ON THE FLY

FEATURING:
MARCUS,
EHS ENGINEER
AND IH PROFESSIONAL
Marcus

Hometown
Seattle, Washington

Alma Maters
University of Illinois, Chicago (BS);
University of Illinois, Chicago (MS, PhD)

Certifications
OHST

Interests
Hiking and camping, actively involved in local school board and PTA

Background
Marcus was inspired to build a career in public safety after seeing the debilitating effects of asbestos in his grandfather’s life. Though he graduated with a BS in biology and worked in the safety office of a large construction firm, he decided he wanted more. Intrigued by his prior studies in occupational and environmental health and safety (OEHS), he diligently pursued and acquired a MS and PhD through UIC’s OEHS Education and Research Center. The center recently placed him in a position at the U.S. Environmental Protection Agency.

Marcus is actively involved in his AIHA Local Section, helping to organize virtual workshops on current safety topics and serving on a volunteer committee for the national association. He is in the midst of acquiring his CIH and is actively looking for more leadership opportunities.
**INDUSTRIAL HYGIENISTS**

**CHLORINE RESPONSE**

IMPORTANT ENOUGH FOR ME TO IMMEDIATELY DROP OUT AND LOSE MY CHANCE AT A NATIONAL RACE.

AN ALERT DURING DOWNTIME ISN’T FUN. BUT FOR AN **IH** LIKE ME, IT’S A CHANCE TO REALLY ELEVATE YOUR GAME. AND A **CHLOREP**” ALERT IS NO JOKE.

AND THEN, JUST MY LUCK.

IMPORTANT ENOUGH FOR ME TO IMMEDIATELY DROP OUT AND LOSE MY CHANCE AT A NATIONAL RACE.

WHETHER WORKING, CAMPING, OR DRONE RACING, I’M AN ALL-IN KIND OF GUY.

FOCUS AND PRECISION ARE TOTALLY MY JAM.

SO WHEN HICCUPS HAPPEN...

RECENTLY, I WAS RACING FOR A SLOT IN THE UPCOMING ROTORCROSS NATIONALS CIRCUIT.

MY BLUE BEE WAS ON TRACK FOR A FIRST-PLACE FINISH.

*INDUSTRIAL HYGIENISTS  **CHLORINE RESPONSE*
A train derailed upstate in a national forest, about 15 miles from the nearest town. It was hauling several high-capacity chlorine tanker cars, two of which were thrown off the rails.

Fortunately, the first responders had already removed the injured from the area. But they thought they smelled faint traces of chlorine gas.

Stephen, the I/O over at Command Central, called me in to help with the field investigation.

Stephen, I’m on site, across the river.

At least one tanker is on its side, looks like it may have hit some boulders from a recent landslide.

Suit up and head in for a closer look.

I’ve got a better idea.

I brought Alfie with me; let’s send it over first.
I’ll do a preliminary sweep for any problem areas.

GREAT IDEA.

Can you establish a data link with me so we can monitor your sensor feeds here at Command Central?

NOT A PROBLEM. Cell signal here is solid.

I was glad I put Alfie in the truck earlier, as I was supposed to show it at the local science club’s expo that weekend.

Now it looked like I could put Alfie through some field testing in the rain.
SO FAR, THE AIR QUALITY SEEMS WITHIN NORMAL PARAMETERS. LET ME DROP CLOSER...

WAIT, THERE’S A SPIKE. AND ANOTHER! THERE’S SOME STRONG TRACES OF CHLORINE VAPOR.

I’M GOING TO ZOOM IN...

WE’VE GOT A CRACKED VALVE; THE DOME’S RIPPED OFF, PROBABLY FROM THOSE BOULDERS ALONG THE TRACK.

LOOKS LIKE THE LIQUID CHLORINE IS MIXING WITH THE RAIN; WE’VE GOT HYDROCHLORIC ACID POOLING.

CONTACT WITH THE AIR IS CONVERTING TO CHLORINE GAS.

THIS IS GOING TO GET OUT OF HAND REALLY QUICKLY, STEPHEN.
HOW BIG IS THE VAPOR CLOUD NOW?

