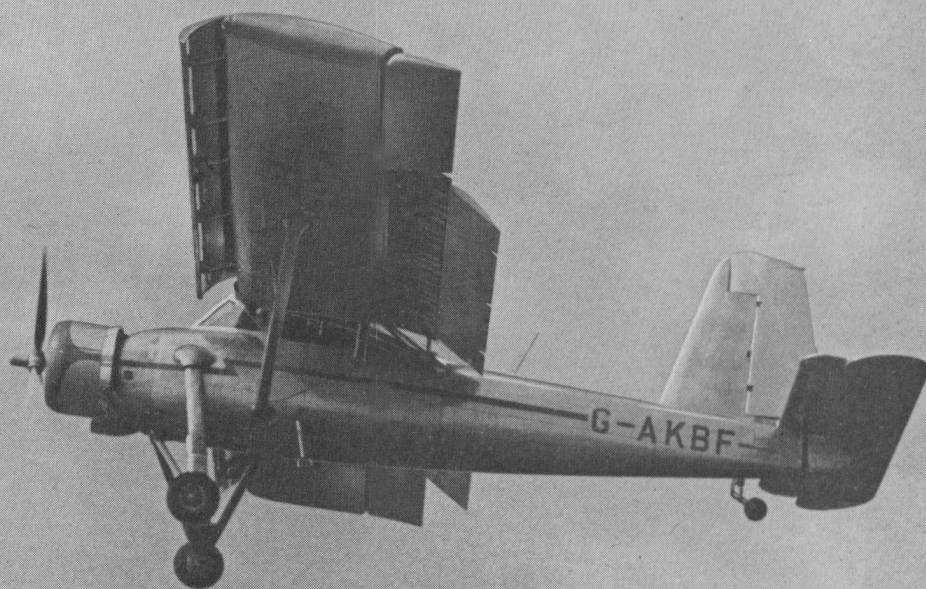
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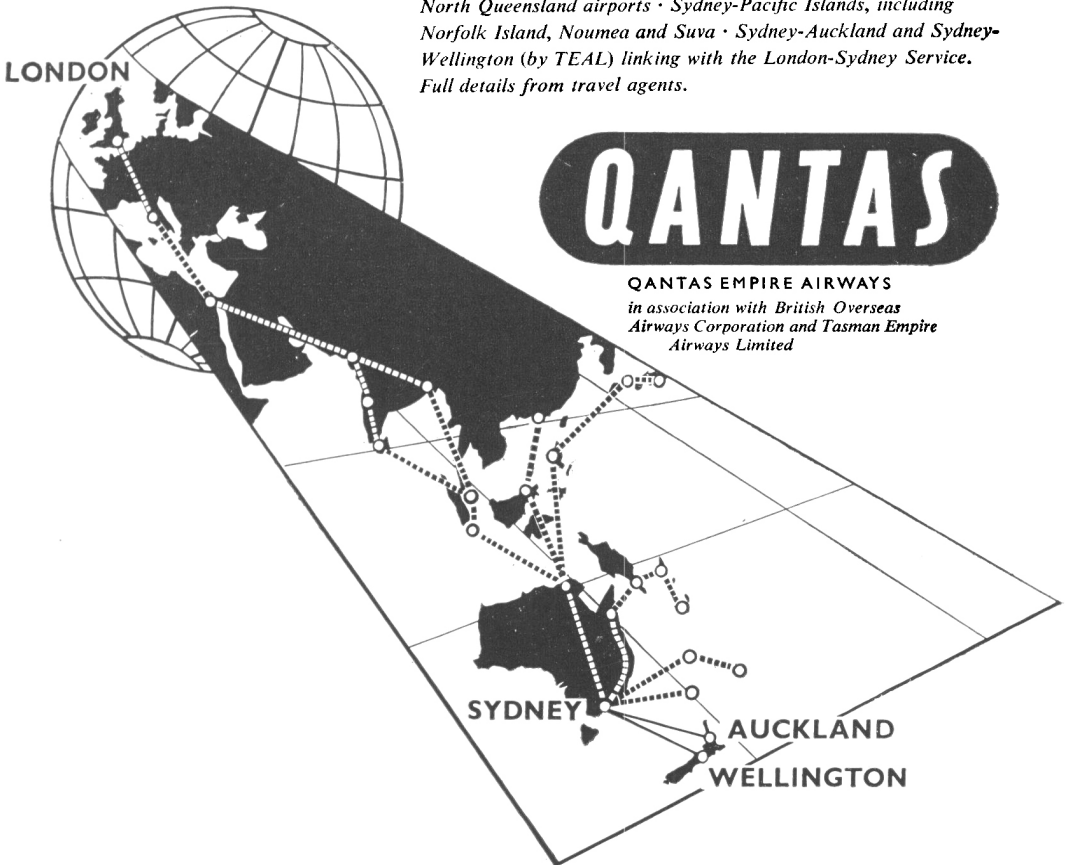
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