4.0 ATTACHMENTS

Attachment 1: Saab 2000 three-view drawing
Attachment 2: Image sequence from the OPH Fuel Tank video (cropped, 4 frames/page)
Attachment 3: Image sequence from the OPH Fuel Tank video (magnified, cropped, 1 frame/page)
Attachment 4: Image sequence from the OPH Front Door video (cropped, 4 frames/page)
Attachment 5: Image sequence from the OPH Front Door video (magnified, cropped, 1 frame/page)
Attachment 6: Image sequence from first passenger video (3 frames/page)
Attachment 7: Image sequence from second passenger video (3 frames/page)
Attachment 8: Runway witness mark and debris evidence
Attachment 9: Preliminary Flight Data Recorder (FDR) plots
Attachment 10: Calculated N686PA groundspeed (from integration of FDR longitudinal acceleration data)
Attachment 11: DUT Airport Layout Plan (ALP)

Attachment 1

Saab 2000 Three-View Drawing

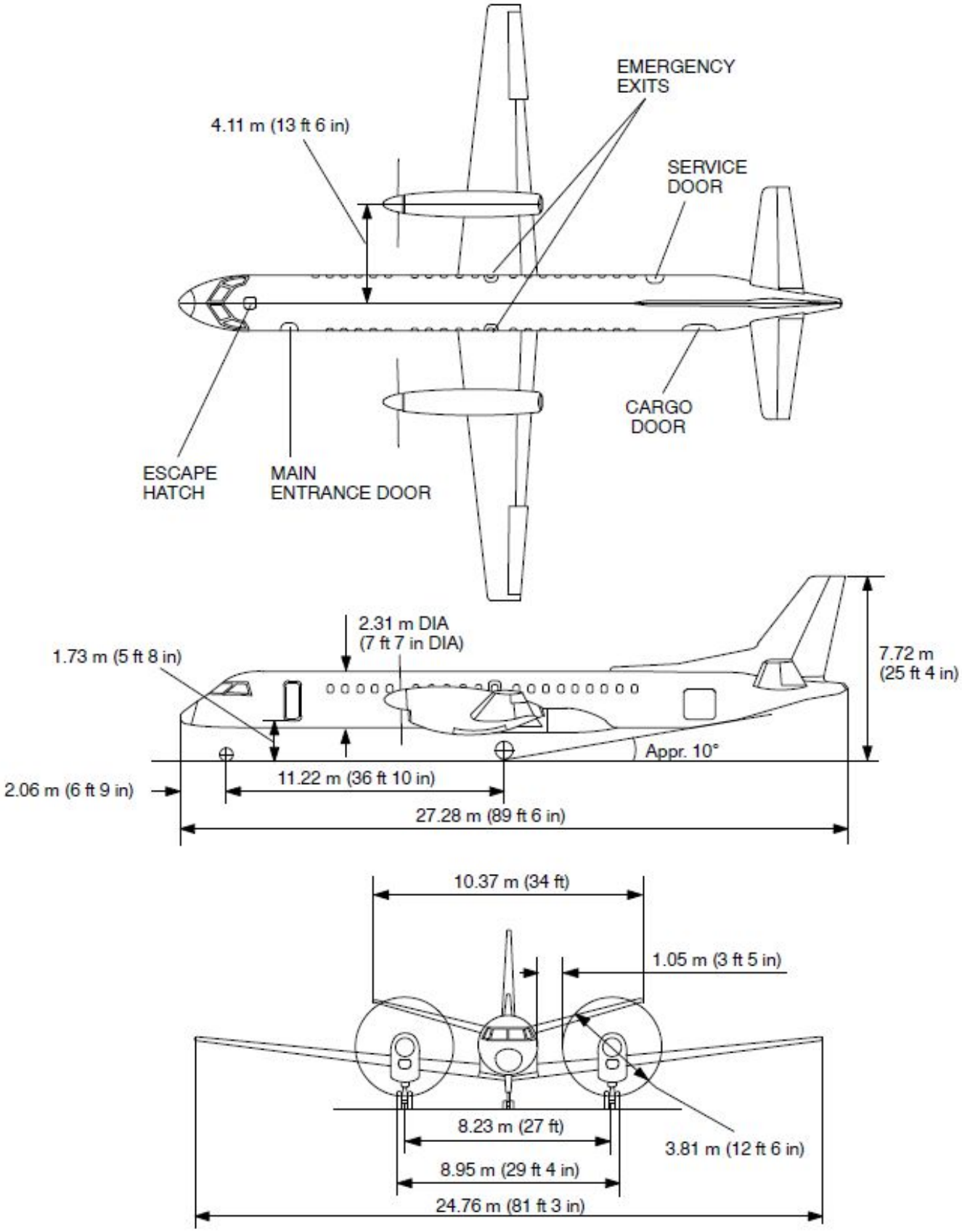


Figure A1.1: Three-view drawing of Saab 2000

Attachment 2

Image sequence from the OPH Fuel Tank video (cropped, 4 frames/page)

OPH Fuel Tank Video Image Summary



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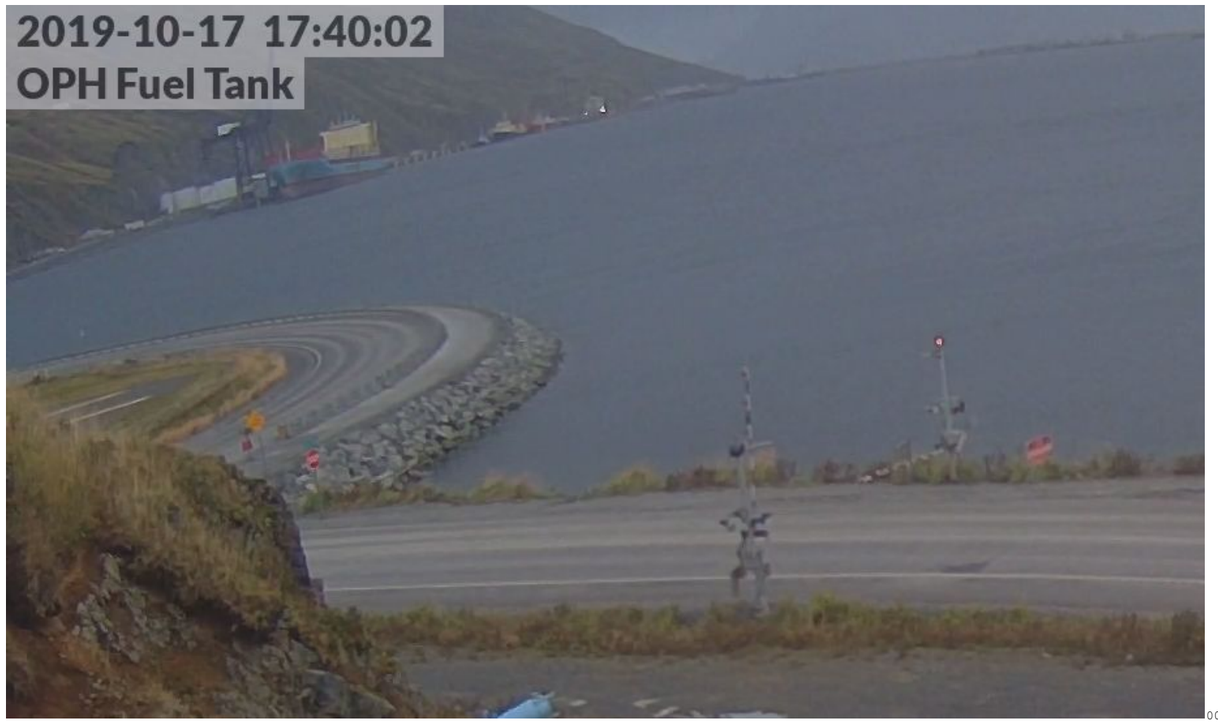


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OPH Fuel Tank Video Image Summary



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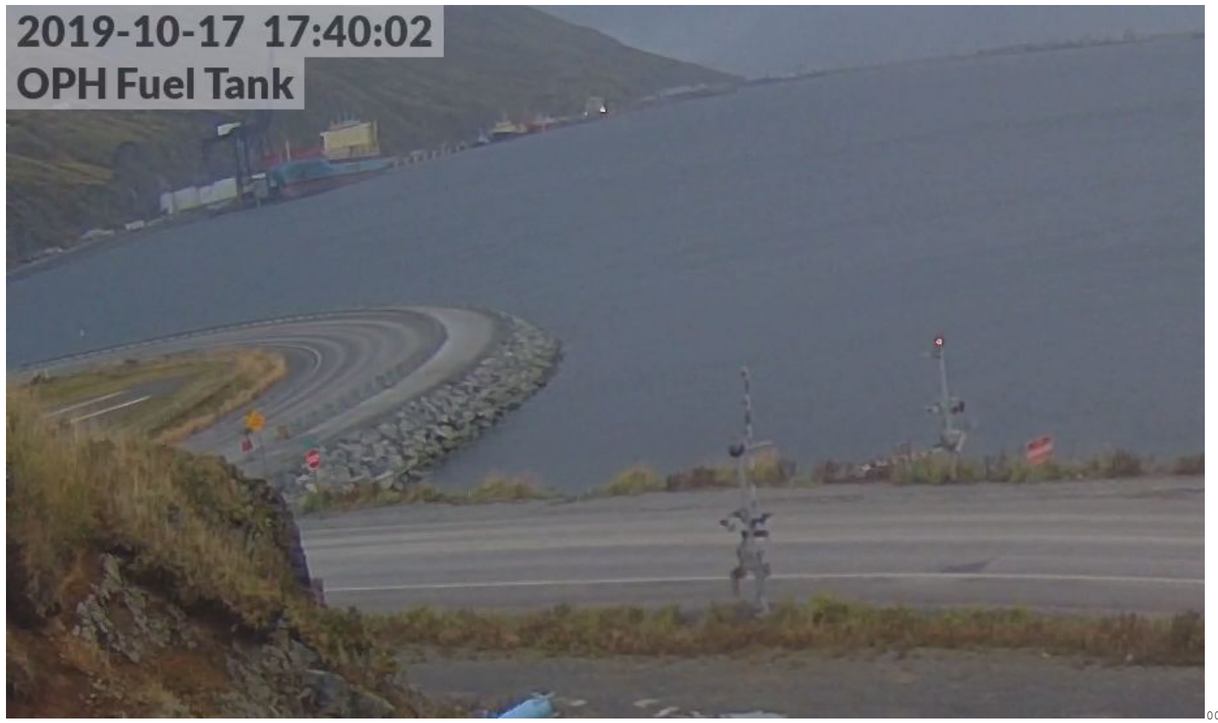


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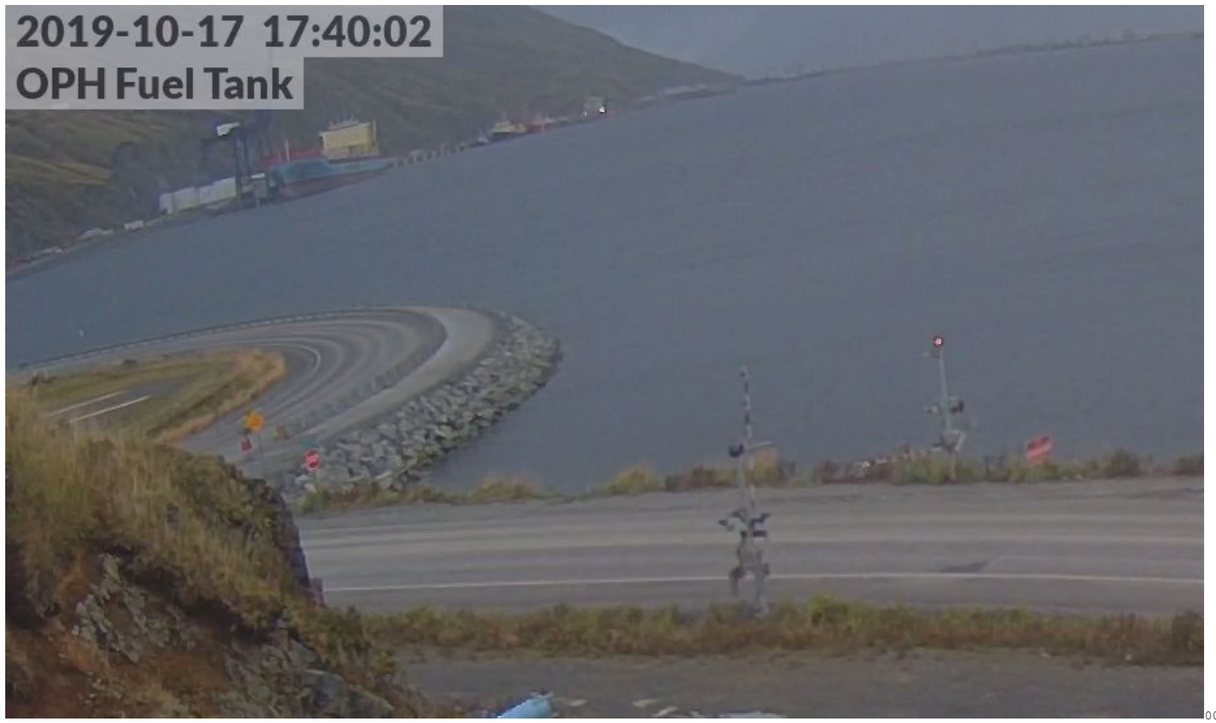


