# The Comback Of Stealth Super Respawn

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*This paper is about the combination of Quick Respawn and Quick Super Jump builds, combined with Comeback and Stealth Jump. The main point of this paper is to show the different possible builds where you gain maximum benefit. Lots of data was acquired with data mining and frame by frame analyses.*

**Nomenclature**

Build A combination of abilities.
CB Comeback
QR Quick Respawn
QSJ Quick Super Jump
Pure build All abilities are the same on a build.
SJ Stealth Jump

## 1 Introduction

Splatoon is a third-person shooter game developed and published by Nintendo for the Wii U, released at the end of May worldwide. The game is about characters known as Inklings, who can transform between kids and squids, for either to run or to swim through ink. For more details see [1]. The point of this paper is the analysis of the abilities Quick Respawn and Quick Super Jump, along with Comeback and Stealth Jump in combination. I start with a definition of abilities itself and the before mentioned abilities, and continue with the ingame behavior and some mechanics. After the explanation part I get to the mathematical view of these abilities and will feature some builds. Finally I end this paper with a conclusion.

## 2 Super Jumping

Super Jumping is an ability that an Inkling allows to jump to another location. For an Inkling to Super Jump it turns into squid form, pointing in direction of the goal and then start jumping to the goal. While the Inkling is preparing for the jump it cannot move and is therefor vulnerable to enemy fire, but after the jump starts the Inkling is invulnerable during the whole jump.

The time it takes from the start of the jump to landing on the destination is always the same regardless of distance. A few frames before the Inkling lands he can start shooting again or active its special, but it cannot use its subweapon.

While Super Jumping, an Inkling can go through walls and floors to ensure that the jump is successful.

A circular marker will appear on the landing spot, and it is visible to everybody under normal circumstances. This marker has the name of the Inkling written on it and an arrow, that visualizes the time the Inkling is still in air.

An Inkling can jump to three different spots:

1. A teammate,
2. a Squid Beakon,
3. and the spawn point.

It is also worth noting, that the whole Super Jumping is faster when you are a squid, because you do not have to transform first.

## 3 Abilites

You can equip abilities to your Inklings to improve various stats like the damage they deal or the damage they take. Each Inkling can be equipped with a maximum of three main abilities and nine sub abilities. One sub ability is equivalent to 30% of a main ability.

We can define a point system for these abilities, where one main ability is equal to 10pt and a sub ability is equal to 3pt.

There are two types of abilities, the stackable and the unstackable abilities. Stackable abilities can be used more than once on a build while unstackable abilities are fixed to one type of gear and cannot appear as subability.

### 3.1 Quick Super Jump

Quick Super Jump reduces the number of frames the Super Jump needs. The animation consists of two parts: The first part is the preparation and the second part the actual jumping. With a pure QSJ build you can reduce the time of jumping by 50%. Refer to table 3.1 for the exact frame data of the jump.

| Main\Sub | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 180 | 171 | 163 | 155 | 148 | 141 | 134 | 128 | 123 | 118 |
| **1** | 153 | 145 | 139 | 132 | 126 | 121 | 116 | 111 | 107 | 103 |
| **2** | 130 | 125 | 119 | 114 | 110 | 106 | 102 | 99 | 96 | 94 |
| **3** | 113 | 108 | 105 | 101 | 98 | 96 | 93 | 92 | 90 | 90 |

Table 1. Data for Quick Super Jump

### 3.2 Quick Respawn

Quick Respawn is one of the abilities in the game. When you die, you respawn in a given time frame. You can shorten the time frame with help of the quick respawn ability. This way you can reduce the respawn time from 510 frames down to 270 frames. The respawn itself consists of three parts. During the first part you can see the yourself on the spot where you died. During the second part you can see the person who splatted you and the third part is the respawn animation. The first part has a time frame between 90 and 30 frames, the second part a time frame between 300 and 120 frames and the last part has a fixed amount of time of 120 frames. You can refer to table 3.2,and 3.2 for the frame data of Quick Respawn.

### 3.3 Stealth Jump

The Stealth Jump ability hides the landing point marker normally visible to all players when performing a Super Jump. It is a unstackable ability and can only be on shoes. As a trade-off it adds 50 frames to the Super Jump. The data can be viewed in table 3.3.

### 3.4 Comeback

Comeback is a headgear exclusive ability, that is also not stackable. If one of the opponents kills you and you respawn, you gain a small bonus for the next 20 seconds. This bonus consists of additional four subs of Ink Saver (Main and Sub), and Special Charge up, also a one main bonus for Run Speed and Swim Speed.

## 4 The QR/QSJ dilemma

There are lots of players who try to be back into action as soon as possible. Quick Respawn and Quick Super Jump will help them to get back a little faster. But what is the exact time where you can be back in action? We start with the formula that expresses the *value* of a point $x \in [0,57]$:

$$val(x) = \frac{118115}{118826}x - \left(5\sqrt{\frac{39}{118826}}x^2\right) \tag{1}$$

The formula to calculate the duration of the respawn is

$$QR(x) = 510 - 8 \cdot val(x) \tag{2}$$

The formula to calculate the time for the Super Jump can be calculated with

$$QSJ(x) = 180 - 3 \cdot val(x) \tag{3}$$

If we combine $QR(x)$ with $QSJ(y)$ we get

$$QR(x) + QSJ(y) = 690 - 8 \cdot val(x) - 3 \cdot val(y) \tag{4}$$

We define this as $QSJ(x,y)$.

