

ES 10/1945

(d)

~~SECRET~~

Document Control Number							Copy No.
E	1	1	1	4	9	2	008

The above references must be quoted on all Security Records documents

T280723

21066

Copy No. 6 of 11 copies  
Page No. 1 of 11 pages  
Plus distribution list

This document does not necessarily represent the final views of AWRE or the Mathematical Physics Department.

Theoretical Physics Note 89/72

024967

A [redacted] PNE device and [redacted]

by [redacted]



Summary

[redacted] about their hypothetical [redacted] PNE device was released to the US [redacted]. There is clearly a close relation to [redacted]. Using this [redacted] we have studied the real and the hypothetical devices. It is shown that [redacted] had at least [redacted] their hypothetical device. [redacted]

also see  
C/A/4380  
in K1828/a

This Document Contains

[redacted]

GRSO

This  
Go  
in  
the  
th  
te

PLEASE KEEP THIS AS MY COPY. IT CONTAINS EXTRA INFORMATION USEFUL TO M

[redacted]

~~SECRET~~ [REDACTED]

TPN 89/72  
Page No. 2 of 11 pages

1. INTRODUCTION

The [REDACTED] on PNE is reported in [REDACTED]. Included is [REDACTED] activity data for [REDACTED] devices of [REDACTED]. It is clear from the report that the character of [REDACTED] is in many respects similar to [REDACTED]. I have therefore used this extra data in a fresh study of [REDACTED].

Comparison at [REDACTED] seems to have arisen from there being a standard [REDACTED] PNE excavation device of this yield, planned for FY1970 as [REDACTED], later postponed to FY1971 but never carried out.

[REDACTED] was an excavation shot on [REDACTED] and from its published crater size LLL have estimated its yield to have been [REDACTED]. This makes its data suitable for their use for a hypothetical [REDACTED] device. It is also [REDACTED] activities, has [REDACTED] and has [REDACTED], some of which features have been sacrificed [REDACTED] excavation shots, so a scaled-up [REDACTED] is the obvious device for them to use as their [REDACTED] competitor.

2. ACTIVITIES IN THE [REDACTED]

2.1 Fissions

[REDACTED] was assigned by them the same fission yield as [REDACTED] and the latter was deduced ([REDACTED]) from the 1967 [REDACTED] statement of [REDACTED] products in the fallout [REDACTED] of [REDACTED]. Since the latter was [REDACTED], [REDACTED] far [REDACTED], its use has to be justified by some strong argument. Presumably this was that the scaled depth of burial of [REDACTED] was an optimum balance between activity release and crater volume. Indeed [REDACTED] was rather deeper buried than [REDACTED]. At any rate, [REDACTED] deduced that the US excavation explosive should be assigned a fission yield of [REDACTED] and took this also for their own.

~~SECRET~~ [REDACTED]

SECRET

TPN 89/72

Page No. 3 of 11 pages

What we can deduce from this procedure is that [REDACTED]

[REDACTED] with [REDACTED]. This must surely mean [REDACTED] and all other [REDACTED].

Secondly, the fission yield [REDACTED] may itself have been of order [REDACTED]. But this is far from established by the above argument and appears not to be so stated in [REDACTED]. If the fission yield were [REDACTED] we can expect it to have been [REDACTED].

2.2

[REDACTED] [REDACTED], "based on their experience with [REDACTED] [REDACTED]. This is [REDACTED] must be from [REDACTED].

2.3

Induced activities

According to [REDACTED], values were given for [REDACTED] the [REDACTED] paper and were stated to be for [REDACTED]; "later informal conversations with him [REDACTED] [REDACTED]'. The simplest explanation is [REDACTED].

We could accept [REDACTED] and [REDACTED] as being the same for both. To have [REDACTED] [REDACTED] the same for both is only plausible if [REDACTED] had the same [REDACTED] as [REDACTED] to their [REDACTED]'.

Let us see whether [REDACTED] is really compatible with [REDACTED]. The nature of the major material near the [REDACTED] which we can assume will be [REDACTED], can be seen from [REDACTED]. For [REDACTED], this ratio is large: for example, [REDACTED] had [REDACTED] and [REDACTED] respectively. For [REDACTED], the ratio is small: examples from devices accepted as having [REDACTED].