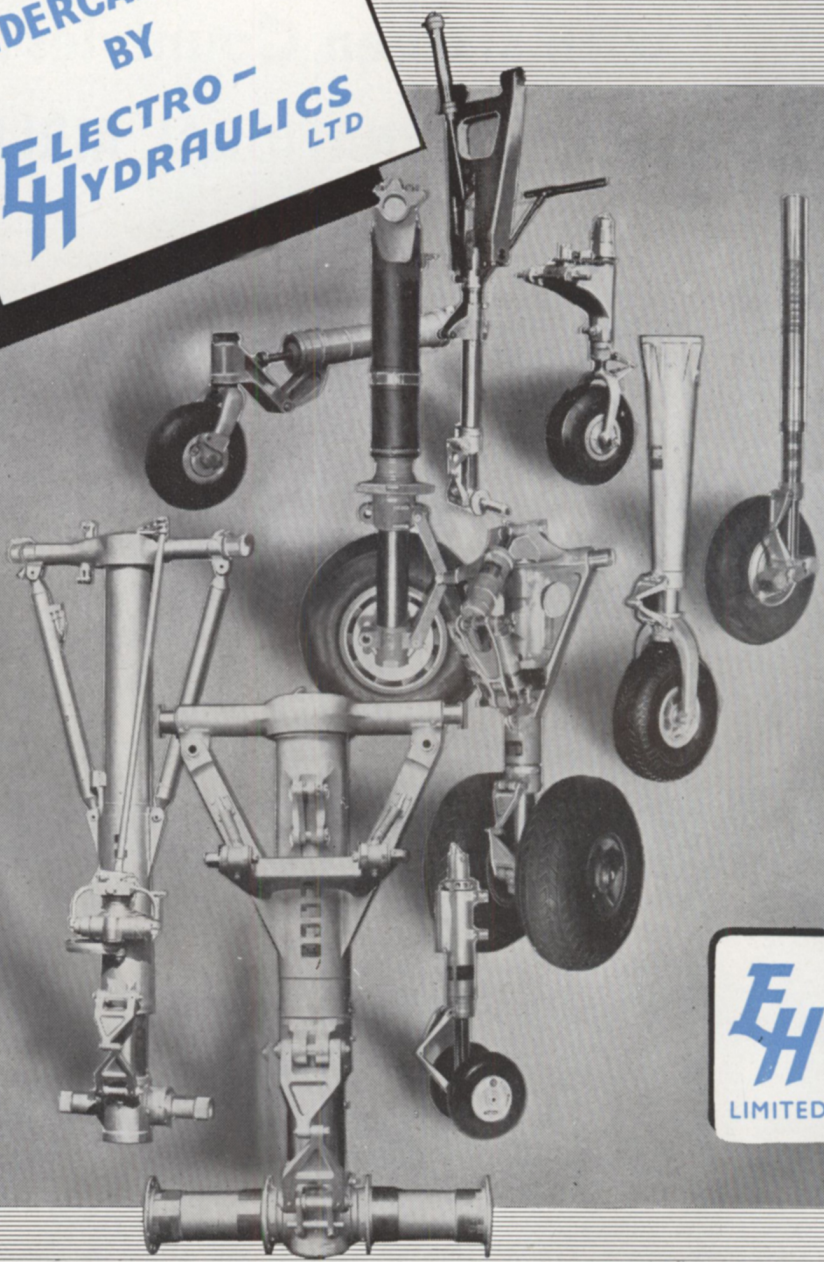
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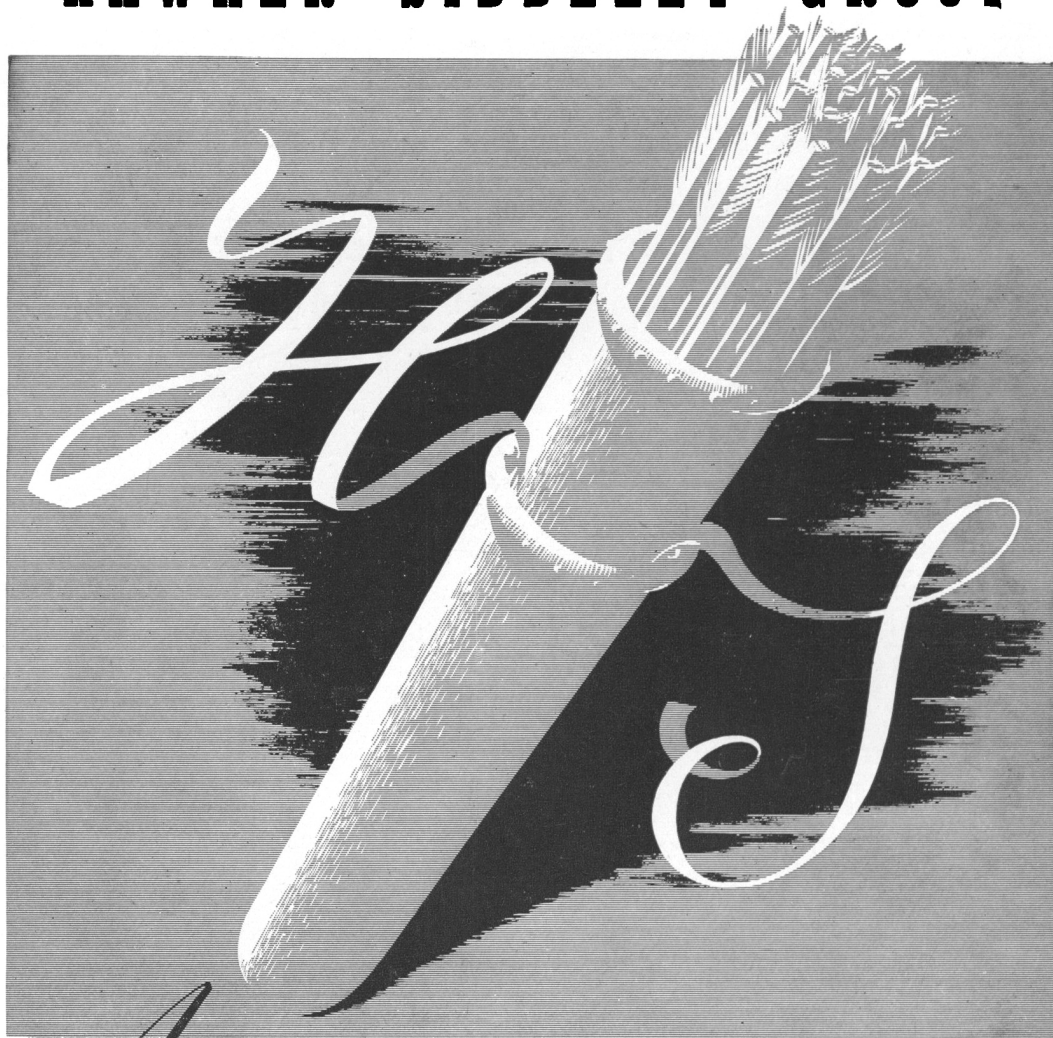
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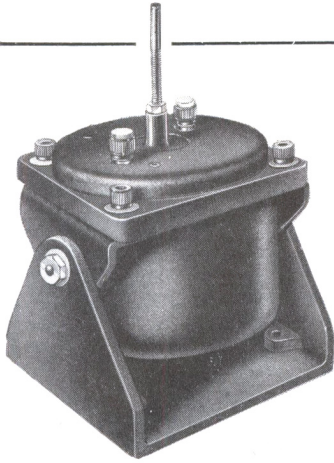
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Mountaineering in Metal