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OPH Fuel Tank Video Image Summary





Attachment 3

Image sequence from the OPH Fuel Tank video (magnified, cropped, 1 frame/page)



Frame 0



Frame 1



Frame 2



Frame 3



Frame 4



Frame 5



Frame 6



Frame 7



Frame 8



Frame 9



Frame 10



Frame 11



Frame 12



Frame 13



Frame 14



Frame 15



Frame 16



Frame 17



Frame 18


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OPH Fuel Tank


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Frame 23


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Frame 32


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Frame 34


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Frame 44


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Frame 46



Frame 47


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Frame 49



Frame 50


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Frame 52


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Frame 57


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Frame 60



Frame 61


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Frame 65


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Frame 90


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Frame 100



Frame 101


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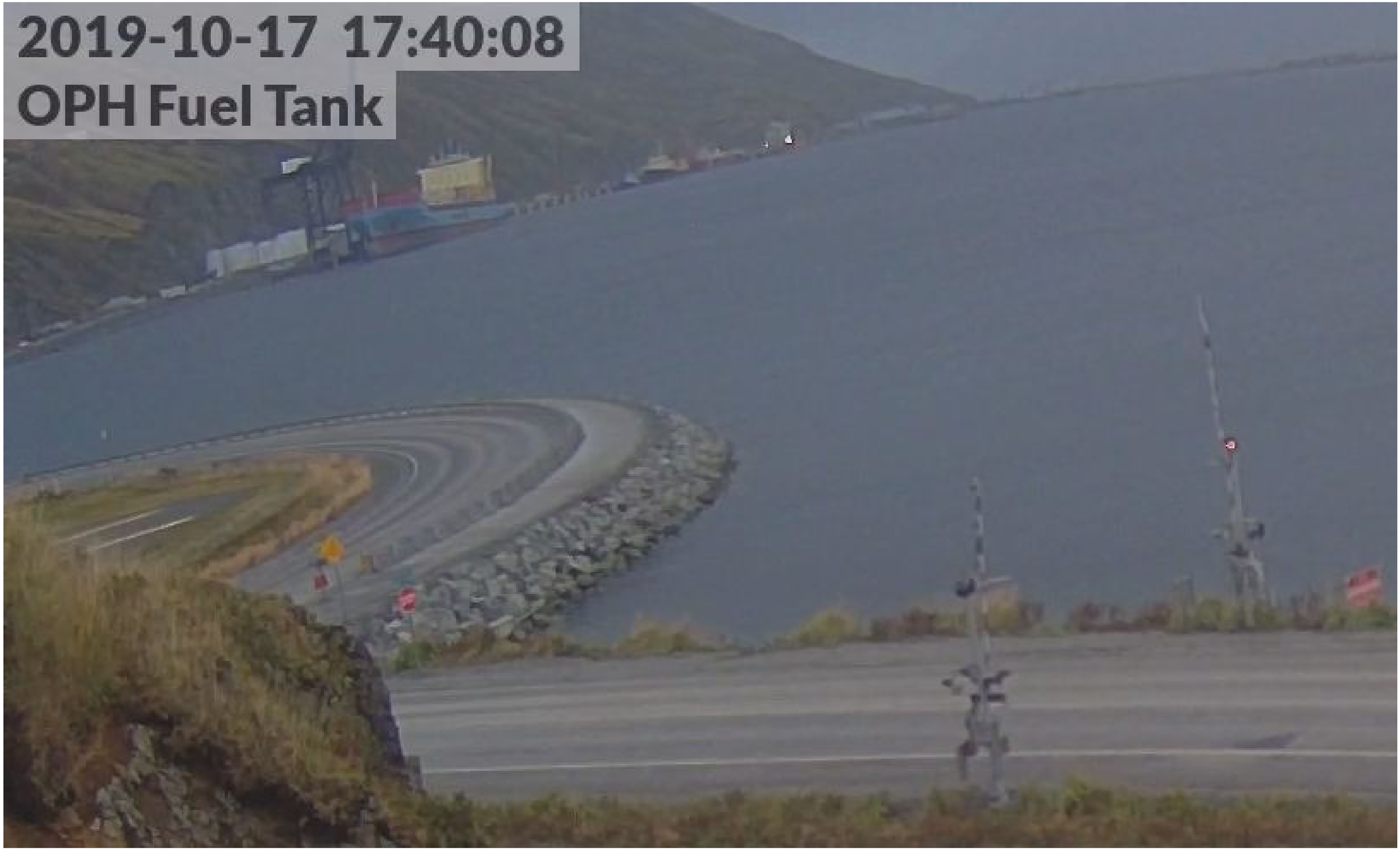


Frame 103



Frame 104


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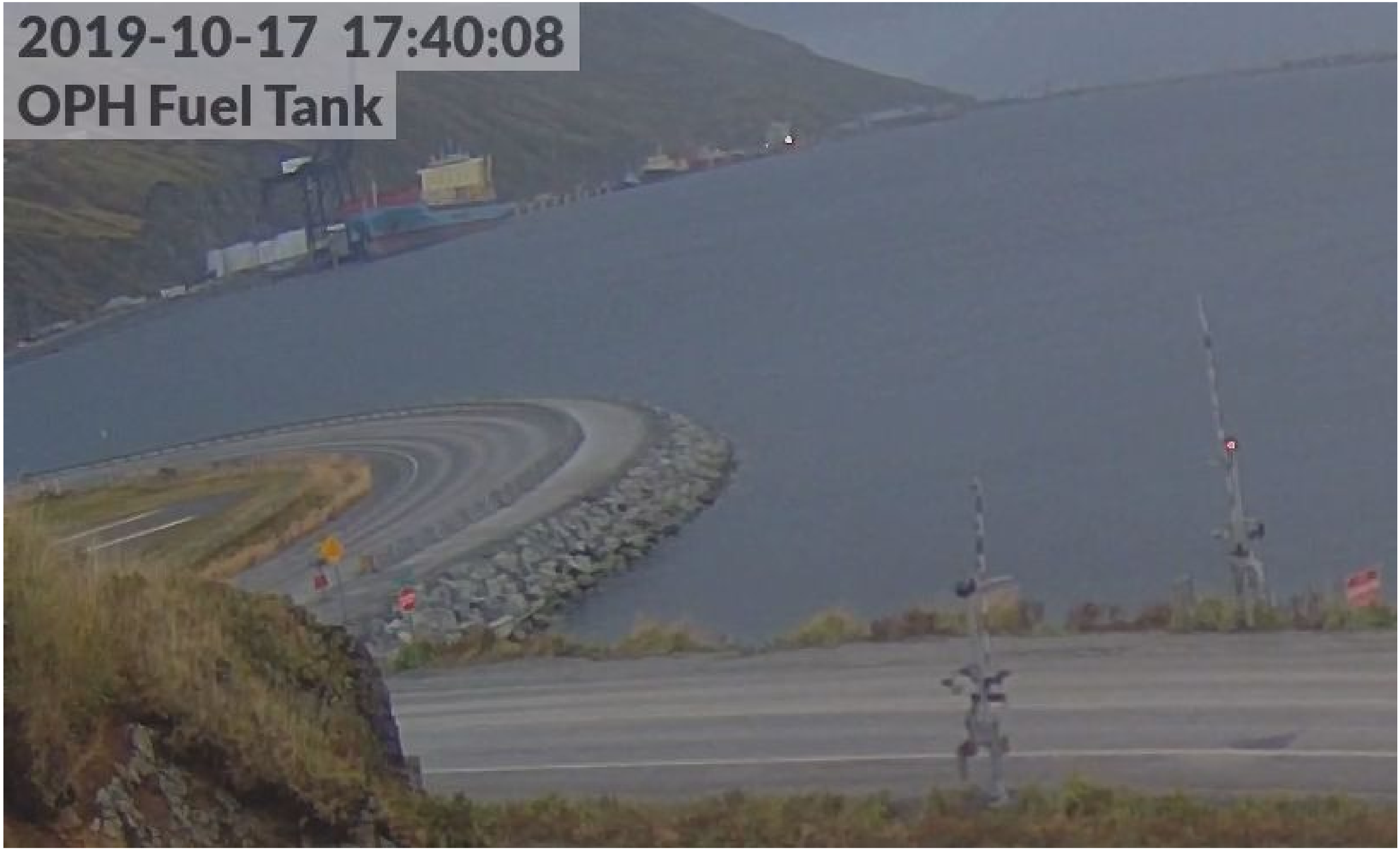