Shot	[Redacted]
[Redacted]	[Redacted]

Since the [Redacted] for [Redacted], clearly the main material near its [Redacted].

The other devices known to me and of which this is true give the following values [Redacted].

Shot	[Redacted]
[Redacted]	[Redacted]

If we take the [Redacted] and assume [Redacted] we get [Redacted]. This is lower than observed for any other shot [Redacted]. If we use [Redacted] of [Redacted] from the [Redacted] paper, there is a further reduction [Redacted].

If we take [REDACTED] and the [REDACTED] very reasonable, but if [REDACTED] is used then [REDACTED] which seems low. We could still believe [REDACTED] if we used [REDACTED]

We can conclude:

- (a) the fissions in [REDACTED] were at least [REDACTED] than in their hypothetical [REDACTED] device;
- (b) [REDACTED] is just believable for [REDACTED] but it is quite unbelievable for their hypothetical [REDACTED] device with [REDACTED].

We note that (b) shows that it was the "informal conversations" with [REDACTED] that led to an erroneous impression. No doubt [REDACTED] on one side or the other could have led to this error. It is also plausible to find that we end with no reason to distrust the [REDACTED]

However, there appears to be a mistake in that paper, at least as it is reported in [REDACTED] as regards [REDACTED]. The atomic ratio [REDACTED] is given as [REDACTED] whereas [REDACTED]. Even the latter is exceptionally high for [REDACTED]: the previously biggest value known to me was [REDACTED]

To sum up the induced activities we can use, there is nothing reliable on [REDACTED] but we can evidently take [REDACTED] to be of order only [REDACTED]; this is for [REDACTED] and seems to be assumed for their [REDACTED] device.

3. [REDACTED] DESIGN

[REDACTED] shows that at constant residual [REDACTED] going to [REDACTED] puts up the [REDACTED] from the device (including [REDACTED] moving with the debris) [REDACTED] and so gives more [REDACTED] the move also gives rather more [REDACTED] and of course requires a heavier and bigger device to get a given yield. Hence we can be certain that [REDACTED] used [REDACTED]

[REDACTED]

[REDACTED] then shows the [REDACTED] to have been about [REDACTED] to have given the [REDACTED]. Thus the [REDACTED] was about [REDACTED]

We now have to deal separately with [REDACTED]. In another report I have given a reason for thinking that [REDACTED] were their normal practice in their [REDACTED]. It seems likely that the same would still be true for the [REDACTED]. However, I shall consider here also the possible use of a [REDACTED].

3.1

[REDACTED] will give a relation for [REDACTED] of a clean [REDACTED] in terms of the parameters  $y$  and  $z$ , defined by

[REDACTED]

[REDACTED] The formula was obtained by fitting to runs with [REDACTED], but when these are replaced by [REDACTED] of density to initial density the [REDACTED]

[REDACTED] the [REDACTED] gives the solutions of Table 1. Since these will give different values of [REDACTED]

Table 1: devices with [REDACTED]

Ex	Assumed	[REDACTED]
1	[REDACTED]	[REDACTED]
2	[REDACTED]	[REDACTED]
3	[REDACTED]	[REDACTED]
4	[REDACTED]	[REDACTED]

SECRET

TPN 89/72  
Page No. 7 of 11 pages

we can hope that the experimental value of this ratio will tell us whether

[REDACTED] shows how to estimate [REDACTED] in the two top groups, denoted [REDACTED]

where the [REDACTED] is the ratio of the [REDACTED] for [REDACTED]. The rather [REDACTED] [REDACTED] [REDACTED] [REDACTED] is of course a reflection of the very low abundance of [REDACTED]

We can demonstrate this formula by using it for three US shots [REDACTED]. All three had [REDACTED] which were [REDACTED] and thus had substantial [REDACTED], most of which should have [REDACTED]. Some may also have had [REDACTED]. Thus the use of (1) with [REDACTED] should underestimate [REDACTED]. In passing, it should be noted that [REDACTED] describes the effect of [REDACTED] but does not give a formula for the creation of [REDACTED]. Creation of [REDACTED] in a [REDACTED] is not likely, in these devices, to have been capable of adding more than [REDACTED] and their [REDACTED] [REDACTED] included in the quantities we use; for one thing, we do not have any data on [REDACTED]. One would certainly expect the [REDACTED] would emit a [REDACTED], and would expect its [REDACTED] to be relatively [REDACTED]; thus the overall [REDACTED] would be [REDACTED]

