Although our ordnance experts continued to believe that anything but an outsize long-range rocket was out of the question, as time went by the evidence began to point more and more clearly to a warhead of relatively modest size.

160. Notwithstanding this evidence, the conception of a huge, earth-shaking projectile persisted. Accordingly much effort was spent on a vain search for the massive launching devices which were believed to be necessary to start so large a missile on its flight.

161. Yet, as the summer of 1944 wore on, the case for the lighter rocket grew stronger. Evidence was obtained that the firing process called for nothing more elaborate than a slab of concrete, on which a portable stand was erected and from which the rocket rose under its own power. By the last week in August all the main characteristics of the A-4 had been established. We knew that it was approximately forty-five feet long and that its all-up weight was less than fourteen tons. We knew that the standard warhead weighed about a ton, but were prepared for the possibility that, by reducing the maximum range from about 200 to 160 miles, the Germans might be able to fit a heavier warhead, weighing up to two tons. We knew that before being fired the rocket was placed upright on the firing platform and there fuelled and serviced—a process which would probably take about two hours. Furthermore, we knew that the Germans had planned at least two methods of storing the missiles, namely in underground pits or tunnels, and in wooden bunkers dispersed in woods. Finally, we had some reason to suspect that active operations would begin during the first half of September.

162. What we did not know was how (if at all) the rocket was externally controlled once it had left the ground. Misleading evidence on this point led to wasted efforts to forestall, detect and hamper non-existent radio transmissions which were expected to be used for this purpose. Not until some time after rocket attacks had begun was the conclusion reached that control of the rocket under operational conditions was entirely internal and automatic, apart from the use of a " beam " to control the line of shoot in certain instances.*

163. The Allied Armies, during their advance through Normandy, discovered a number of sites which the Germans had clearly intended for the firing of rockets. Far from resembling the " large sites ", these consisted merely of rough concrete slabs let into the surface of roads. We were bound to assume that similar firing sites existed in areas still in German hands; but their location was unknown to us, and there was not the slightest chance of our detecting them on air reconnaissance photographs.

(c) *The Eve of the Rocket Campaign* (30*th August to 7th September,* 1944).

164. Such, then, was the state of our knowledge towards the end of August, 1944, when we found ourselves faced with the possibility that rocket attacks might begin at almost any moment. For many months past a system for detecting the firing of rockets had existed, and a programme of bombing attacks on the " large sites " and other objectives suspected of a connection with the rocket had been carried out. In addition the Air Staff at the Air Ministry had devised and kept up to date an elaborate scheme of countermeasures which was to be put into effect as soon as the first rocket was fired.

165. One of the provisions of this scheme was that as soon as attacks were seen to be imminent, fighter aircraft should be held ready to fly armed reconnaissance sorties over the firing areas.* These operations were to be conducted within the " tactical area "† by the Tactical Air Forces, and elsewhere by my Command.

166. Towards the end of the month the stage of imminent attack appeared to have arrived; and the Air Staff decided that we should go a little further than had been contemplated in the paper scheme, by starting to fly the armed reconnaissance sorties without more ado.

167. I had already taken the precaution of authorising my operations and intelligence staffs to issue instructions and memoranda which would enable us to start these operations at short notice; and on the 30th August the sorties began. Since we did not know the location of any firing sites in enemy territory, all we could do was to brief our pilots to recognise anything they might see, and despatch them over the general area from which we expected to be attacked.

168. A few days later, on the 4th September, the rapid advance of the Allied troops into the Pas de Calais and Flanders obliged us to discontinue the sorties. Thereupon I learned that the Chiefs of Staff considered that, since the whole of the Pas de Calais was or shortly would be ours, the threat to London from the rocket could be regarded as over.

169. My intelligence staff felt unable to assent to this opinion without a reservation. They pointed out that the rocket, having a range of 200 miles or more, could still be fired at London from western Holland. Western Holland was still in German hands, and part of it would remain so if the Germans stood on the lower Rhine and the Siegfried Line. True, we had no evidence that the Germans had prepared any firing sites on Dutch soil; but the sites could be so quickly built and were so hard to spot that this proved nothing. While recognising that the Chiefs of Staff were better able than ourselves to foresee the effect of future operations, my intelligence officers felt, therefore, that as things stood at the moment we ought to be ready to meet rocket attacks from western Holland within the next ten days.

170. The logic of this argument was irrefutable; and I was relieved to learn next day that a review of the situation by the Vice-Chiefs of Staff had led to the conclusion that the immediate relaxation of all defensive

* In the later stages of the campaign the Germans did, however, use radio for control of range in certain cases. They do not seem to have perfected this technique, which gave less accurate results than their usual methods.

* " Armed reconnaissance " is defined as " air reconnaissance carried out by offensively-armed aircraft with the intention of locating and attacking suitable enemy targets ".

† This was an area, defined from time to time by the Air Commander-in-Chief, in which the conduct of all air operations devolved upon the Tactical Air Forces.