Developing strategies and innovations to help NC Transit Systems effectively respond to COVID-19

Work On It Meeting

September 9, 2020











Welcome & Orientation

Warren Miller Principal, Fountainworks

AGENDA

- Welcome & Orientation
- Opening Remarks
- Kick It Off Meeting Review
- Understanding & Limiting the Spread of COVID-19 in Transit Vehicles
- Contactless Fare Payment in the Triangle Region
- BREAK
- Prioritization of Innovations
- Closing & Next Steps

Navigating Zoom





Meeting Rules

PRACTICE ONLINE PRESENCE



SHOW YOUR MULTITASKING SKILLS

EMBRACE TECH CHALLENGES



EVENTUALLY IT WILL WORK





DON'T FORGET TO STRETCH AND STAND

MUTE WHEN NOT SPEAKING



SO WE LIMIT UNNECESSARY NOISE

SPEAK UP



YOUR INPUT IS IMPORTANT

Opening Remarks

Julie White Deputy Secretary for Multimodal Transportation, NCDOT

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Kick It Off Meeting Review

Jim Westmoreland

Managing Principal, Westmoreland Strategic Enterprises

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Project Purpose and Approach

- Through surveys and virtual meetings, gather input from transit systems about impacts of COVID-19, unique ideas to respond and recover, and innovative solutions to long-term challenges
- Focus on ideas which ensure customer safety and health while maximizing access to opportunities and services, particularly for populations most impacted
- Establish NCDOT's role to aid in innovation deployment





Project Goals

- Identify products which help NC transit systems respond to and deal with the mid-term and long-term trends of COVID-19
- Develop strategies and innovations which help NC transit systems become more resilient and prepared to handle future disruptions
- Demonstrate how NC Transit Cares connects with and builds upon the 2018 Public Transportation Strategic Plan and its recommended tactics





NC Transit Cares 2020 Schedule





Small Group Feedback from 7/22 Kick Off Meeting

Overview of Biggest Challenges, Innovations, & Strategies



Biggest Challenges Facing NC Transit





- Short-term: current to December 31, 2020
- Mid-term: January 1, 2021 June 30, 2021
- Long-term: July 1, 2021 and beyond

How can we keep passengers and employees safe?

Innovation	Timeframe
Establish partnerships with Others (UNC School of Public Health and Industry Groups – APTA, FRA, FAA)	Short-term
Transit Cleaning Accreditation Program	Mid-term
Contactless Fares or Fare Elimination Systems	Mid-term
Air Filtration Systems (Emerging technology such as UVGI)	Mid-term
Vehicle Design Changes	Long-term

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Resiliency Strategies for NC Transit

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How can we offset ridership declines due to COVID-19?

Innovation	Timeframe
New Marketing Techniques	Short-term
Evaluate new service opportunities	Mid-term
Real-time app to survey passengers	Mid-term
Technologies to enhance service delivery flexibility in post COVID 19 environment	Long-term

How can we restore revenues and funding lost as a result of COVID-19?

Innovation	Timeframe
State and Regional Procurement Models	Short-term
Agency cash models to minimize impacts to revenues	Mid-term
NCDOT improve data to demonstrate impacts of funding reductions	Mid-term
Regional Partnerships and Ride Sharing	Mid-term
Additional Covid-19 Funding and Strategies for Funding Flexibility	Mid-term

How can we move to new service patterns as needs evolve?

Innovation	Timeframe
Expand use of microtransit and on-demand service models	Short-term
Statewide Technology Deployment and Integration	Mid-term
Scheduling and Forecasting Innovations	Mid-term
Mobility For All Pilot	Mid-term
Mobility as a Service	Long-term

Understanding & Limiting the Spread of COVID-19 in Transit Vehicles

Glenn Morrison

Professor, Environmental Sciences & Engineering Gillings School of Global Public Health, UNC-Chapel Hill

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SARS-CoV-2 transmission and prevention

Glenn Morrison (and many slides from Barbara Turpin) Environmental Sciences and Engineering Gillings School of Global Public Health





Virus transmission



direct contact



indirect contact

Fomite pathway

close-range only (<2 m)



large droplets



aerosols

Aerosols, **Close and** long range



https://www.cdc.gov/flu/resource-center/freeresources/graphics/images.htm, http://solutionsdesignedforhealthcare.com/rhinovirus, https://phil.cdc.gov/Details.aspx?pid=23312, https://pdb101.rcsb.org/motm/132