BROWSING along the non-friction shelves at the library the other day my eye caught the title, *A Plain Man's Guide to Lubrication*. I took the volume into a quiet corner and turned the pages. . . .

There was a photograph of either the Andes or the Rockies. Or was it the Alps? The high sierra, jagged peaks. I looked closer and read the legend—

“Steel surface ground with grade 150 carborundum. Height of irregularities about 3,000 to 10,000 Ångströms. Vertical magnification $\times 10,000$.”

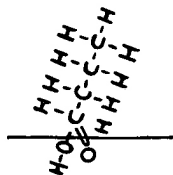
Well, you could have knocked me down with the proverbial. “An Ångström?” said the young lady at the counter. “An Ångström is one ten-thousandth of a micron or one hundred-millionth of a centimetre—why?”

“Oh, nothing,” I said. “Silly of me to forget.” I returned to my corner and read on.

Metal surfaces that appear perfectly smooth to the naked eye, the author revealed, are in reality extraordinarily rough. They are pitted and scored by deep valleys and traversed by chains of mountains with lofty peaks known as “asperities.” Thus when two surfaces rub together a fair amount of friction is generated and the metal surfaces suffer wear and tear. (The experts speak of “plastic deformation,” “elastic deformation,” “local welding,” “abrasion” and “molecular attraction,” but they *mean* wear and tear—I think.)

Now wear and tear, it seems, can be reduced by lubrication (“No, not for me, thanks, I’m driving”), by splash feed lubrication, force feed lubrication and full force feed lubrication—to blazes with technicalities: let’s call it hydrodynamic or fluid film lubrication—all are achieved by using the best lubricants. Esso lubricants.

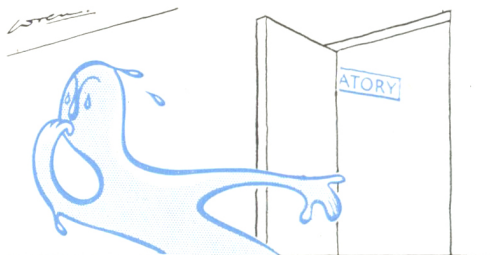
This little diagram will, perhaps, make everything crystal clear:



It does? Good.

Let’s go back a bit. The engine used by the Wright brothers differed very little from the

ordinary motor-car engine of the day, and the motor oil of the day was good enough to keep their biplane flying without a fatal dose of friction. But as aircraft engines improved in power and performance, as speeds and pressures and cylinder temperatures rocketed, lubrication outgrew its early infancy and entered the laboratories. Here it can be seen entering the laboratories:



Aircraft became larger, heavier, flew higher . . . 10,000 feet . . . 20,000 feet . . . 40,000 feet . . . and lubricants were required to flow readily at 0 deg. F. . . . -33 deg. . . . -67 deg. Esso supplied them.

Esso still supplies them. In the labs, scientists concoct complex chemical compounds known as “additives,” substances which are (yes!) added to oils and greases to increase their efficiency. Some years ago they devised additive ‘A’ (let’s call it) which prevents oil congealing in cold weather; then there was ‘B’ which helps oil carry the heavier loads imposed by increasingly powerful engines. ‘C’ prevents excessive thinning-out when hot, excessive thickening when cold. And then there are ‘X’ and ‘Y’ and ‘Z.’ And ‘E’ and ‘S’ and ‘S’ and ‘O.’ Yes—

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