SMALL, BUT EXPANDING. THAT ACID LEAK IS JUST GOING TO GET BIGGER WITH TIME...

WHICH WILL INCREASE THE SIZE OF THE CLOUD.

AT SOME POINT, IT’LL REACH THE EDGE OF THE EMBANKMENT.

KATIE, WHAT’S THE WEATHER OUTLOOK?

THE WIND IS SHIFTING AND INCREASING; WE HAVE A HEAVY RAIN SQUALL ROLLING IN ALONG THE VALLEY.

SHOULD BE THERE IN A FEW HOURS.

NOT GOOD.
THESE READINGS FROM OUR DRONE INDICATE THAT THE CHLORINE CLOUD’S GOING TO BE UNMANAGEABLE SOON.

CHLORINE GAS SINKS, RIGHT?

SO IT’LL FLOW DOWNHILL ALONG THE GROUND TO THE RIVER IF IT GETS BIG ENOUGH?

YES. IT WON’T DISSIPATE FAST ENOUGH;

THERE WILL BE HARM TO THE LOCAL ECOSYSTEM IF WE DON’T CONTAIN OR RESOLVE IT SOON.

WHY IS THAT A PROBLEM?

CHLORINE WILL CONTAMINATE THE GROUND AS IT MOVES, SLOWLY POISONING THE LOCAL FLORA AND FAUNA.

THE SOONER WE END THE LEAK, THE FASTER THAT CLOUD WILL DISSIPATE INTO THE ATMOSPHERE AND REMOVE ITSELF AS AN ENVIRONMENTAL THREAT.

THERE WILL BE HARM TO THE LOCAL ECOSYSTEM IF WE DON’T CONTAIN OR RESOLVE IT SOON.
SO YOU’LL WANT TO SET UP A LONG-TERM CLEAN-UP PLAN?

ABSOLUTELY.

BUT RIGHT NOW, THE IMMEDIATE FOCUS IS STOPPING THAT LEAK.

YES, KATIE?

THE WIND IS DEFINITELY PICKING UP AND SHIFTING SOUTHEAST.

THAT’S GOING TO PUSH THE CLOUD MORE TOWARDS THE ENGINE FIRE THAT’S STILL BURNING.

WE CAN’T LET THAT HAPPEN. CHLORINE VAPOR AND A STILL-SMOLDERING FIRE? THAT’S A VERY EXPLOSIVE MIX.

SURELY THERE’S SOMETHING WE CAN DO TO PREVENT THAT?

MARCUS, CAN YOU TASK ALFIE TO REMAIN ON STATION AND MONITOR THROUGH THE STORM?

THE WIND IS ALREADY MAKING IT DIFFICULT FOR ALFIE.

I’M AFRAID THE ROTORS I HAVE AREN’T TOUGH ENOUGH FOR THIS KIND OF WEATHER.

IT’S DRAINING THE BATTERY AT A HIGHER RATE THAN I ESTIMATED. I’VE GOT MAYBE TEN MINUTES LEFT.

UMMM...
That’s unfortunate. I may need you to suit up to keep monitoring things.

Chief, can we set up a water fog along here?

Sure. Think that’ll help?

It’ll help dilute the vapor enough to slow its spread towards the fire.

They say ‘necessity is the mother of invention.

I didn’t want anyone to risk their life just to monitor a dangerous situation, especially me.

But ultimately, we still have to stop that leak.

I mean, what good is technology if we can’t use it in part to reduce human risk?

I wanted to do this as safely as possible, which meant finding a way to keep using Alfie.
MARCUS, YOU SUITED UP YET? WE REALLY NEED THAT FEED.

NOTE TO SELF FOR LATER: UPGRADE ALFIE’S ENGINES...

MARCUS?

...THEY NEED TO BE AS POWERFUL AS THE BLUE BEE, WITH HIGHER BATTERY CAPACITY...

WAIT A MINUTE...

SORRY BEE. RIGHT NOW, I NEED YOUR WINGS...