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OPH Fuel Tank

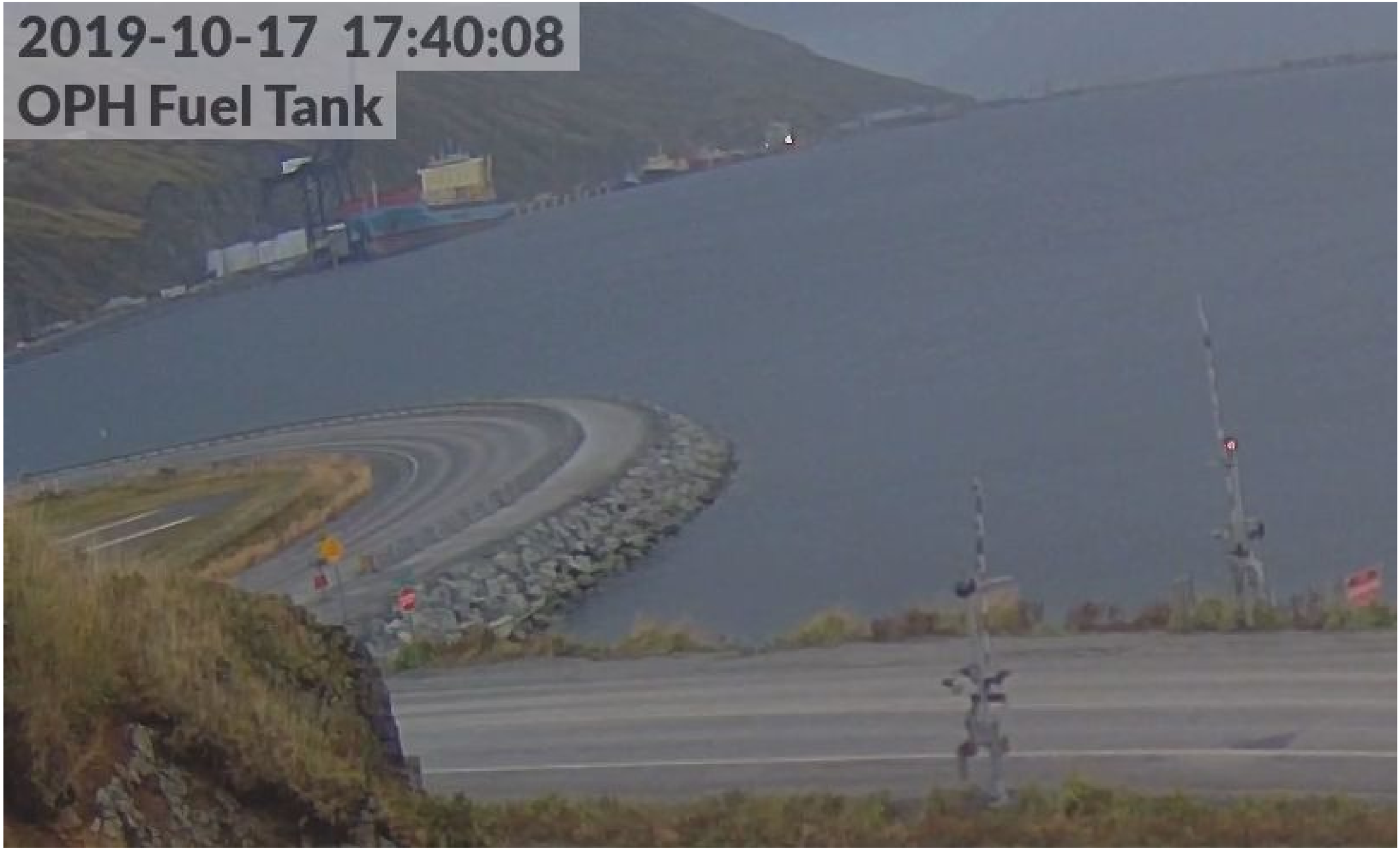


Frame 107

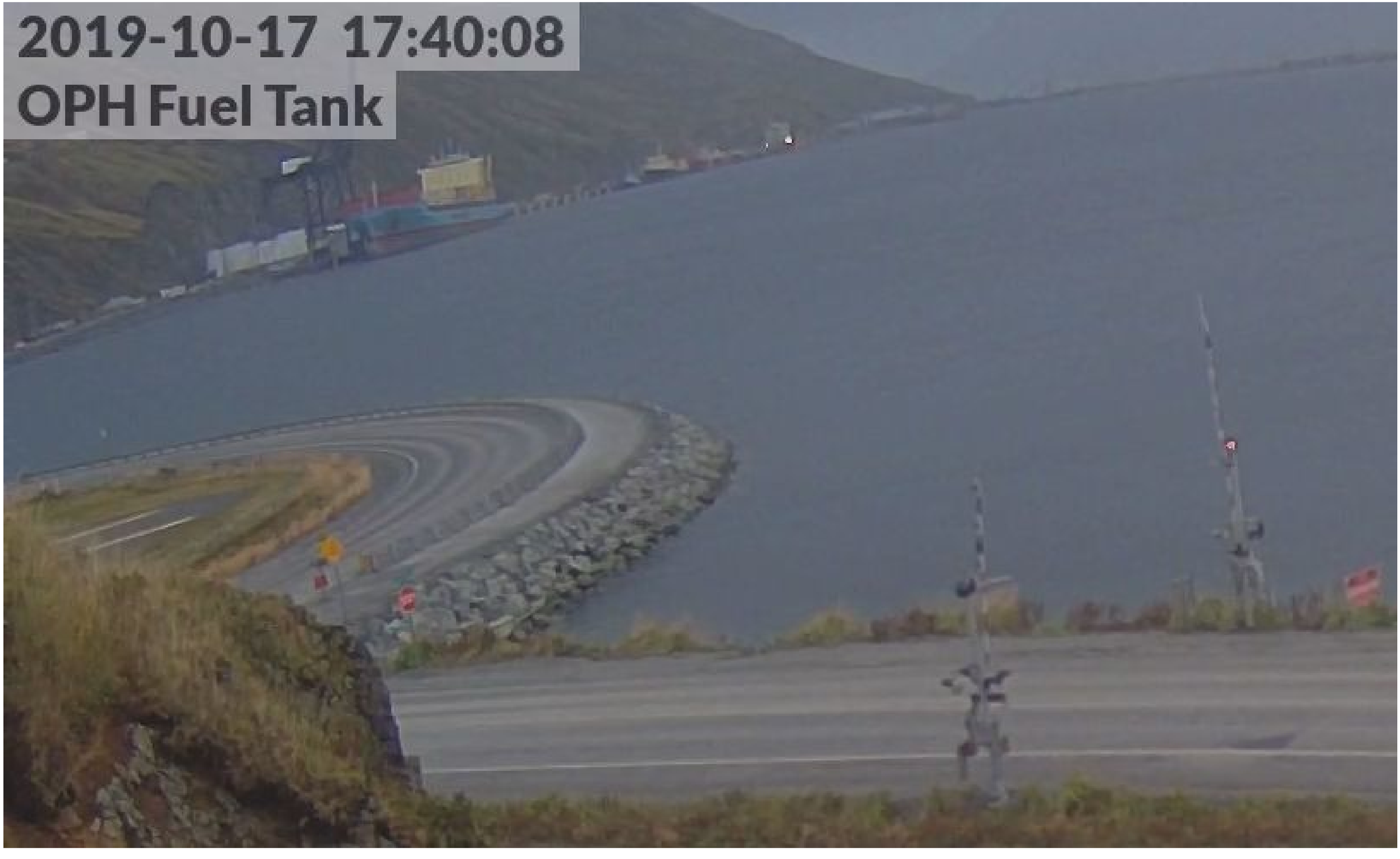


Frame 108


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OPH Fuel Tank



Frame 110


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Frame 112


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Frame 114


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Frame 116


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Frame 120


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Frame 122


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Frame 125



Frame 126


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Frame 134


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Frame 137



Frame 138



Frame 139



Frame 140



Frame 141



Frame 142



Frame 143



Frame 144



Frame 145



Frame 146



Frame 147



Frame 148



Frame 149



Frame 150


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OPH Fuel Tank



Frame 152


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Frame 154


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Frame 158



Frame 159



Frame 160


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Frame 162



Frame 163



Frame 164



Frame 165



Frame 166



Frame 167



Frame 168



Frame 169



Frame 170



Frame 171


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Frame 176



Frame 177



Frame 178


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Frame 180



Frame 181



Frame 182



Frame 183



Frame 184



Frame 185



Frame 186



Frame 187



Frame 188



Frame 189



Frame 190



Frame 191



Frame 192



Frame 193



Frame 194



Frame 195



Frame 196



Frame 197



Frame 198


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OPH Fuel Tank



Frame 200



Frame 201


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Frame 204



Frame 205



Frame 206


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Frame 208


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Frame 210



Frame 211


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Frame 216


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Frame 226


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Frame 230


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Frame 240


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Frame 242


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Frame 245



Frame 246


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Frame 248


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Frame 250


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Frame 256


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Frame 260



Frame 261



Frame 262


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Frame 266


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Frame 270


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Frame 272


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Frame 279



Frame 280



Frame 281


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Frame 283


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Frame 286


2019-10-17 17:40:20
OPH Fuel Tank


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Frame 290


2019-10-17 17:40:20
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Frame 292


2019-10-17 17:40:20
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Frame 295


2019-10-17 17:40:20
OPH Fuel Tank



Frame 297


2019-10-17 17:40:20
OPH Fuel Tank


2019-10-17 17:40:20
OPH Fuel Tank



Frame 300



Frame 301



Frame 302


2019-10-17 17:40:21
OPH Fuel Tank


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OPH Fuel Tank



Frame 309



Frame 310



Frame 311



Frame 312



Frame 313


2019-10-17 17:40:21
OPH Fuel Tank



Frame 315



Frame 316



Frame 317



Frame 318



Frame 319



Frame 320


2019-10-17 17:40:22
OPH Fuel Tank


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OPH Fuel Tank


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OPH Fuel Tank



Frame 326



Frame 327


2019-10-17 17:40:22
OPH Fuel Tank


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OPH Fuel Tank



Frame 331


2019-10-17 17:40:23
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OPH Fuel Tank



Frame 340


2019-10-17 17:40:23
OPH Fuel Tank



Frame 342



Frame 343



Frame 344


2019-10-17 17:40:23
OPH Fuel Tank


2019-10-17 17:40:24
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Frame 347


2019-10-17 17:40:24
OPH Fuel Tank



Frame 349



Frame 350


2019-10-17 17:40:24
OPH Fuel Tank



Frame 352


2019-10-17 17:40:24
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Frame 357


2019-10-17 17:40:24
OPH Fuel Tank



Frame 359


2019-10-17 17:40:25
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Frame 363


2019-10-17 17:40:25
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Frame 365



Frame 366



Frame 367



Frame 368



Frame 369



Frame 370


2019-10-17 17:40:25
OPH Fuel Tank



Frame 372



Frame 373



Frame 374



Frame 375



Frame 376



Frame 377



Frame 378



Frame 379



Frame 380


2019-10-17 17:40:26
OPH Fuel Tank


2019-10-17 17:40:26
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Frame 383


2019-10-17 17:40:26
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Frame 386



Frame 387



Frame 388


2019-10-17 17:40:26
OPH Fuel Tank



Frame 390



Frame 391


2019-10-17 17:40:27
OPH Fuel Tank



Frame 393



Frame 394


2019-10-17 17:40:27
OPH Fuel Tank



Frame 396



Frame 397



Frame 398


2019-10-17 17:40:27
OPH Fuel Tank



Frame 400


2019-10-17 17:40:27
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Frame 404


2019-10-17 17:40:27
OPH Fuel Tank



Frame 406


2019-10-17 17:40:28
OPH Fuel Tank



Frame 408



Frame 409



Frame 410


2019-10-17 17:40:28
OPH Fuel Tank



Frame 412


2019-10-17 17:40:28
OPH Fuel Tank



Frame 414



Frame 415


2019-10-17 17:40:28
OPH Fuel Tank



Frame 417



Frame 418


2019-10-17 17:40:28
OPH Fuel Tank



Frame 420



Frame 421


2019-10-17 17:40:29
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Frame 424



Frame 425



Frame 426


2019-10-17 17:40:29
OPH Fuel Tank



Frame 428



Frame 429



Frame 430


2019-10-17 17:40:29
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Frame 432



Frame 433


2019-10-17 17:40:29
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Frame 435



Frame 436


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Frame 440


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Frame 446


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Frame 448



Frame 449


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OPH Fuel Tank



Frame 451



Frame 452


2019-10-17 17:40:31
OPH Fuel Tank



Frame 454


2019-10-17 17:40:31
OPH Fuel Tank



Frame 456



Frame 457



Frame 458



Frame 459



Frame 460


2019-10-17 17:40:31
OPH Fuel Tank



Frame 462


2019-10-17 17:40:31
OPH Fuel Tank



Frame 464



Frame 465


2019-10-17 17:40:32
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Frame 467


2019-10-17 17:40:32
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Frame 469



Frame 470


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Frame 472



Frame 473


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Frame 479



Frame 480



Frame 481


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Frame 485


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Frame 488



Frame 489



Frame 490


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Frame 493


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Frame 496


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Frame 499



Frame 500



Frame 501



Frame 502


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Frame 506


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Frame 508


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Frame 510


2019-10-17 17:40:35
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Frame 512


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Frame 514



Frame 515



Frame 516


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Frame 519



Frame 520


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Frame 525



Frame 526



Frame 527



Frame 528


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Frame 534


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Frame 542


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Frame 544



Frame 545


2019-10-17 17:40:37
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Frame 547



Frame 548


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Frame 550


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Frame 556


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Frame 560



Frame 561


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Frame 565


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Frame 567


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Frame 575


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Frame 580



Frame 581



Frame 582


2019-10-17 17:40:39
OPH Fuel Tank



Frame 584



Frame 585



Frame 586


2019-10-17 17:40:40
OPH Fuel Tank



Frame 588


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Frame 590


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Frame 594


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Frame 596



Frame 597


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OPH Fuel Tank



Frame 599



Frame 600


2019-10-17 17:40:41
OPH Fuel Tank



Frame 602


2019-10-17 17:40:41
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Frame 604



Frame 605



Frame 606


2019-10-17 17:40:41
OPH Fuel Tank



Frame 608



Frame 609


2019-10-17 17:40:41
OPH Fuel Tank



Frame 611


2019-10-17 17:40:41
OPH Fuel Tank



Frame 613



Frame 614


2019-10-17 17:40:41
OPH Fuel Tank


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OPH Fuel Tank


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OPH Fuel Tank



Frame 618



Frame 619



Frame 620


2019-10-17 17:40:42
OPH Fuel Tank



Frame 622


2019-10-17 17:40:42
OPH Fuel Tank



Frame 624



Frame 625


2019-10-17 17:40:42
OPH Fuel Tank



Frame 627



Frame 628



Frame 629

Attachment 4

Image sequence from the OPH Front Door video (cropped, 4 frames/page)

OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary









OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary









OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary









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OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary









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OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary









OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary









OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary









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OPH Front Door Video Image Summary









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OPH Front Door Video Image Summary









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OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary









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OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary









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OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary









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OPH Front Door Video Image Summary









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OPH Front Door Video Image Summary









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OPH Front Door Video Image Summary









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OPH Front Door Video Image Summary









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OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary









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OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary









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OPH Front Door Video Image Summary









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OPH Front Door Video Image Summary









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OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary









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OPH Front Door Video Image Summary









OPH Front Door Video Image Summary



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OPH Front Door Video Image Summary









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OPH Front Door Video Image Summary









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OPH Front Door Video Image Summary