### 4.1 Pure QSJ

The first approach to find an optimal distribution between these points is to use a build with only QR and QSJ, that means the following holds:

$$x + y = 57 \tag{5}$$

Now we can simplify (4):

$$QSJ(x,57-x) = 690 - 8 \cdot val(x) - 3 \cdot val(57-x) \tag{6}$$

For the next step we have to derivative $val(x)$, so we can calculate the maximum:

$$\frac{d}{dx}val(x) = \frac{118115}{118826} - 5\sqrt{\frac{78}{59413}}x \tag{7}$$

This leads us to the derivative of $QSJ(x,57-x)$:

$$\frac{d}{dx}QSJ(x,57-x) = 25 \cdot \frac{858x - 36961}{118826} \tag{8}$$

Now we simply solve the equation

$$\frac{d}{dx}QSJ(x,57-x) = 0 \tag{9}$$

and get $x = \frac{36961}{858}$, which is equal to 43pt of QR and 14pt of QSJ. Since this is not possible with any combination, the optimal amount is 44pt of QR and 13pt of QSJ, which results in 432 frames to be back in action. But be careful to only jump into beakons or safe spots.

| Main\Sub | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 90 | 84 | 79 | 73 | 69 | 64 | 60 | 56 | 52 | 48 |
| **1** | 72 | 67 | 62 | 58 | 54 | 51 | 47 | 44 | 41 | 39 |
| **2** | 57 | 53 | 49 | 46 | 43 | 41 | 38 | 36 | 34 | 33 |
| **3** | 45 | 42 | 40 | 37 | 35 | 34 | 32 | 31 | 30 | 30 |

Table 2. Data for Quick Respawn (Dying)

| Main\Sub | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 510 | 487 | 465 | 444 | 424 | 406 | 388 | 372 | 357 | 343 |
| **1** | 437 | 418 | 400 | 383 | 367 | 353 | 339 | 327 | 316 | 306 |
| **2** | 378 | 362 | 348 | 335 | 323 | 312 | 303 | 294 | 287 | 281 |
| **3** | 331 | 319 | 309 | 300 | 292 | 285 | 279 | 275 | 271 | 270 |

Table 3. Data for Quick Respawn (Complete respawn)

| Main\Sub | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 230 | 221 | 213 | 205 | 198 | 191 | 184 | 178 | 173 | 168 |
| **1** | 203 | 195 | 189 | 182 | 176 | 171 | 166 | 161 | 157 | 153 |
| **2** | 180 | 175 | 169 | 164 | 160 | 156 | 152 | 149 | 146 | 144 |

Table 4. Data for Stealth Jump

### 4.2 Pure QSJ + SJ

The next approach would be to use one SJ, so you can be back in action at any time. Thanks to SJ we only need to look at points $x, y \in [0,47], x+y = 47$, since 1 main slot is taken. The equations (4) and (7) still holds, so we get

$$QSJ(x,47-x) = 690 - 8 \cdot val(x) - 3 \cdot val(47-x) \quad (10)$$

$$\frac{d}{dx} QSJ(x,47-x) = 25 \cdot \frac{858x - 34621}{118826} \quad (11)$$

Now we can find the minimum by solving

$$\frac{d}{dx} QSJ(x,47-x) = 0 \quad (12)$$

and get $x = 34621/858$ which is equal to 40pt. So the optimal amount would be 41pt of QR and 6pt of QSJ, which results in 507 frames. This is around 26.5% faster and you can jump to any possible location without the mark.

### 4.3 Pure QSJ + CB + SJ

Since we die a lot with a QSJ build, we can try to make some use of it and include CB. The duration of comeback is limited to 20 seconds after the spawn. This time we are limited to $x, y \in [0,37], x+y = 37$. Following the standard approach we get $x = 37$, which results in 0pt for the Super Jump. The conclusion of this is, that we only have 16.17s left. To take this into account we try to put some points from QR to QSJ. Obviously you get the most benefits of CB if you go for 37pt of QSJ, but then you will have a long respawn time. In my opinion you have the biggest benefit by using 18pt of QR and 19pt of QSJ. This will give you a time to action of 570 frames and a CB time fo 16.96s.

### 4.4 Other sets

As seen above the use of QSJ is only effective, when you have more than 40pt of QR. After you have them, you can mix them up with everything you like.

## 5 Conclusions

We have seen that the use of QSJ is nearly useless if you can equip yourself with QR. The only use of QSJ would be to escape from the middle of a combat or to increase the time of CB.

## References

[1] , 2016. "Splatoon". https://en.wikipedia.org/wiki/Splatoon.