

Human Factors Assessment and Redesign of the ISS Respiratory Support Pack (RSP) Cue Card

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The Respiratory Support Pack (RSP) is a medical pack onboard the International Space Station (ISS) that contains much of the necessary equipment for providing aid to a conscious or unconscious crewmember in respiratory distress. Inside the RSP lid pocket is a 5.5 by 11 inch paper procedural cue card, which is used by a Crew Medical Officer (CMO) to set up the equipment and deliver oxygen to a crewmember. In training, crewmembers expressed concerns about the readability and usability of the cue card; consequently, updating the cue card was prioritized as an activity to be completed. The Usability Testing and Analysis Facility at the Johnson Space Center (JSC) evaluated the original layout of the cue card, and proposed several new cue card designs based on human factors principles.

The approach taken for the assessment was an iterative process. First, in order to completely understand the issues with the RSP cue card, crewmember post training comments regarding the RSP cue card were taken into consideration. Over the course of the iterative process, the procedural information was reorganized into a linear flow after the removal of irrelevant (non-emergency) content. Pictures, color coding, and borders were added to highlight key components in the RSP to aid in quickly identifying those components. There were minimal changes to the actual text content.

Three studies were conducted using non-medically trained JSC personnel (total of 34 participants). Non-medically trained personnel participated in order to approximate a scenario of limited CMO exposure to the RSP equipment and training (which can occur six months prior to the mission). In each study, participants were asked to perform two respiratory distress scenarios using one of the cue card designs to simulate resuscitation (using a mannequin along with the hardware).

Procedure completion time, errors, and subjective ratings were recorded. The last iteration of the cue card featured a schematic of the RSP, colors, borders, and simplification of the flow of information. The time to complete the RSP procedure was reduced by approximately three minutes with the new design. In an emergency situation, three minutes significantly increases the probability of saving a life. In addition, participants showed the highest preference for this design.

The results of the studies and the new design were presented to a focus group of astronauts, flight surgeons, medical trainers, and procedures personnel. The final cue card was presented to a medical control board and approved for flight. The revised RSP cue card is currently onboard ISS.

Cue card design guidelines developed as a result of this project include:

- Provide a definite “start” and “stop” point
- Create a linear flow of information
- Add numbers to steps
- Add schematic(s) or picture(s) to cue card, but avoid too many pictures/too much detail
- Use color where feasible for identification, but do not overuse color (e.g. for decoration)
- Highlight important words with the use of bold, underlined, or bordered text

Picture Captions

OriginalModified.jpg

Original RSP Cue Card Design

RecommendedCueCardwithColors.jpg

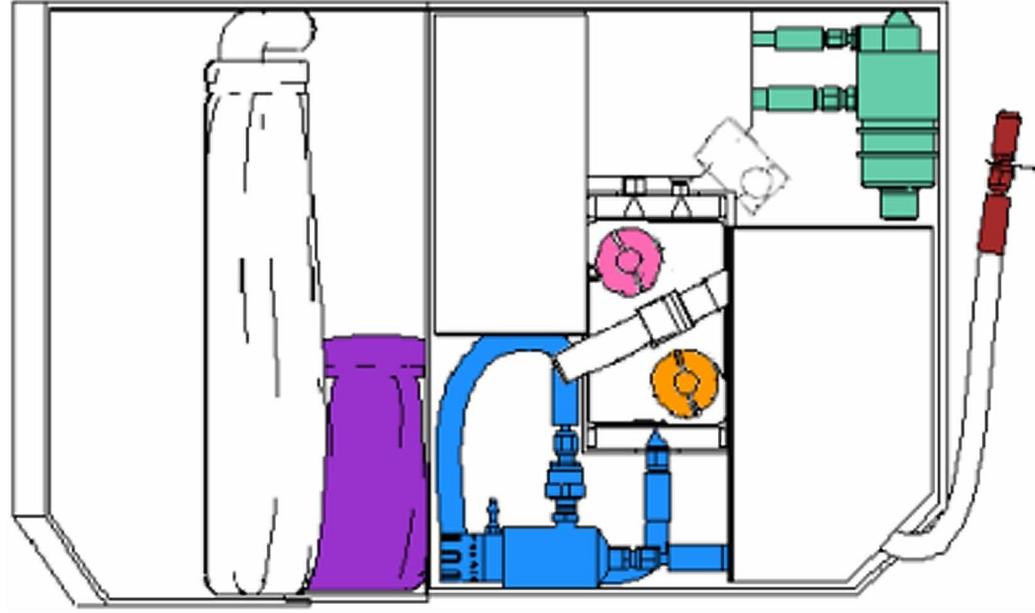
Redesigned RSP Cue Card (3 minute savings)

UNCONSCIOUS PATIENT

<ol style="list-style-type: none"> 1. Deploy RSP, ALSP and Defibrillator 2. Pull red metal cap off Regulator Supply Hose and connect to Oxygen port (**If CHeCS unavailable, use PBA port**) 3. Autovent BPM knob → white dot (●) 	<ol style="list-style-type: none"> 4. Regulator WHITE indicator line → 12 5. From ALSP, retrieve blue Ambu Bag and attach Ambu Bag Tubing to RSP Regulator hosebarb 	<ol style="list-style-type: none"> 6. Place Ambu Bag on Patient and give 1 breath every 5 sec while preparing ILMA (in IK/A) 7. From IK/A, insert ILMA using ILMA cue card 	<ol style="list-style-type: none"> 8. Regulator WHITE indicator line → 0 9. Autovent BPM knob → 12 10. Autovent Tidal Volume → 800 	<ol style="list-style-type: none"> 11. Verify movement of green indicator on top and feel for Oxygen flow from Patient Valve 12. Patient Valve → ← ILMA 13. Contact Flight Surgeon 14. Monitor patient
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CONSCIOUS PATIENT

<ol style="list-style-type: none"> 1. Deploy RSP, ALSP and Defibrillator 2. Pull red metal cap off Regulator Supply Hose and connect to Oxygen port (**If CHeCS unavailable, use PBA port**) 3. Autovent BPM knob → white dot (●) 	<ol style="list-style-type: none"> 4. Regulator WHITE indicator line → 12 5. Remove Low Flow Non-Rebreather Mask from RSP lid pocket and attach Mask Inlet Tubing to Regulator hosebarb. 6. Put mask on patient 	<ol style="list-style-type: none"> 7. Contact Flight Surgeon 8. Monitor patient
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RESPIRATORY SUPPORT PACK (RSP) SETUP ALGORITHM