• Lifetime in the atmosphere

Aerosol size is important

• Where it deposits in the respiratory system

Aerosol generated by Breathing, speaking, and coughing

High air velocity shears respiratory fluids during expiration

Modes: 0.8 μm (largest mode) 2-4 μm (two modes) 100 μm (smaller)

Droplets (100 μm): By number, 0.8μm mode is 100 times larger (coughing)





Evidence for SARS-Cov-2 transmission by aerosols

- "super spreader" events 18x more likely indoors
 - Nishiura, medRxiv 2020.02.28.20029272; doi: <u>https://doi.org/10.1101/2020.02.28.20029272</u>
- Dinner in China
 - Diners in local flow zone infected
 - Li et al. (2020) medRxiv, doi: https://www.medrxiv.org/content/10.1101/2020.04.16.200 67728v1
- Skagit Valley Choir
 - Precautions to avoid contact
 - Transmission broadly spread across room
 - 52 + index case of 61 total people
 - *Miller et al. (2020) medRxiv*, doi: https://www.medrxiv.org/
 - content/10.1101/2020.06.15.20132027v2.full.pdf+html



Study published *this* week: probable aerosol transmission on bus

Outbreak associated with Buddhist retreat

- 100 min round trip
- no masks (early in pandemic)
- Index case from Wuhan
- Note cases distributed randomly
- Bus 1, no cases; Bus 2, 24 cases
- Shen et al. JAMA Internal Medicine, 2020



An aerosol scientist's perspective

Summary of Evidence vs. Modes of Transmission

		Droplets	Fomites	Aerosols	Key:
	Outdoors << Indoors	x	1	11	√: evidence
	Similar viruses demonstrated	X	1	~	X: no evidence
	Animal models	?	1	1	
	Superspreading events	X	X	11	
	Importance of close proximity	1	x	11	es es
	Consistency of close prox. & room-level	X	X	~	ultiple
	Physical plausibility (talking)	X	1	~	on m d ref
	Physical plausibility (cough, sneeze)	1	~	~	bear iis ar
	Impact of reduced ventilation	x	x	1	ould r deta
	SARS-CoV-2 infectivity demonstrated in real world	X	X	1	that c
	SARS-CoV-2 infectivity demonstrated in lab	x	1	1	ems r slid
	"Droplet" PPE works reasonably	1	~	~	the it
	Transmission by a/pre-symptomatics (no cough)	x	1	1	iding See
	Infection through eyes	1	1	1	inclu ways
	Transmission risk models	1	1	1	Only
-					

https://twitter.com/jljcolorado/statu s/1300438984481415175/photo/1

Control of transmission by aerosols

Source control, masks (also limit loud talking/singing)



Dilution, ventilation, filtration



Distance and density



Minimize contact time



Receptor control, masks



Type and level		Low occupancy		High occupancy				
of group activity	Outdoors and well ventilated	Indoors and well ventilated	Poorly ventilated	Outdoors and well ventilated	Indoors and well ventilated	Poorly ventilated		
Wearing face cove	erings, contact for sl	nort time						
Silent								
Speaking								
Shouting, singing								
Wearing face cove	erings, contact for p	rolonged time						
Silent								
Speaking		*		*				
Shouting, singing								
No face coverings	s, contact for short t	ime						
Silent								
Speaking								
Shouting, singing								
No face coverings	s, contact for prolon;	ged time						
Silent								
Speaking								
Shouting, singing								
Risk of transmissi	on lium High I	* Borderline of distancing	case that is highly depe , number of individuals	endent on quantitative de s, and time of exposure	finitions Jones	Nicholas R, Q		

Jones Nicholas R, Qureshi Zeshan U, Temple Robert J, Larwood Jessica P J, Greenhalgh Trisha, Bourouiba Lydia et al. Two metres or one: what is the evidence for physical distancing in covid-19? BMJ 2020; 370 :m3223