OPH Front Door Video Image Summary



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Attachment 5

Image sequence from the OPH Front Door video (magnified, cropped, 1 frame/page)



Frame 0



Frame 1



Frame 2



Frame 3



Frame 4



Frame 5



Frame 6



Frame 7



Frame 8



Frame 9



Frame 10


-10-17 17:40:02
Front Door



Frame 12



Frame 13


-10-17 17:40:02
Front Door



Frame 15



Frame 16



Frame 17



Frame 18


-10-17 17:40:03
Front Door



Frame 20


-10-17 17:40:03
Front Door


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Frame 25


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Frame 27


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Frame 40


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Frame 44



Frame 45



Frame 46


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Front Door


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Frame 50



Frame 51


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Frame 60



Frame 61


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Front Door


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Frame 64


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Frame 67


-10-17 17:40:06
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Frame 74


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Frame 80


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Frame 84



Frame 85


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Frame 90


-10-17 17:40:08
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Frame 94



Frame 95


-10-17 17:40:08
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Front Door



Frame 100



Frame 101



Frame 102



Frame 103



Frame 104



Frame 105



Frame 106


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Front Door



Frame 108


-10-17 17:40:09
Front Door



Frame 110


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Frame 116


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Frame 118


-10-17 17:40:10
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Frame 120


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Frame 123



Frame 124


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Frame 126


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Frame 130


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Frame 140


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Frame 144



Frame 145



Frame 146


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Frame 149


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Frame 160


-10-17 17:40:12
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Frame 162



Frame 163


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Frame 165


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Frame 168


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Frame 180


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Frame 183


-10-17 17:40:14
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Frame 185



Frame 186


-10-17 17:40:14
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Frame 188


-10-17 17:40:14
Front Door



Frame 190



Frame 191



Frame 192



Frame 193


-10-17 17:40:14
Front Door



Frame 195


-10-17 17:40:14
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-10-17 17:40:15
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Frame 198


-10-17 17:40:15
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Frame 200


-10-17 17:40:15
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Frame 205


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Frame 210


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Frame 215


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Frame 223


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Frame 230


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Frame 235


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Frame 238


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Frame 240


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Frame 243


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Frame 245


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Frame 247


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Frame 256


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Frame 262


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Frame 270



Frame 271


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Frame 276


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Frame 290


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Frame 293


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Frame 295


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Frame 300


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Frame 344


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Frame 355


-10-17 17:40:25
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Frame 360


-10-17 17:40:26
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Frame 370


-10-17 17:40:26
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Frame 373


-10-17 17:40:26
Front Door



Frame 375


-10-17 17:40:27
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-10-17 17:40:27
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Frame 378


-10-17 17:40:27
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Frame 380


-10-17 17:40:27
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Frame 382



Frame 383


-10-17 17:40:27
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Frame 385



Frame 386


-10-17 17:40:28
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Frame 388


-10-17 17:40:28
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Frame 390


-10-17 17:40:28
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Frame 394



Frame 395



Frame 396


-10-17 17:40:28
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Front Door



Frame 399



Frame 400



Frame 401



Frame 402



Frame 403



Frame 404



Frame 405



Frame 406


-10-17 17:40:29
Front Door



Frame 408



Frame 409


-10-17 17:40:29
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-10-17 17:40:29
Front Door



Frame 412


-10-17 17:40:29
Front Door



Frame 414



Frame 415



Frame 416


-10-17 17:40:29
Front Door



Frame 418


-10-17 17:40:30
Front Door



Frame 420


-10-17 17:40:30
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-10-17 17:40:30
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Frame 424



Frame 425



Frame 426



Frame 427



Frame 428



Frame 429



Frame 430


-10-17 17:40:30
Front Door


-10-17 17:40:31
Front Door



Frame 433


-10-17 17:40:31
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-10-17 17:40:31
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Frame 436


-10-17 17:40:31
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-10-17 17:40:31
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-10-17 17:40:31
Front Door



Frame 440



Frame 441



Frame 442



Frame 443



Frame 444



Frame 445



Frame 446



Frame 447



Frame 448


-10-17 17:40:32
Front Door



Frame 450


-10-17 17:40:32
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Frame 452


-10-17 17:40:32
Front Door



Frame 454



Frame 455



Frame 456


-10-17 17:40:32
Front Door


-10-17 17:40:32
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-10-17 17:40:32
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Frame 460


-10-17 17:40:32
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Frame 462



Frame 463



Frame 464


-10-17 17:40:32
Front Door



Frame 466



Frame 467


-10-17 17:40:33
Front Door



Frame 469



Frame 470



Frame 471


-10-17 17:40:33
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Front Door



Frame 474



Frame 475



Frame 476



Frame 477


-10-17 17:40:34
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Frame 479



Frame 480


-10-17 17:40:34
Front Door



Frame 482



Frame 483



Frame 484


-10-17 17:40:34
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Frame 486


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Frame 490


-10-17 17:40:34
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Frame 493


-10-17 17:40:34
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Frame 495



Frame 496



Frame 497



Frame 498



Frame 499



Frame 500


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Frame 504



Frame 505


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Frame 508


-10-17 17:40:36
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Frame 514


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Front Door

Attachment 6

Image sequence from the first passenger video (3 frames/page)

Passenger Video Image Summary



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00702

Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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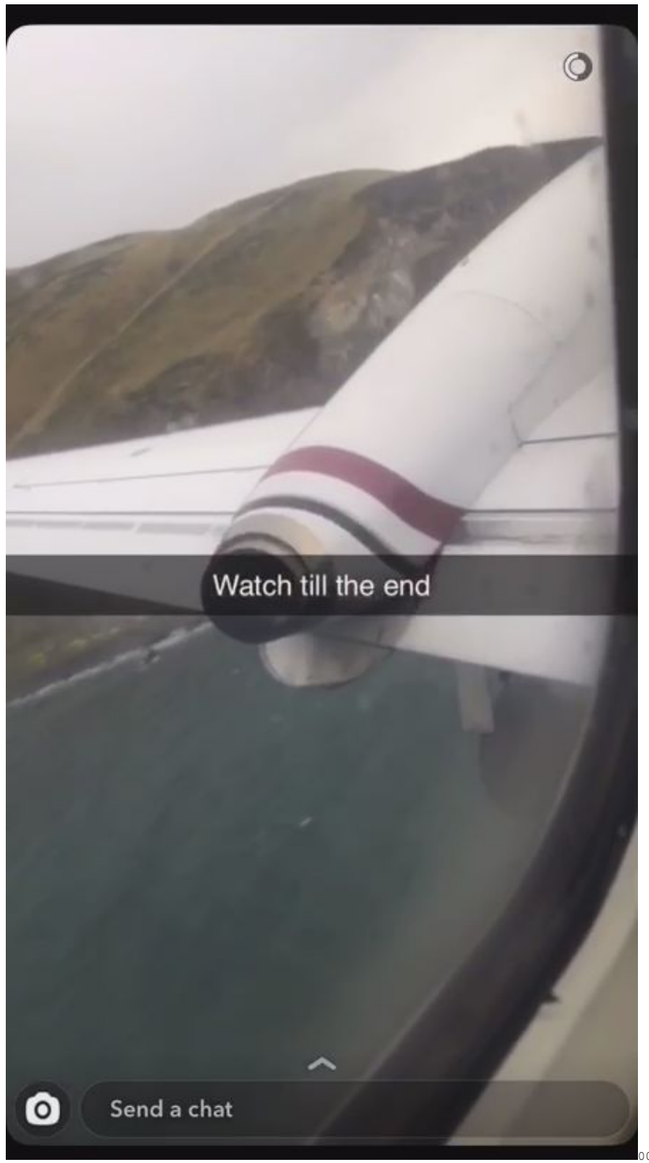
Passenger Video Image Summary



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Passenger Video Image Summary



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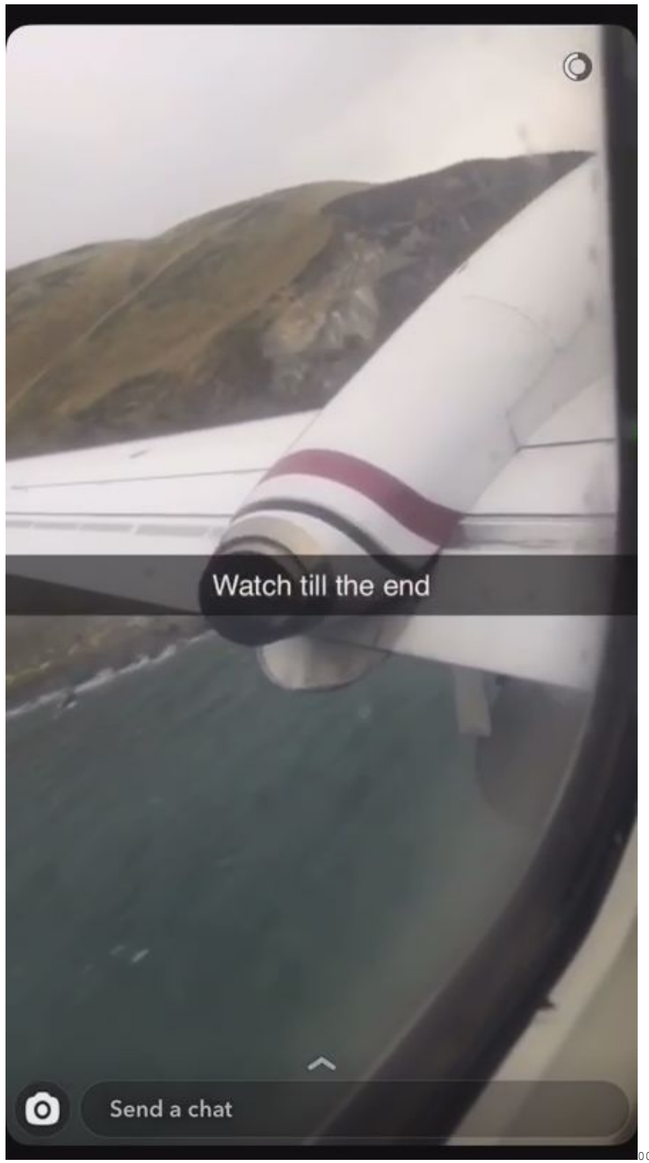


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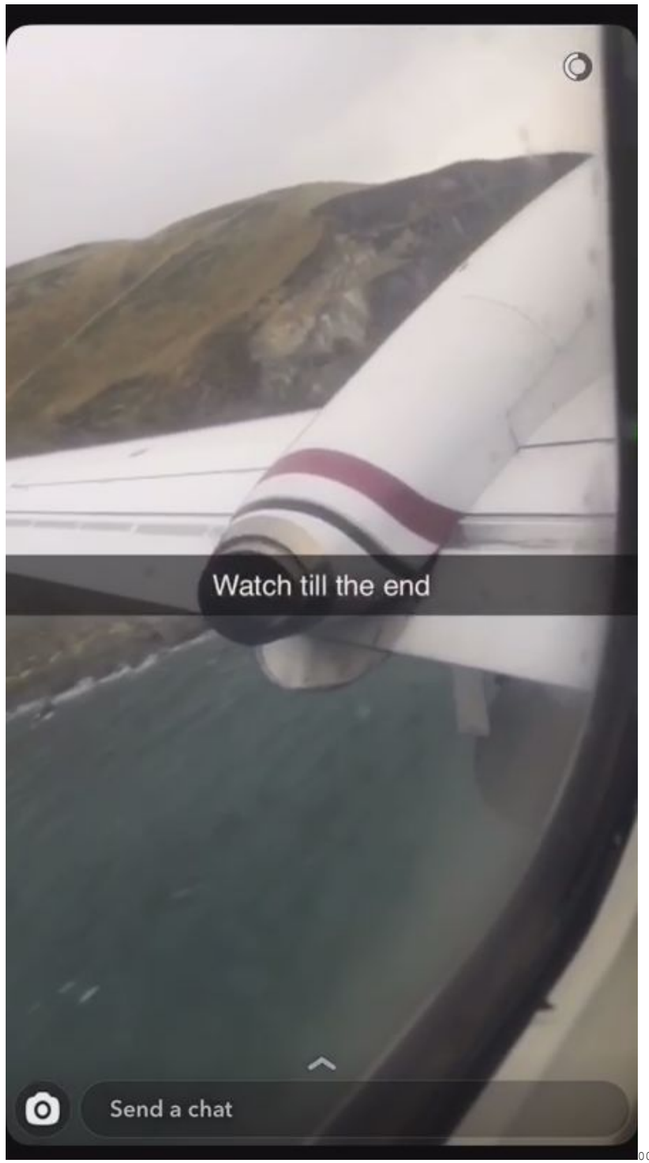


