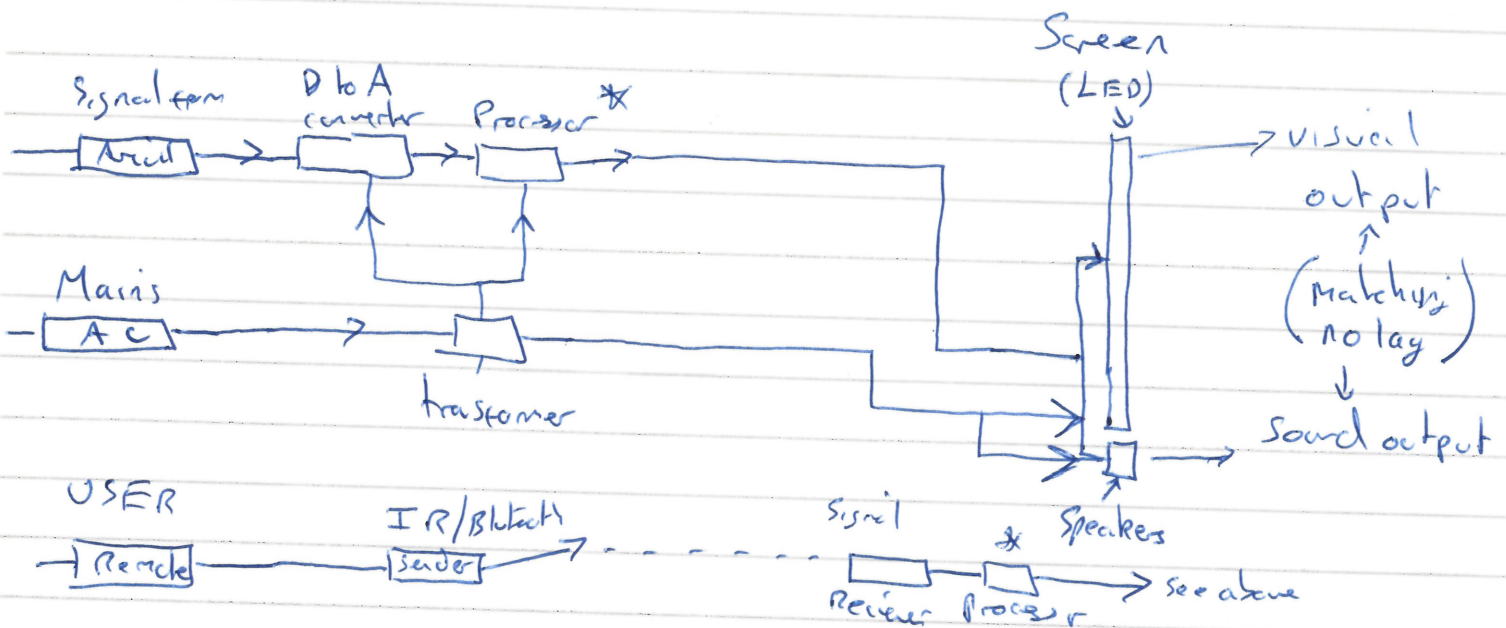


- ① A system is a set of things / Parts / Subsystems which work together as part of a network to produce a required. Basically taking the inputs to give the (desired) output. A bad system can give an undesired output. A system is required to do something and has to do that thing. It can also be known as a "complex whole"

TV



- ② Chance cause variation comes from the statistics of the manufacturing process. There will always be variation, $10\text{cm} \pm 0.2\text{cm}$. The bandwidth at 0.4cm is where the chance variation will be. It is almost planned for, that's why tolerances are there.

Assignable cause variation is when something changes that is not part of normal distribution. This could be wear on a roller, meaning that the thickness of a plate is out of tolerance, or wear on a punch which makes a hole too small. It could also be new equipment or stuff.

③ other types of functional requirements include

Operational requirement - what the thing has to do

functional requirements - what the system needs to do to meet operational

Non functional requirements:

NF System

NF Performance

NF Implementation

requirements
(noun/verb)

} Constraints, how the action is to be performed
or how well it is to be performed

④ Basic - Generally not mentioned by the customer as considered so basic that they are obvious, but must be included

Expressed - The requirement the customer tells you about, which the customer wants or believes they need.