Risk simulators available, specific to aerosols

	2020_COVID-19_Aer File Edit View Insert	osol_Transmi Format Data	ssion_E Tools A	stima t dd-ons	or ☆ 🏠 d Help	3
ŧ	🖥 🍸 - 100% - 💿 View o	nly 👻				
JX						
	A	В	С	D	E	F
2	Estimation of COVID-	19 aerosol t	ransmi	ission	in an urbar	n bus
3						
4	Input Parameters					
5		Value			Value in other u	units
6	Surface area	307	sq ft	=	28.6	m2
7	Height	7.9	ft	=	2.4	m
8	Volume				69	m3
9						
10	Passengers	40	people			
11	Breathing rate	0.8	m3 / h			
12						
13	Duration of trip	45	min	_	0.75	h
14)			
15	Ventilation w/ outside air	3	h-1		1.4	L/s/per
16	Decay rate of the virus	0.32	h-1			
17	Deposition to surfaces	0.3	h-1			
18	Additional control measures	0	h-1			
19	Total first order loss rate	3.62	h-1			
20						
21	Fraction of population infected	0.30%				
22	Number of passengers infected	0.12	people			
23						

https://tinyurl.com/covid-estimator

http://covid-exposure-modelerdata-devils.cloud.duke.edu/

Known Parameters	Value		Uncertain Parameters: Specify Range		Minimum		Maximum	
Number of faculty in the course	1 (fixed)		Percentage of faculty-age people in community who are infectious (%)			1.4	•	
Number of students in the course	40		Percentage of student-age people in community who are infectious (%) 0.			1.4	.	
Number of in-person class sessions in the course	20	•	Mask efficiency in reducing virus exhalation (%)			0		
Duration of each in-person class session (min.)	360	0	Mask efficiency in reducing virus inhalation (%)	0	0	0	0	
Floor area of classroom (sq. ft.)	300		Room air ventilation rate w/outside air (air changes per hour)	5	•	10		
Height of classroom (ft.)			Additional control measures (effective air changes per hour)	0	٥	0	-	
			Decay rate of virus infectivity indoors (per hour)	0	٠	1	•	
			Deposition rate of virus to surfaces (per hour)	0.3	٥	1.5	•	
			Inhalation rate: Faculty (m³/minute)			0.01		
			Inhalation rate: Student (m³/minute)			0.007	•	
			FOR ADVANCED USERS ONLY					
			Click links below before specifying	Mean		Standar	d Deviatio	
Calculate Infection Proba	bility		log10[Quanta emission rate: Faculty (quanta/hour)]	1.5	٠	0.71	٠	
			log10[Quanta emission rate: Student (quanta/hour)]	0.69	•	0.71	•	
Predicted Infection Probabilities for the S	emeste	r						
FOR FACULTY MEMBER TEACHING THE COURS	E		FOR A STUDENT TAKING THE COURSE					
Best Estimate of Infection Pro 5% chance that infection probability will be le	bability 2 ess than 1	7.25% .16%	Best Estimate of Infection Probability 26.87% 5% chance that infection probability will be less than 2.50%					
25% chance that infection probability will be loss than 5.72%		72%	25% chance that infection probability will be loss than 9 16%					

Simulate infection probability for bus driver

- Risk of infection to driver
 - 6 Month, 4 hours/day
- Assumptions
 - Hygiene and distancing
 - Bus size, air well mixed in bus
 - Air leakage
 - Community infection %
- Measures
 - From 40 \rightarrow 10 passengers
 - No masks \rightarrow universal masks
 - Closed \rightarrow open windows





Research and Expertise related to SARS-Cov-2

- Aerosol Scientists
- Microbiologists
- Building/indoor science
- Epidemiology



Barbara Turpin



Ralph Baric



Jill Stewart







Jason Surratt



Michael Fisher

Karsten Baumann

Thank you

UNC GILLINGS SCHOOL OF GLOBAL PUBLIC HEALTH



Contactless Fare Payment in the Triangle Region

Brian Fahey Transit Administrator, GoTriangle

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Triangle Mobile Ticketing Implementation

Brian Fahey Transit Administrator GoTriangle



Mobile Ticketing Partners

- GoTriangle
- City of Raleigh (GoRaleigh)
- City of Durham (GoDurham)
- Town of Cary (GoCary)
- Wake, Durham, Orange Counties
- CAMPO, DCHC-MPO





Why Mobile Ticketing?

- 2018 Fare Integration Study
 - Improve pass distribution & sales
 - Balance revenue & ridership goals
 - Improve the passenger experience
 - Improve regional coordination
 - Make transit an affordable option







Why Mobile Ticketing?