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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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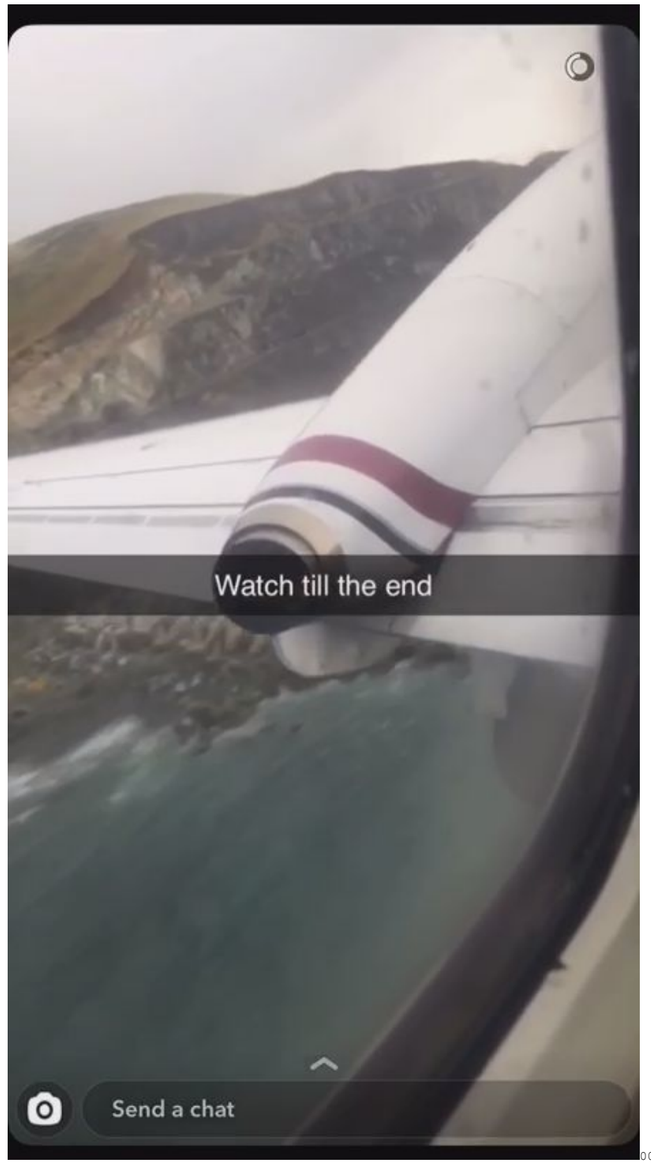


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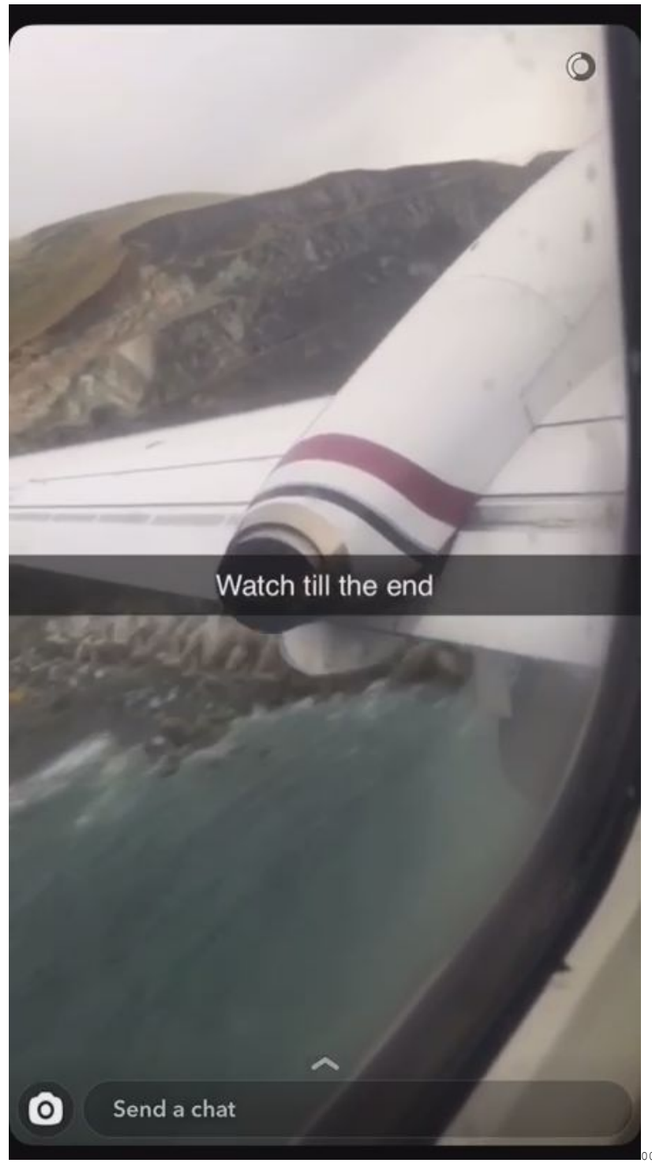
Passenger Video Image Summary



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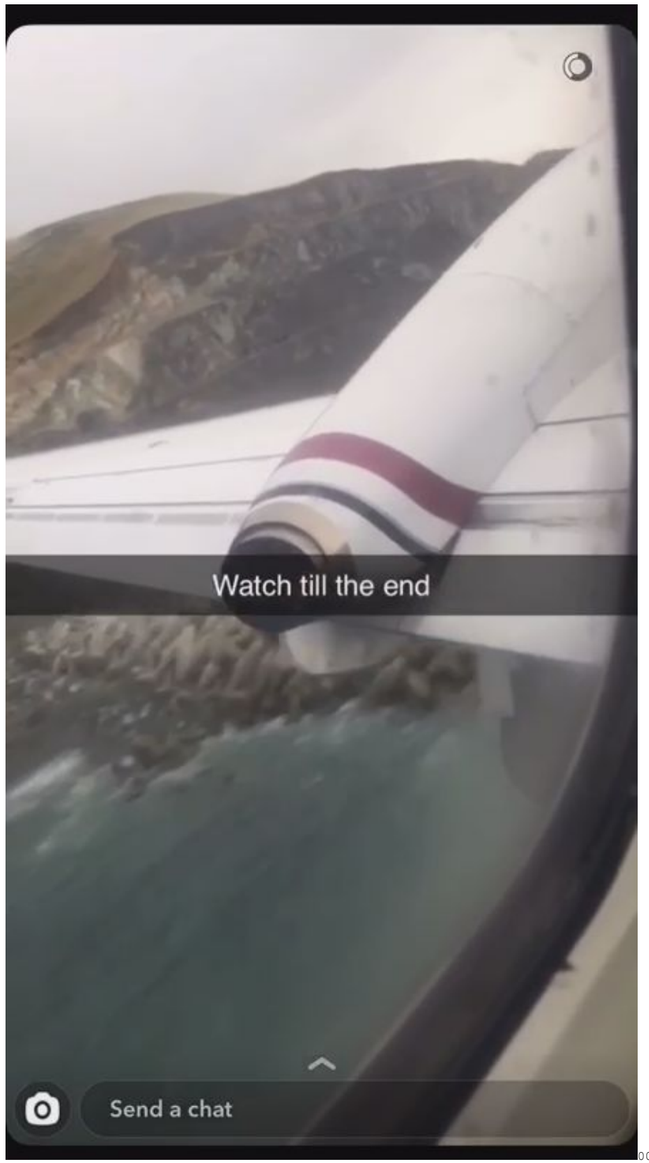


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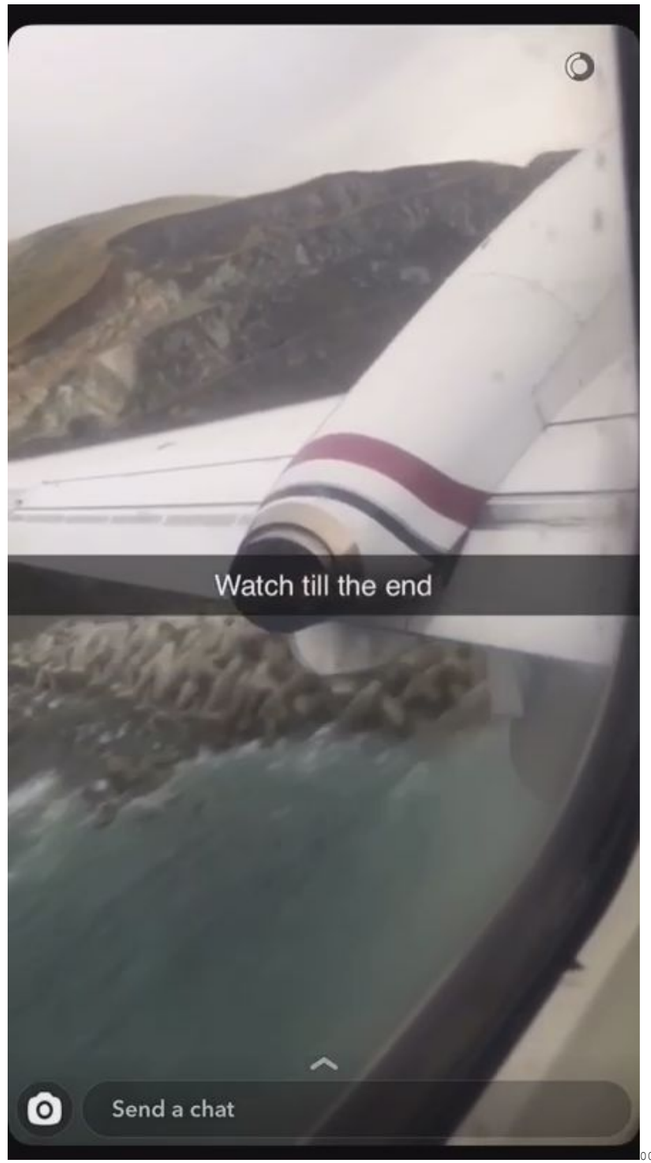


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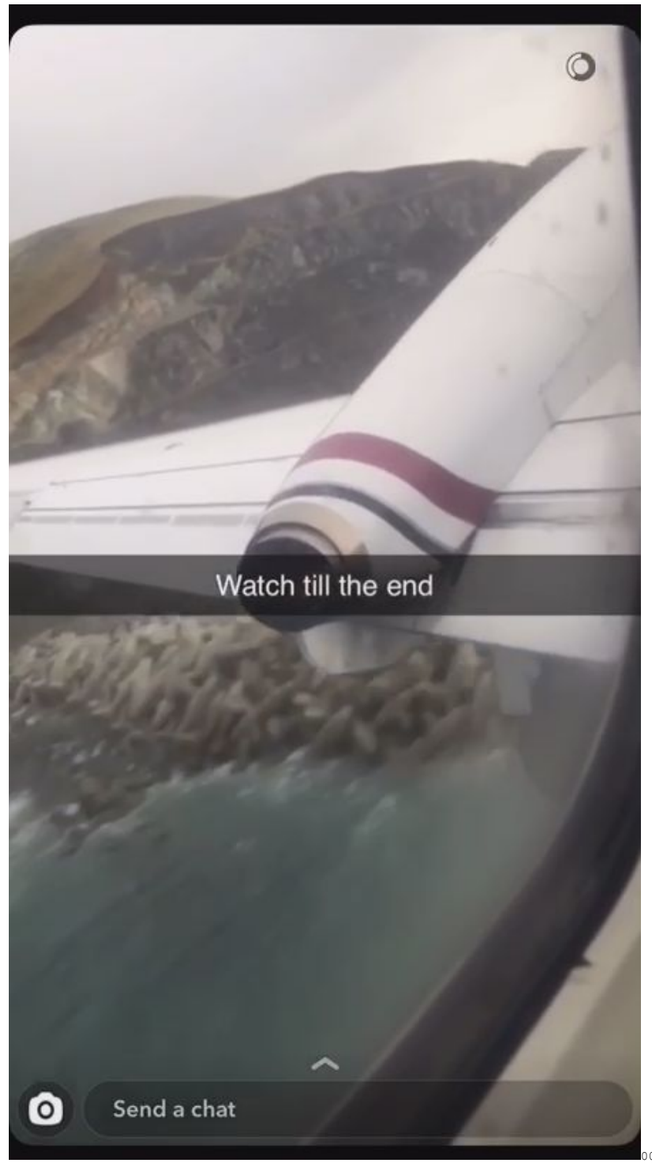
Passenger Video Image Summary