Assumed - More than basic requirements, but not expressed by the customer, who will not be happy if they are missed. They may be taken for granted

Delight - Requirements that the customer does not know they want. If these are included then the customer will be very happy. Must ensure they are not over designing, just add ons

⑤ Too much - mixer runs too fast

Too little - mixer runs too slow

No one - mixer does not run

Intermittent - mixer runs sometimes but not in planned mode

Unlinked - mixer runs when not commanded

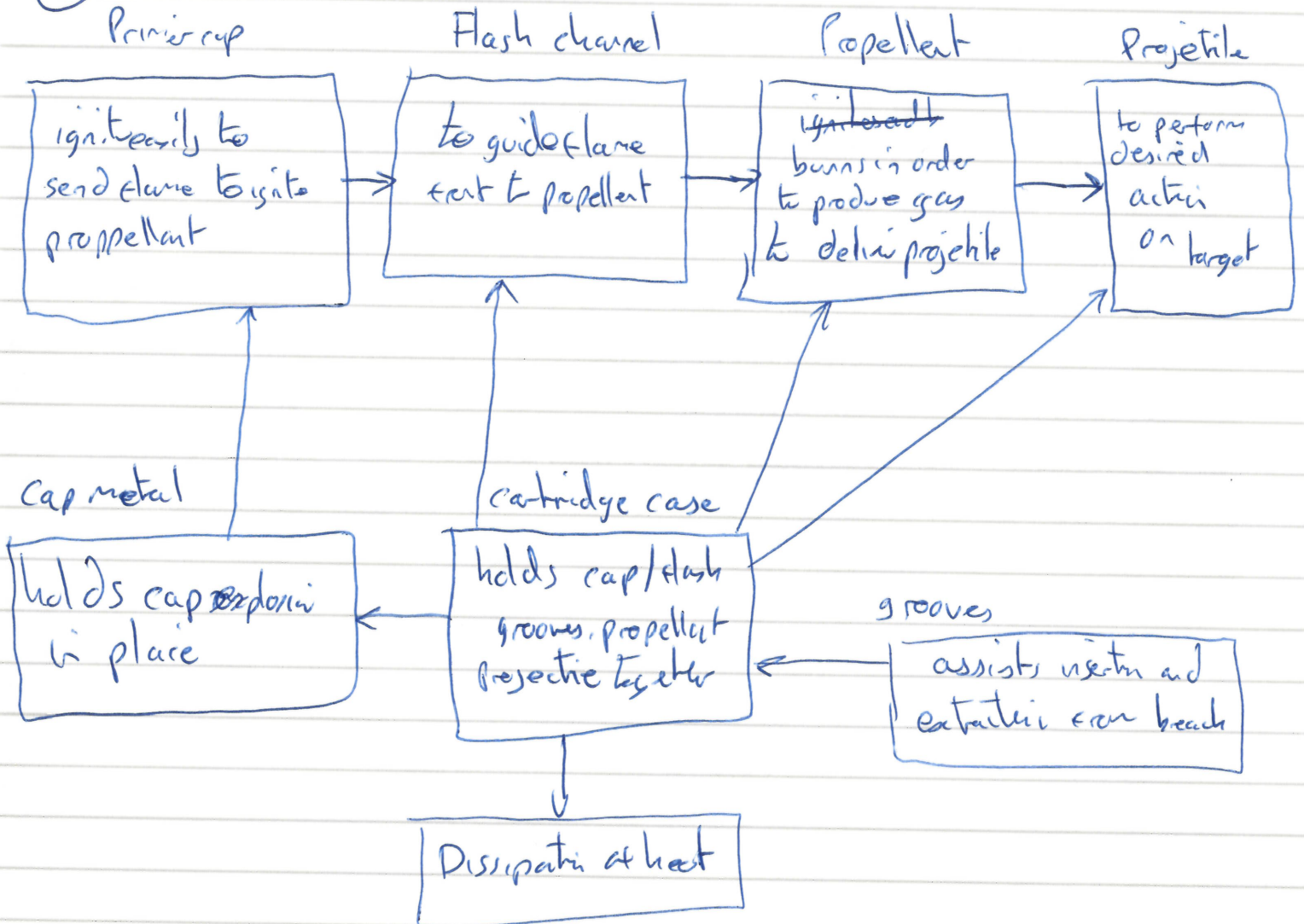
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- ⑥ Failure mechanism is the ~~is the~~ part of the process that leads to a failure, The direct cause of the failure mode.