I HOPE I DON’T REGRET THIS.

SORRY STEPHEN. I HAVE AN IDEA; GIVE ME A MINUTE.
IT TOOK A FEW
MINUTES, ACTUALLY.

THANKFULLY, A LOT
OF DRONE PARTS ARE
MODULAR IN DESIGN
THEORY, SO MY FIELD
MODIFICATIONS
DIDN’T TAKE LONG.

ALFIE WAS BACK
IN THE AIR IN
NO TIME.

MARCUS!
WE’RE GETTING
THE DRONE FEED
AGAIN.

I THOUGHT
YOU DIDN’T HAVE
ENOUGH POWER?

I MODIFIED
ALFIE USING SOME
OF MY RACING
DRONE’S PARTS.

THIS SHOULD
HOLD UP EASILY
AGAINST THOSE
WINDS FOR SEVERAL
HOURS.

I DIDN’T MENTION THAT
WHAT I DID MAY HAVE
CRIPPLED THE BLUE
BEE IRREPARABLY.

WHICH MEANT MY SHOT
FOR THE NATIONALS
COULD BE POSTPONED
FOR A YEAR.

WITH OUR EYE IN
THE SKY BACK ON
THE JOB, IT WAS
TIME TO FOCUS
ON STOPPING
THAT LEAK.

STEPHEN, DOES
THE HAZRES* TEAM
HAVE A UNIVERSAL
PUMP SYSTEM ON
BOARD?

IT’S STANDARD
EQUIPMENT ON
THEIR TRUCKS
NOW. WHY?

*HAZARD RESPONSE
IT WAS TIME FOR ME TO STEP UP AND SUIT UP. WE COULD SET UP A TEMPORARY CONTAINMENT SYSTEM USING THE PUMP.

THEN TRANSFER THE LIQUID CHLORINE OUT OF THE DAMAGED TANKER TO AN EMPTY ONE.

FORTUNATELY, STEPHEN HAD THE FORESIGHT TO DISPATCH ONE AS SOON AS IT WAS CLEAR THERE WAS A POSSIBLE LEAK.

I CHECKED ALFIE’S FEED AGAIN AS THE EMPTY TANKER CARS ARRIVED.

SO FAR, IT LOOKED AS IF THE WATER BARRIER WAS WORKING, BUT JUST BARELY. THE CLOUD CONTINUED TO INCREASE IN SIZE; THE LEAK WAS GETTING WIDER.

THE NEXT PART MEANT I NEEDED TO WEAR A HAZMAT SUIT. I DON’T KNOW HOW MY RESCUE PEERS CAN WEAR THESE ALL THE TIME...

I ALWAYS FEEL A BIT SICK WEARING ONE. I MEAN, YOU’RE BASICALLY WALKING INTO A CLOUD THAT WILL KILL YOU, AFTER ALL.

I MEAN, ANYTHING COULD HAPPEN.

I KNEW STEPHEN WAS WATCHING OVER US FROM AFAR, WHICH WAS COMFORTING.

HE’D KEEP A CRITICAL EYE ON THINGS WHILE WE TACKLED THE IMMEDIATE PROBLEM.
WE WERE READY.

I LED THE WAY, ARMED WITH A HIGH-CAPACITY FLUOROPROTEIN SPRAYER.

BASICALLY, A GLORIFIED FIRE EXTINGUISHER.

THE SCARIEST MOMENT WAS STEPPING INTO THE GAS CLOUD FOR THE FIRST TIME.

YOU'RE SURROUNDED BY SOMETHING THAT WILL KILL YOU, AND YET YOU'RE SAFE INSIDE YOUR EQUIPMENT.

IT'S SURREAL.

I CAUGHT MYSELF HOLDING MY BREATH AS WE APPROACHED. I SLOWLY LET IT OUT AND FOCUSED. TIME TO GET DOWN TO BUSINESS.
THE FOAM WOULD TEMPORARILY STOP THE ACID LEAK, LONG ENOUGH FOR US TO SECURE THE PUMP SLEEVE AROUND THE REMAINS OF THE DOME.