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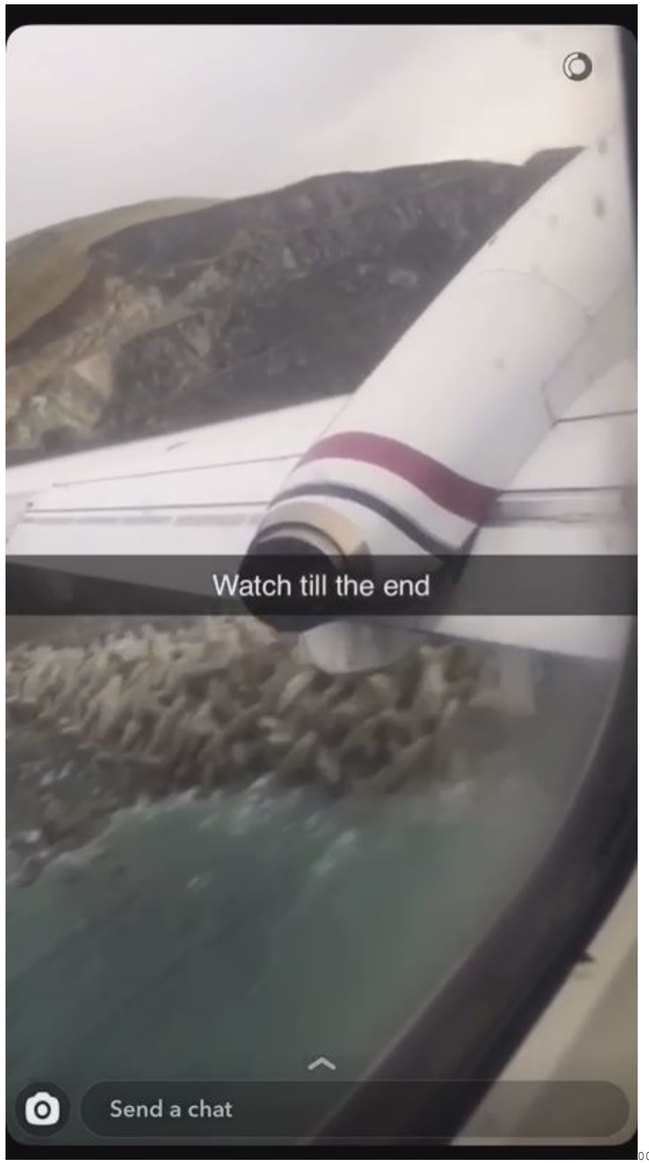


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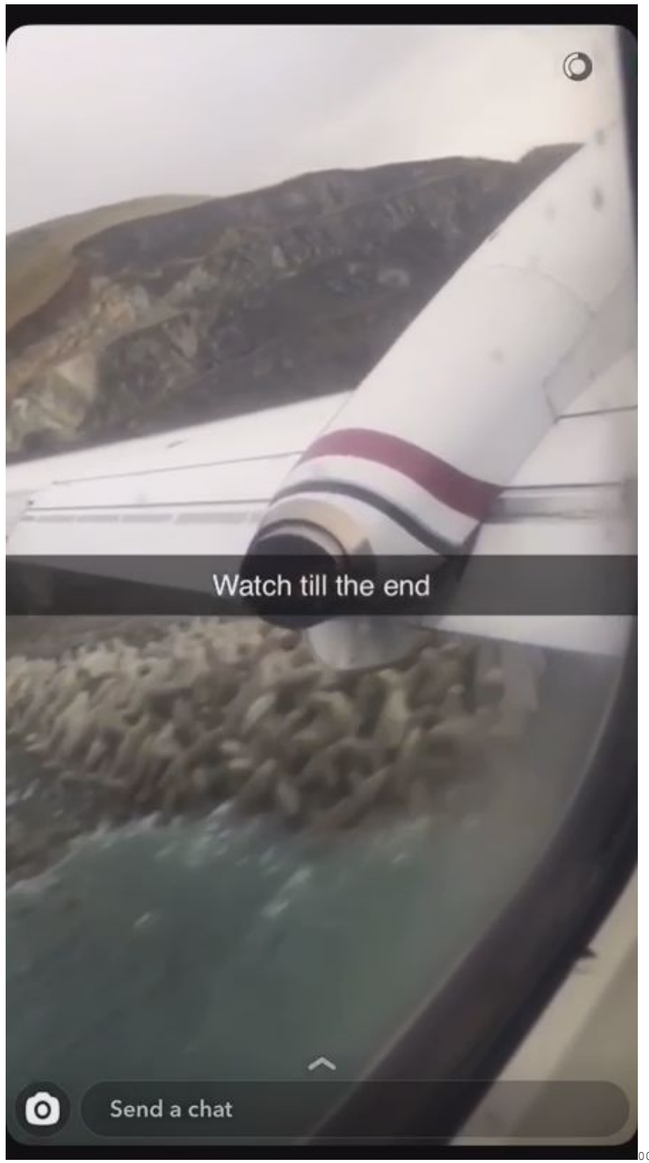


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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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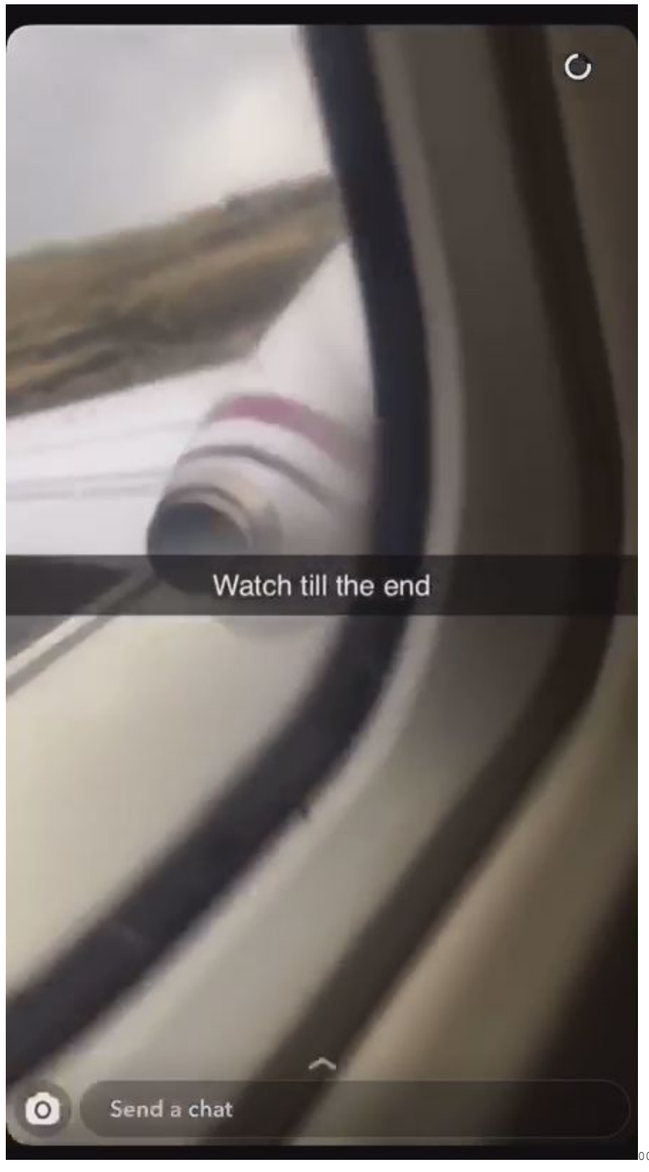
Passenger Video Image Summary



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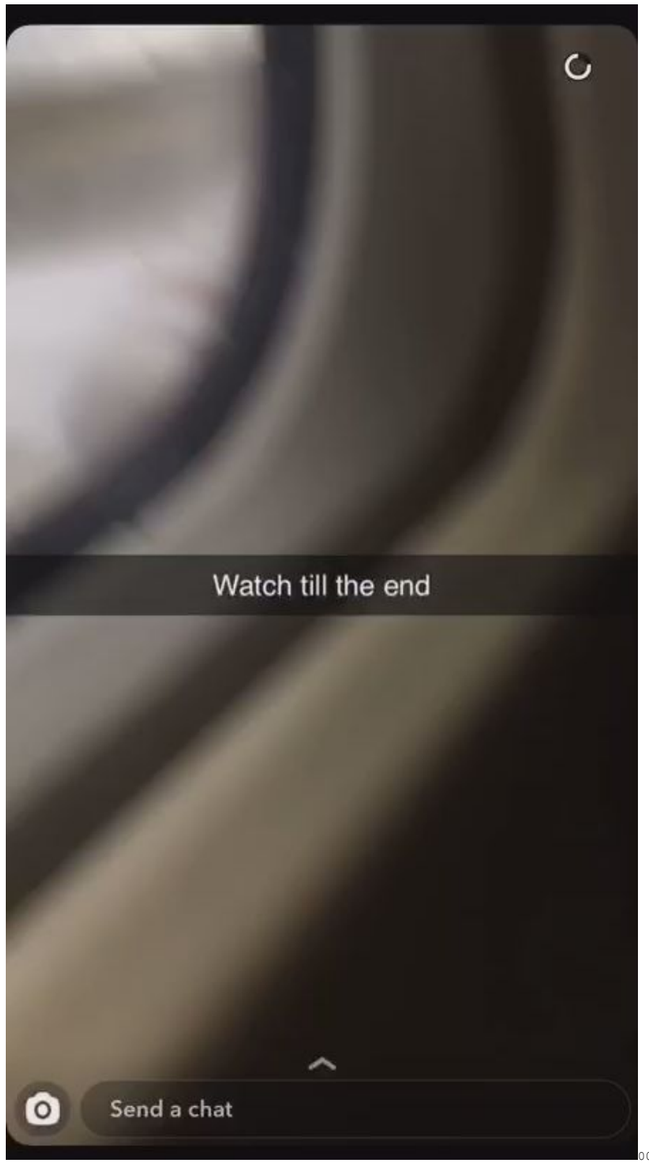
Passenger Video Image Summary



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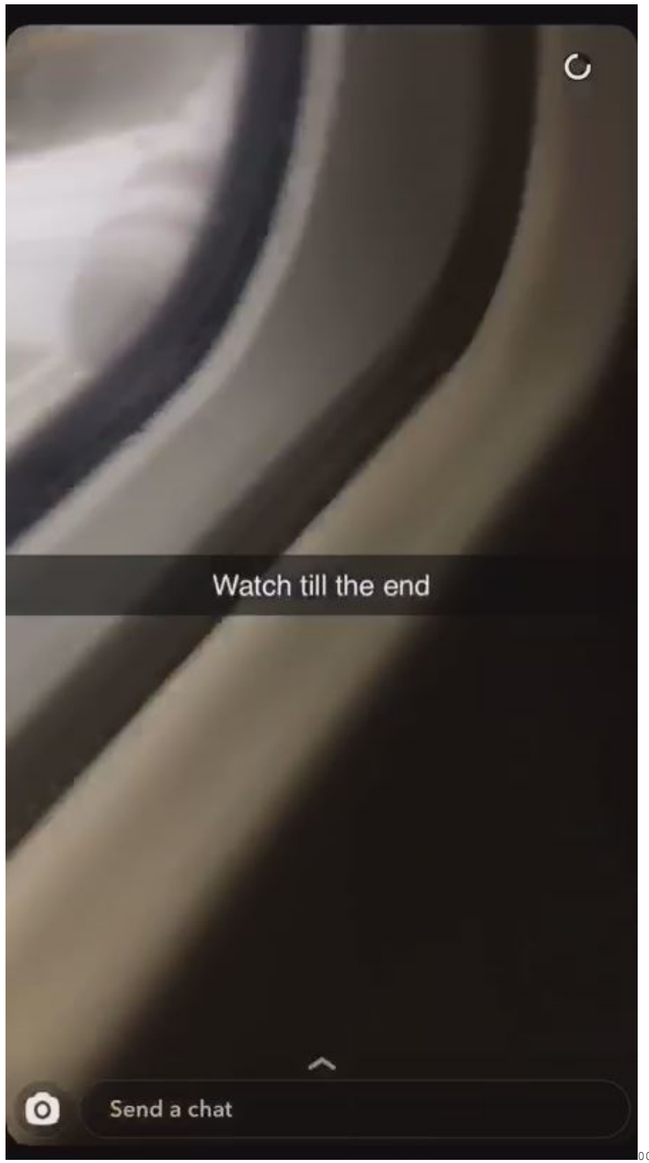