If a temperature sensor breaks, then the heat ~~is~~ applied to the sample is too much, and the sample explodes.

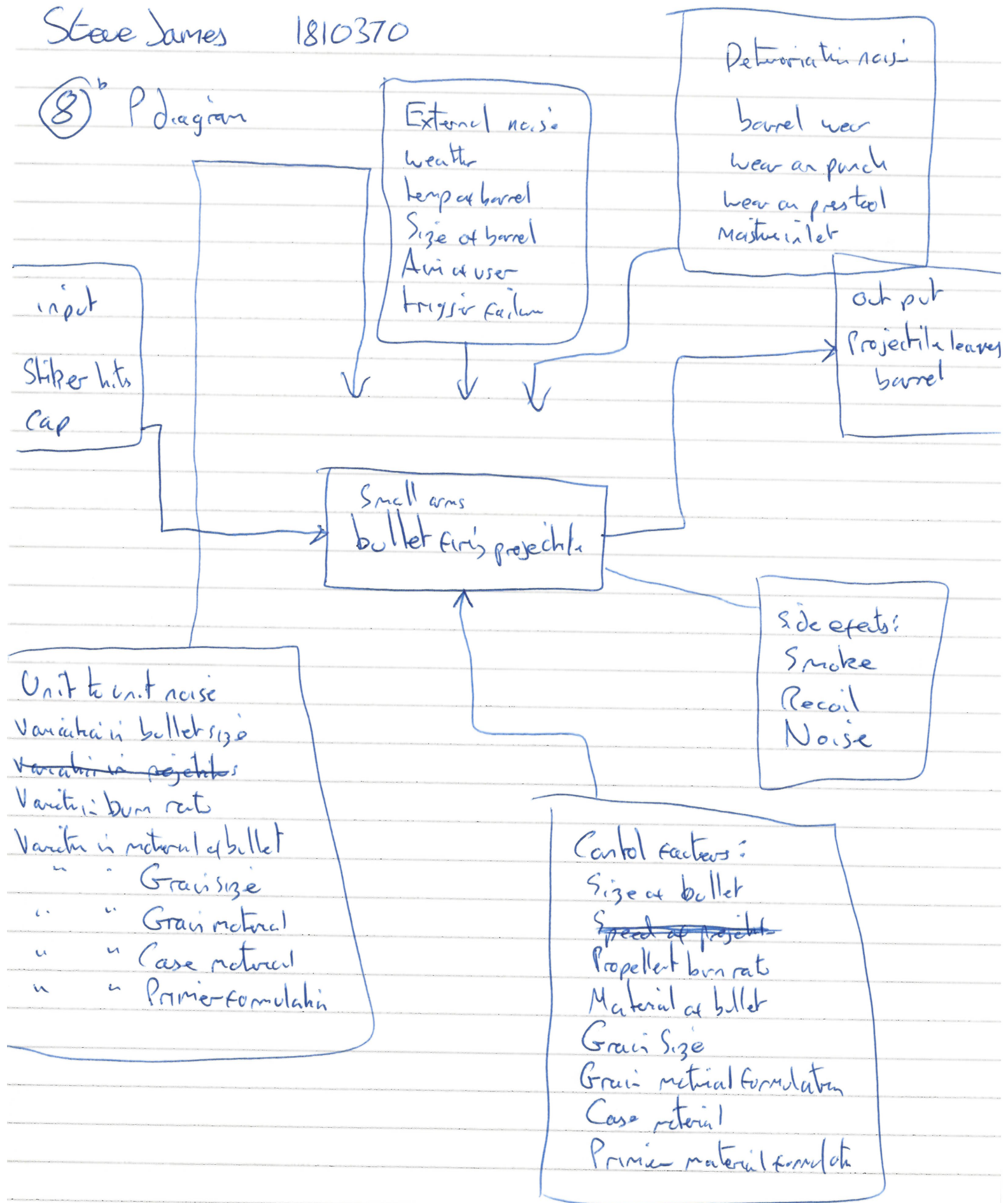
The mechanism was the sensor breaking due to an impact, which lead to a failure mode of too much heat and the output was the material exploding.