Data used for the [REDACTED] are in [REDACTED]. The weakest links are the [REDACTED]. In using these with [REDACTED], we have to remember that that was

SECRET

[REDACTED] For given [REDACTED] the ratio of [REDACTED] to [REDACTED] is

Table 2: data used for shots with [REDACTED]

Shot	Source TPN	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]

[REDACTED] for a typical [REDACTED]. We can simulate this by taking an effective [REDACTED]. Furthermore, we have to preserve [REDACTED], hence the effective [REDACTED] must also be one [REDACTED]. An alternative form of the argument is that [REDACTED] is [REDACTED] [REDACTED], at given [REDACTED] hence the [REDACTED] decrease in area that goes with the effective [REDACTED], must be supplemented by a further cut of [REDACTED].

[REDACTED] calculated in this way are compared with the observed values in Table 3. The calculated values are the less, as they should be. To be less by [REDACTED] is disappointing: [REDACTED] is not very certain, but even dropping [REDACTED] leaves [REDACTED]. It seems probable that the major part of the difference lies in [REDACTED]. The [REDACTED] version of the device fired [REDACTED] certainly had [REDACTED].

Table 3

Shot	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]

[REDACTED], and it is probable that the same was true of the [REDACTED]

[REDACTED] In this connection the sequence of increasing obs/calc, namely

[REDACTED] is what one would surmise from other evidence for increasing ratio of [REDACTED].

It is clear that to explain the observed [REDACTED] one needs to [REDACTED] of course, the observed quantity is for this shot unfortunately rather uncertain. Table 4 shows [REDACTED] for the solutions of Table 1. We can certainly draw the conclusion that [REDACTED]

Table 4: [REDACTED] for devices of Table 1

Ex	[REDACTED]
1	[REDACTED]
2	[REDACTED]
3	[REDACTED]
4	[REDACTED]

[REDACTED]  
[REDACTED]

This is for a [REDACTED]. We turn to the possibility of a [REDACTED].

3.2 [REDACTED]

A graph for [REDACTED] is given in [REDACTED].

At given [REDACTED] [REDACTED] to get the same [REDACTED].

Calculations of [REDACTED] show that this is very much the same at given [REDACTED]. The decision between [REDACTED] therefore reduces to the plausibility of the [REDACTED] implied. Table 5 illustrates this.

We can say that if the [REDACTED] corresponding to the observed [REDACTED] would be too low to be plausible for a [REDACTED] shot. On the other hand, if [REDACTED]

Table 5: [REDACTED]

● assumed	
■	
■	

[REDACTED] could be excluded, and the same is true down to [REDACTED]

From Table 4 one may expect that the [REDACTED] is not likely to permit any [REDACTED]

4. COMPARISON WITH [REDACTED]

It is interesting that [REDACTED] and [REDACTED] are very different (Table 6). The [REDACTED] is also noticeably higher than in the [REDACTED]

Table 6

--

5. URANIUM

It was found that [REDACTED] less than [REDACTED] This suggests device [REDACTED]

[REDACTED] The latter would include at least a few [REDACTED] Thus the device must have contained several [REDACTED]

This could not all have been [REDACTED]

[REDACTED]. The obvious place for most of [REDACTED]  
[REDACTED]

6. CONCLUSIONS

[REDACTED]. The whole device had  
of order [REDACTED]. [REDACTED] how to reduce this  
[REDACTED]

The observed [REDACTED] shows that there was a [REDACTED]  
and the observed, rather uncertain [REDACTED] then shows a [REDACTED] which is  
certainly not [REDACTED] [REDACTED] [REDACTED] are  
still allowed by these data, but if [REDACTED] could be reliably established as  
[REDACTED] from the implosion aspect.

7. [REDACTED]

[REDACTED] gave a deduction from published data on  
[REDACTED], and without [REDACTED] [REDACTED],  
that the fission yield in these devices [REDACTED] [REDACTED].  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]