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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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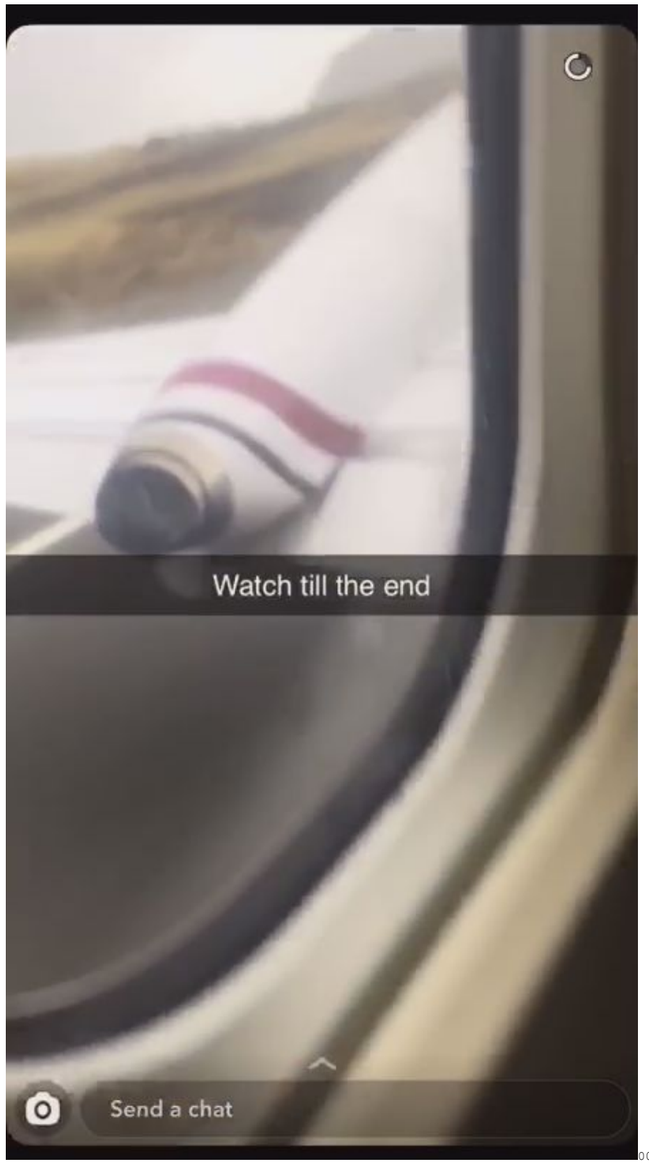
Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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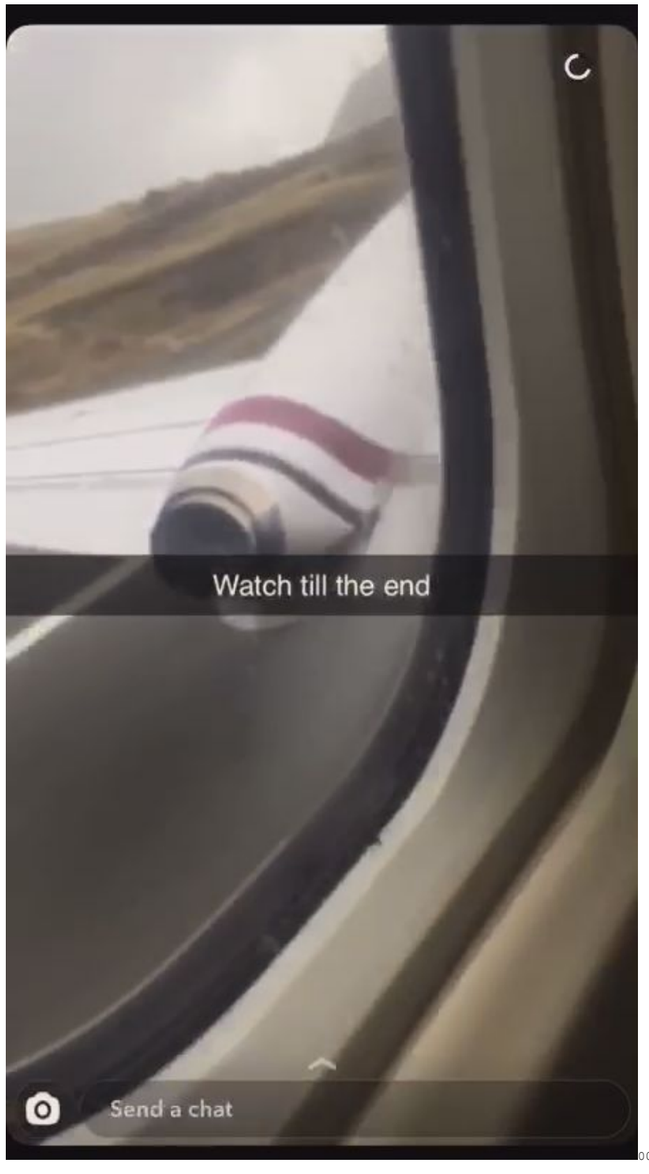
Passenger Video Image Summary



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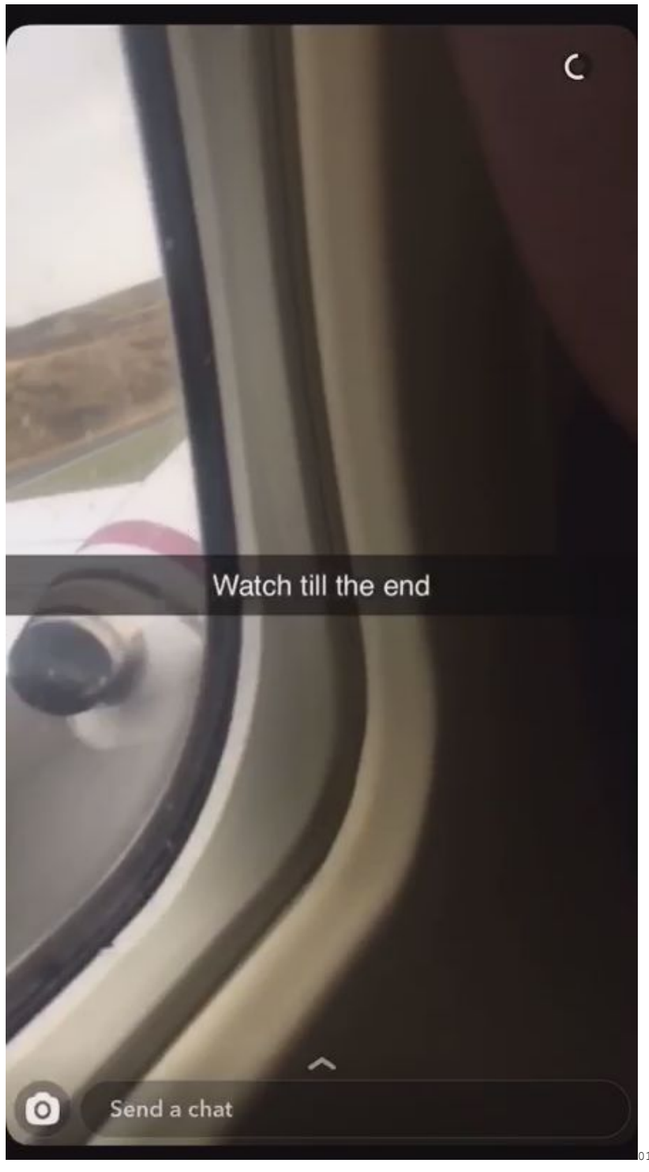


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Passenger Video Image Summary



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Passenger Video Image Summary



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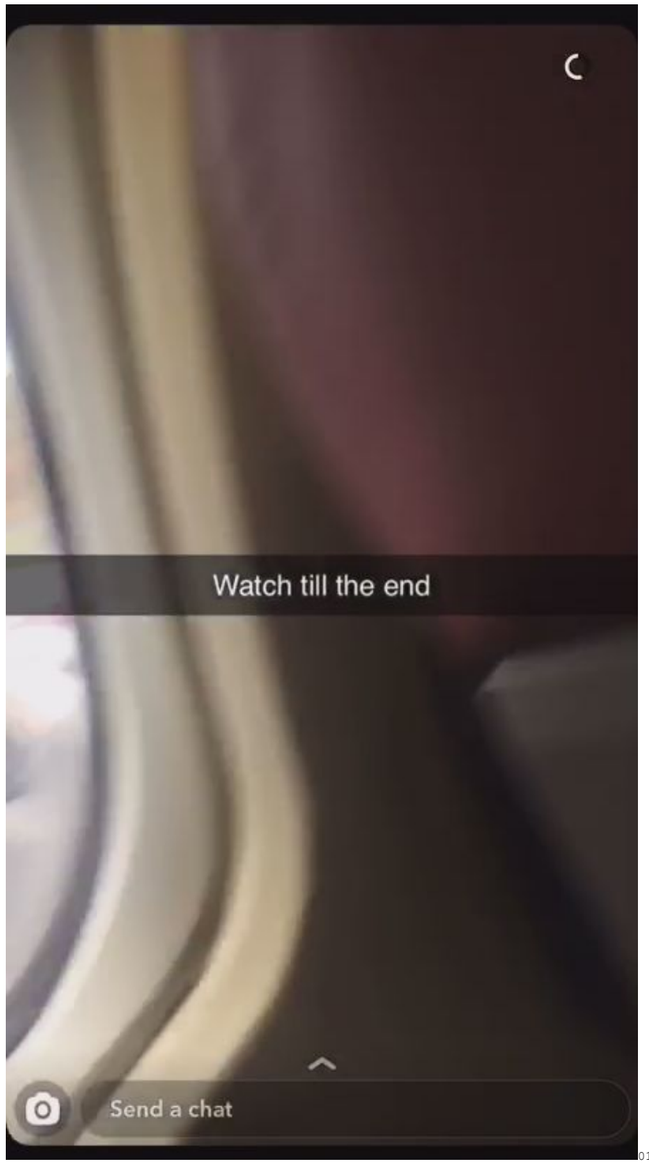
Passenger Video Image Summary