- Joint RFP issued in 2019
- Partners selected the TouchPass system from Delerrok, Inc.
- Primary Goals:
 - Provide convenience to customers (increase distribution network)
 - · Create platform where fare capping can be applied
 - Improve efficiency (decrease boarding times)



TouchPass System

- Account-based fare collection
- Mobile app, smart card
- Cloud-hosted, real-time transactions
- Scalable for other services (BRT, paratransit, County services)







Benefits

- Automate fare capping
- Customers can easily purchase fare products and stored value online or through app
- Contactless payment
- Ability to use promotional codes and paper tokens
- API for ticket vending machines (TVM's)





Benefits

- InComm reload network
 - 150 retail locations
- InComm reload network
 - GoPass
 - Youth GoPass







Integration

- Multi-modal
- Journey planning
- Rewards
- Fare collection





Timeline

- Currently installing hardware/configuring software
- Regional marketing program
- Internal testing period (October-November)
- Soft Launch (December)
- Full Launch January 2, 2021







QUESTIONS?

bfahey@gotriangle.org

(919) 485-7501



BREAK

We will resume at 9:55.

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Prioritization of Innovations

Warren Miller

Principal, Fountainworks

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Biggest Challenges Facing NC Transit



How can we keep passengers and employees safe?

Innovation	Description
Establish partnerships with Others (UNC School of Public Health and Industry Groups – APTA, FRA, FAA)	This innovation would create partnerships that would allow information sharing and keep NCDOT and NC transit agencies up to date with latest COVID-19 guidance.
Transit Cleaning Accreditation Program	This innovation would allow operators or maintenance staff to receive training and be certified in best cleaning practices. This could come from FTA or another agency's standard operating procedure that NCDOT adopts.
Contactless Fares or Fare Elimination Systems	Contactless fares are where the passenger validates fare payment without interacting with the operator. Fare elimination means that passengers would ride transit without submitting a fare payment (example: Chapel Hill Transit). This innovation would help collect information from agencies looking in to either of these concepts and research the feasibility of a pilot program for systems in NC, including consideration of equity components and potential mitigation.
Air Filtration Systems (Emerging technology such as UVGI)	This innovation would involve understanding the latest research on sanitation practices and technologies, and also working with experts and companies on how agencies could adapt current technologies (i.e. what is the best way to run air within a vehicle, guidance on opening vehicle windows).
Vehicle Design Changes	This innovation would help understand latest research and consider how vehicle companies could modify vehicles to adapt to COVID-19.

How can we offset ridership declines due to COVID-19?

Innovation	Description
New Marketing Techniques	This innovation would catalog the current best ideas by agencies around NC and also research marketing techniques to encourage people to use transit. There is an opportunity for NCDOT to create a pilot program marketing transit to the general public.
Evaluate new service opportunities	Many agencies around NC adapted during COVID-19 to expand their services to include services such as meal delivery to homebound seniors. This innovation would help catalog these ideas and research the applicability (increase ridership, cost, etc.) to agencies around NC.
Real-time app to survey passengers	One aspect of real-time app would be to survey passengers on how they feel about using transit (i.e. do they feel safe?). Another is to track buses in real time. NCDOT could help research and identify applications that could be used throughout NC.
Technologies to enhance service delivery flexibility in post COVID-19 environment	This innovation would explore emerging technologies to enhance transit service delivery such as rider notifications on 'where is my ride' which would include, for example, notifications around seat assignment and a reminder to comply with local ordinances on face coverings.

How can we restore revenues and funding lost as a result of COVID-19?

Innovation	Description
State and Regional Procurement Models	This innovation would develop an inventory of needs within NC transit agencies to perhaps expand joint purchasing (i.e. PPE) and research opportunities to allow bulk procurement with multiple transit agencies or procurement through a single source like NCDOT.
Evaluate Agency cash models to minimize impacts to revenues	This innovation would research agency cash models used in ridership and revenue forecasting to determine how agencies charge and determine if there are models for that could help capture more revenue during COVID-19 environment. (I.e. if rides are charged by mile or trip, is one of those better for systems when ridership is down or the trips contain more individual riders per trip?)
NCDOT improve data to demonstrate impacts of funding reductions	This innovation would collaborate with agencies to determine what data from agencies is most effective to regularly update in order to tell the story of what is happening at agencies at any point in time. (i.e. If the legislature asked for information on transit in NC, what information would be useful to have readily available?). Based on feedback, NCDOT can work to establish the best system/method to collect data.
Regional Partnerships and Ride Sharing	This innovation would research current and planned cross-county services by transit agencies to try and identify cost-saving measures and efficiencies that could be implemented. NCDOT could use this information to potentially identify pilot projects.
Additional COVID-19 Funding and Strategies for Funding Flexibility	This innovation would create a dialogue with agencies and NCDOT to help identify and understand COVID-19 funding needs and research current funding programs (both State and Federal) to identify possible ways to use those funding programs in new ways to address COVID-19 funding needs.