⑧ a.



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⑧^b P diagram



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8^c what/why

unit to unit					External		Observation			
Grain Size	Grain Material	burn Rate	Primer Formulation	Case Size	Weather	Temp at hand	Size of bucket	barrel war	war on prob	war on preschol
Grain Size 4	9 3			1	3	1		1	3	3
Grain Material 4	3 9									3
burn Rate 5	9 9	9 3		1	9 3			1	3 3 9	
Primer Formulation 4	1 9 9									
Case Size 3	1 1			9	3 3			1	9 9 1	
93/100/90/63/36					66/28	112/54/42/2				

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⑨^a Influence Map



④ Finance - ensure that funding is available

⑤ legal - make sure everything about it is legal, i.e. where from, safe, going in legal position

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Q^b QFD

Customer
input

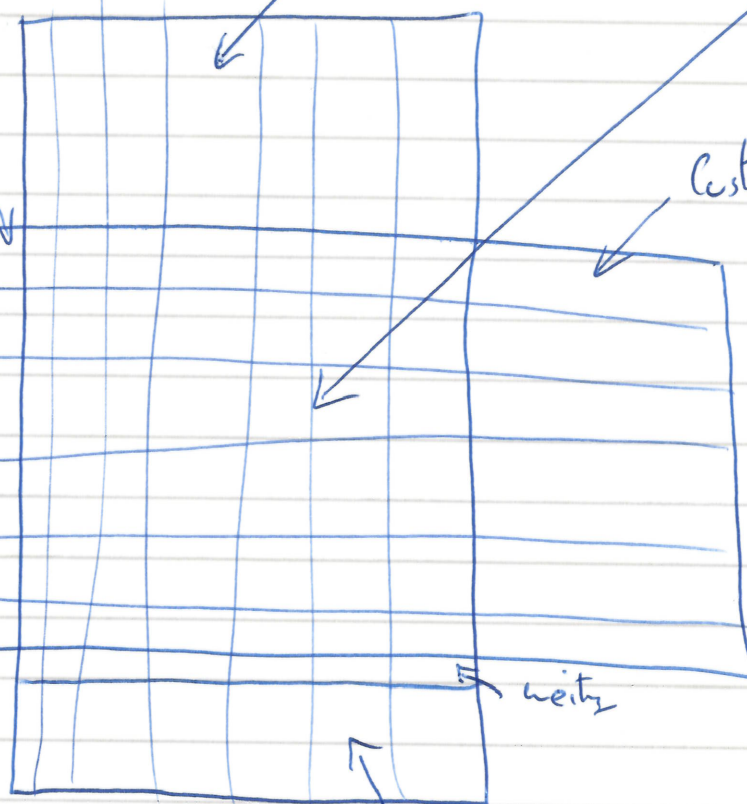
Functional requirements

Relationship

Customer targets

Customer
requirements

(NFR requirements)



Target value specified for the solution component
Some NFR can go here / Design targets

QFD, takes the customer requirements and positions them against the functional requirements, and the matrix is used to see if there is a relationship between the two, and if there is a relationship, how strong that relationship is. a 9 will show there is a strong relationship. A 1 will show slight relationship, some will have no relationship, this can be left blank. A mild relationship is given 3. Densely populated columns will show critical functions, Rows which are full or densely populated have influence across the whole system and so require special attention. It can help manage the requirements from the start to implementation of a project. Basically giving completeness to the planning of the project from the start.

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9

⑨^{obj ch...}

An importance is assigned to the customer requirements. This shows which of the requirements the customer believes is more important than others. This will help design the coffee machine.

~~It~~ ~~It~~ If the customer wants "make coffee" importance of 5, then they want it to be important, whereas "add sugar" may only be a 2, i.e., it would be nice but not that important.

The QFD can also be used to create a trial plan. The bottom row has target design requirements. Test engineers can use the requirements in order to design a test series to meet those requirements.

eg. "Heat water" - target value 92°C . Test engineers can then design tests to ensure that that water can be heated to 92°C , this would also develop designs later on to type of heating.