WE SLOWLY AND METHODICALLY SECURED THE PUMP APPARATUS AND HOSES. THERE WAS NO TIME TO THINK ABOUT THE KILLING FOG THAT SWIRLED AROUND US IN THE EVENING AIR.

SOON WE HAD EVERYTHING SET UP, INCLUDING THE CONNECTIONS TO THE EMPTY TANKER’S VALVES.

FINALLY, WE DOUBLE-CHECKED OUR WORK. WITH A CLEAR SIGN FROM EVERYONE, I STARTED THE PROCESS. EVERYTHING WORKED PERFECTLY!

STEPHEN CONTINUED TO MONITOR THINGS FROM ALFIE’S SENSOR FEED AS MY TEAM AND I WITHDREW.

STEPHEN, LOOKS LIKE WE’RE FINISHED!

I’M LOOKING FORWARD TO GETTING OUT OF THIS SUIT.

I BET! GREAT WORK OVER THERE.
ALFIE REMAINED ON STATION OVERNIGHT TO MONITOR THE SITE, HELPING US SAFEGUARD THE FIREFIGHTERS AS THEY TACKLED THE STILL-SMOLDERING ENGINE FIRE.

THE RAIN AND WIND WAS ROUGH, BUT THE MODIFICATIONS I MADE TO ALFIE WERE MORE THAN UP TO THE TASK.

THE CHLORINE CLOUD CONTINUED TO THIN THROUGH THE NIGHT.

BY DAWN, THE TOXIC GAS WAS GONE. ALFIE'S SENSORS VERIFIED THAT EVERYTHING HAD RETURNED TO NORMAL.

THE MORNING SKY WAS BRIGHT AND CLEAR.

NOW IT WAS TIME FOR THE OTHER RECOVERY TEAMS TO SHINE AS THEY PREPARED TO REMOVE THE WRECK AND REOPEN THE TRACK TO TRAFFIC.
THE HAZARD THREAT IS NOW ZERO!

THANK YOU, EVERYONE, FOR YOUR HARD WORK.

GREAT JOB, STEPHEN. I DON’T KNOW HOW ANY OF US COULDN’T HAVE DONE THIS WITHOUT YOUR HELP.

SAME TO YOU, MARCUS. YOU DID SOME STELLAR WORK OUT THERE IN THE FIELD.

LISTEN, I WANT YOU TO JOIN THE PLANNING TEAM TOMORROW, TO HELP US WITH THE LONG-TERM CLEAN-UP.

WAIT, WHAT? I HAVE A QUALIFYING RACE TO PREPARE FOR.

THANK YOU, EVERYONE, FOR YOUR HARD WORK.
MARCUS, you know as well as I do that for industrial hygienists like us...

...our work is never truly done.

Especially when it comes down to the long-term safety of the people we serve every day.

Stephen was right. I do what I do because I want to help people live happy, safe, productive lives.

I knew helping out on the planning team was the right move.

What we do here and now resonates in the world around us.

That’s why I’m an industrial hygienist.

I am IH.
Hometown
Bozeman, Montana

Alma Mater
Montana Tech (BS, MS)

Certifications
CIH, CSP, CAE, LEED

Interests
Mountain climbing, skiing, hunting

Background
Fascinated with adventure from early on, Stephen loved to
mountain climb and cave dive while traveling around the United
States with his father. After graduating with a degree in Mining
Engineering, he took a job in Canada, working at remote mining
sites in the far northern reaches.

After several years as a health and safety coordinator, he re-
turned to the USA to further his education. Intrigued with the
rising interest in sustainability, he joined a regional firm and spent
several years working to transform mining sites to a more ‘green’
platform. Retired from active consulting work, Stephen still steps
in as an advisor when called upon, especially during disaster
events that are potentially hazardous to
local communities and the environment.
Join our IH Heroes™ as they face a new threat from a nearby derailment. Will teamwork and technology save the day? Learn more about these quiet workplace heroes and check out their latest adventures in AIHA’s award-winning graphic series at IHHeroes.org.