How can we move to new service patterns as needs evolve?

Innovation	Description
Expand Use of micro-transit and similar on-demand service models	Using the pilot project in Wilson as an example, this innovation would determine other agencies in NC interested in participating in a micro-transit pilot project and explore how to expand participation. This innovation would need to coordinate with existing transit, the community, and labor resources, to determine a) replacement or enhancement of the current system, b) new drivers or transition and training for existing drivers , c)service areas and d) finance models and trip rates
Statewide technology deployment and integration	Led by NCDOT, broadly deploy online and app-based scheduling, payment, vehicle tracking and other technologies which will improve service efficiency, cross-jurisdiction trip coordination, cost effectiveness, and rider experience. This innovation would require planning, piloting of concepts (partly through existing efforts like the Mobility for All and Wilson projects), and securing funding.
Research and disseminate information on best practices and innovations to assist with trip scheduling and forecasting with COVID-19 restrictions	This innovation would research national innovations and best practices in new software to create transit schedules which comply with COVID-19 restrictions such as social distancing. This innovation would also research innovations on forecasting trip demands with COVID-19 uncertainties and compile this information for NC agencies to access.
Systems collaborate with NCDOT on the Mobility for All pilot project linking transit scheduling software with the North Carolina Department of Health and Human Services NCCARE360 program	NCDOT has a pilot project which will experiment with linking transit scheduling software to medical trip needs identified in the NCDHHS NCCARE360 program. This innovation would explore how this pilot project could be deployed more extensively within NC transit agencies.
Research and disseminate information on state of the industry, potential models, best practices and innovations in elements of Mobility as a Service (MaaS), to create a roadmap toward implementation of MaaS elements.	There are many elements to Mobility as a Service and many emerging technologies. This innovation would collect and summarize current national innovations and best practices in MaaS, as well as challenges and needs, and make this information available to NC agencies.

Breakout Group Instructions

Breakout Group Instructions



You will be placed in a breakout group based on the challenge areas you selected when you registered.

Your group facilitator will guide you through a discussion of different innovations. You will then have a choice to vote for your top 2 on a virtual whiteboard.



Closing & Follow-Up

Jim Westmoreland

Managing Principal, Westmoreland Strategic Enterprises

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https://connect.ncdot.gov/business/Transit/Pages/Transit-Cares.aspx

Connect NCDOT business partner resources									A Home	🗬 Help	Site N	lap	
Doing Business		Bidding & Letting		g Projects	Projects Resources		Local Governments					Q	
Prequalify	Small Bus	siness	Consultants	Directory of Fir	ms Truck	king	Fleet & Material Mgmt	DMV	Public Trans	Purchasing	ROW	Turnpike	

NC Transit Cares

NCTC Project Information	NCTC Innovations	NCTC Innovations			
. INITIATIVE DEVELOPMENT COMMITTEE (IDC)	NCTC Survey Results	1			
2-26-20 NCIT-IDC Kickoff Meeting eb Kickoff Meeting	POF				
22-26-20 NCIT-IDC Kickoff Meeting Minutes Feb Kickoff Minutes	COVID 19 Information Resources	al			
5-05-20 NCTC-IDC Meeting May Meeting	Developing a Pandemic Virus Serv Restoration Checklist	ce			
5-05-20 NCTC-IDC Meeting Minutes lay Minutes	APTA White Paper				
8-12-20 NCTC-IDC Meeting ugust Meeting	Considerations When Planning in a Unprecedented Realm of Unknown WSP White Paper	n s			
08-12-20 NCTC-IDC Meeting Minutes August Minutes	Global Practices for Protecting				
08-12-20 NCTC-IDC Meeting Minutes August Minutes B. KICK IT OFF MEETING – JULY 22, 2020	POF	Global Practices for Protecting Employee and Customer Health WSP publication for MTA			
(ick It Off Meeting - July 22, 2020	How it the global transport sector				

Follow-up and Next Steps

Follow-up:

- NCDOT will send transit systems information on top 8 innovations to review and prioritize by September 23rd
- Consultant team will review rankings, develop summary implementation plans for each innovation, and project summary for launch it meeting

Next meeting:

Launch It Meeting November 18th

- 9am Noon
- Virtual meeting open to the elected and appointed officials (State, Cities, and Counties)
- Purpose will be to provide overview NC Transit Cares initiative, review summary implementation plans of each priority innovation, and for NCDOT to announce planned follow-up support and next steps