01027

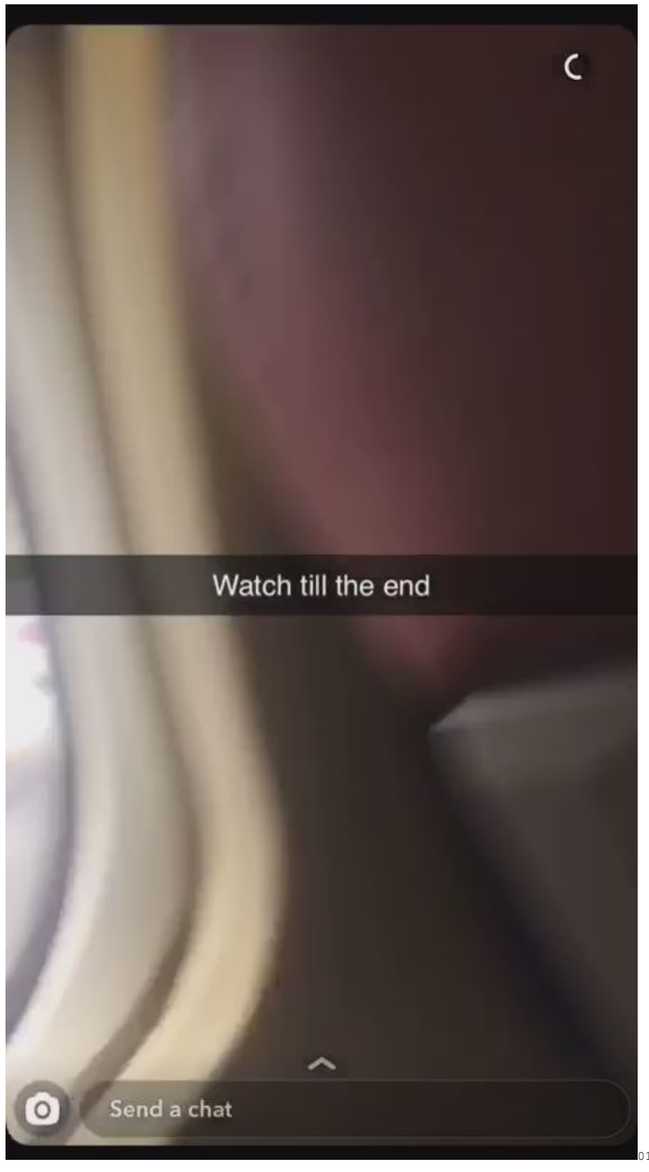


01028

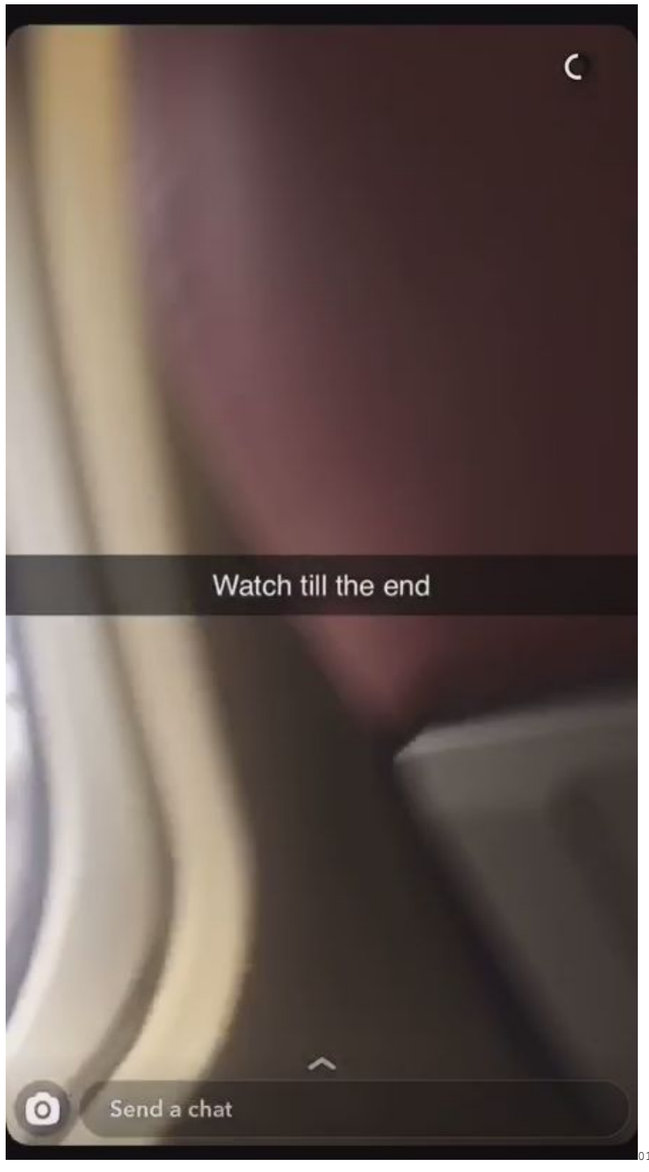


01029

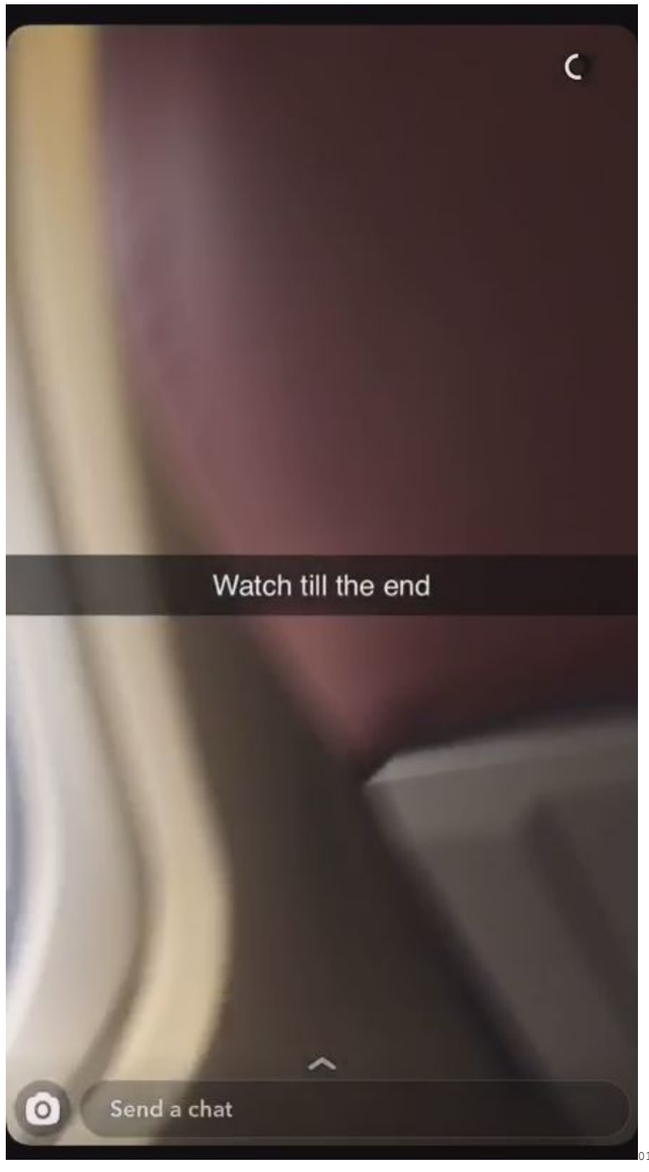
Passenger Video Image Summary



01030

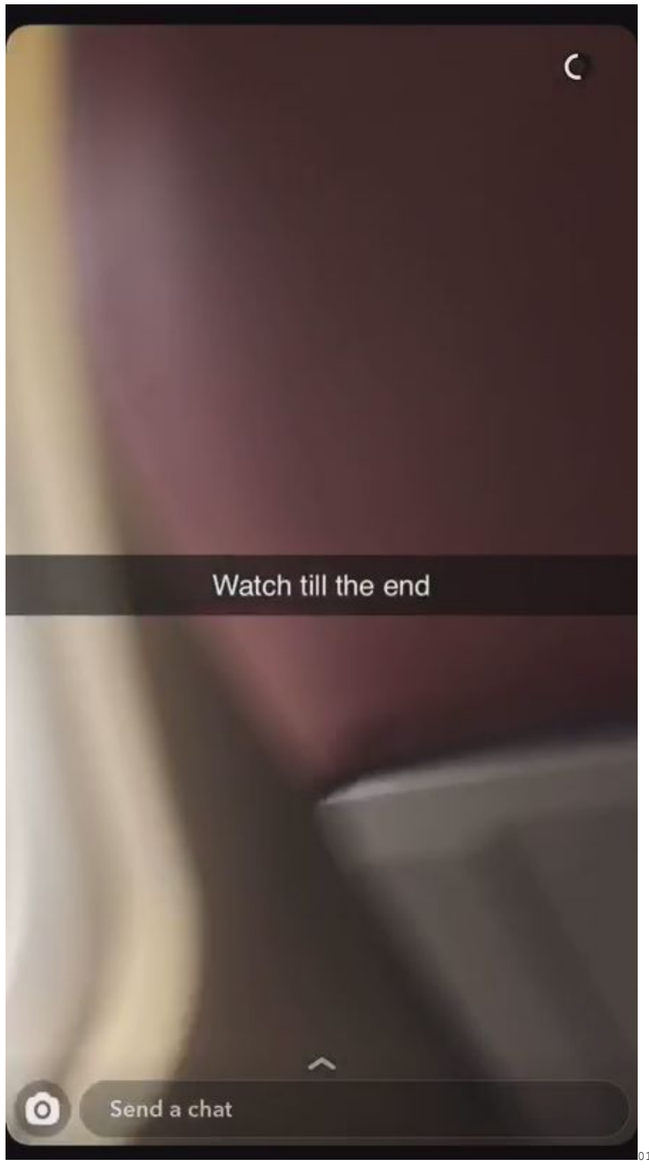


01031

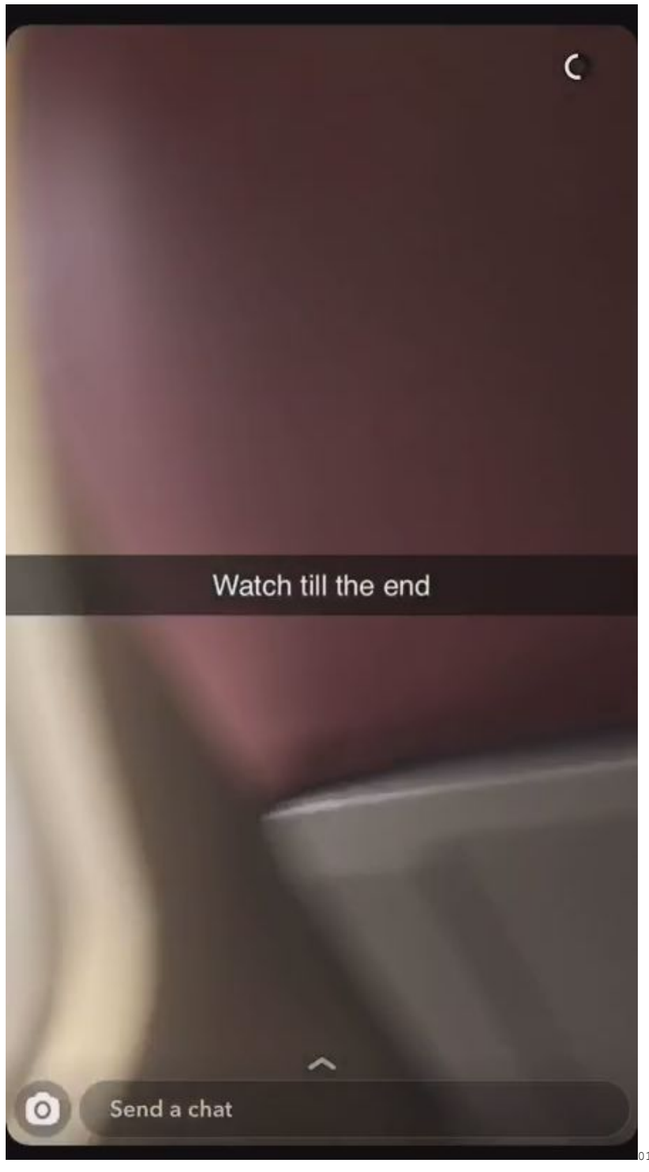


01032

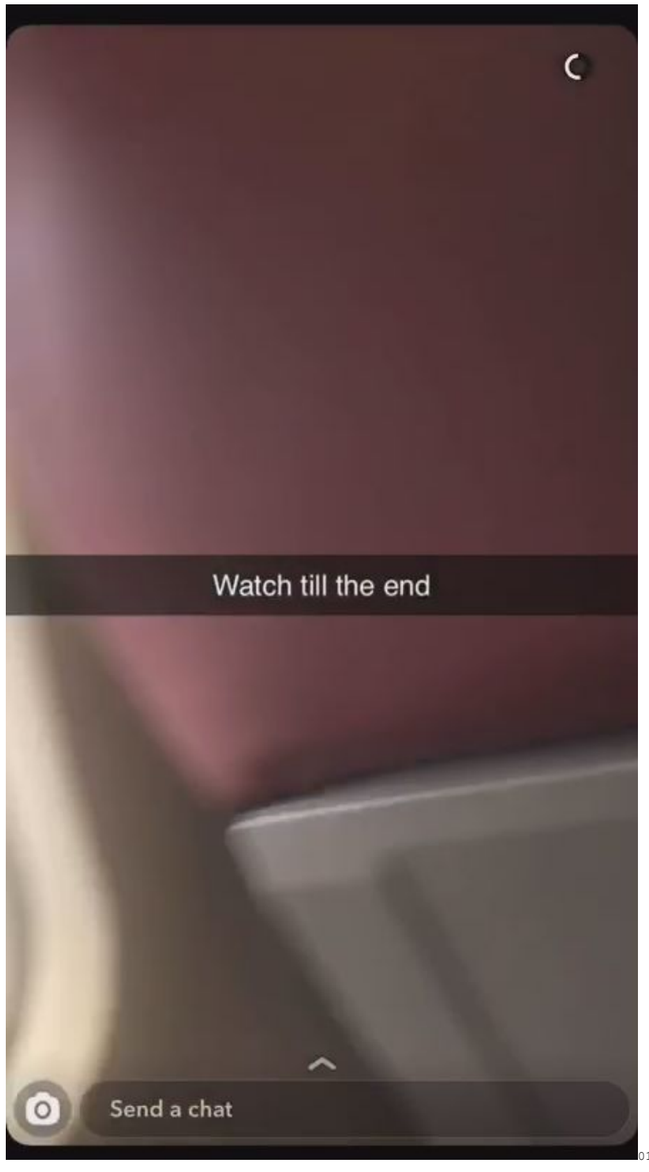
Passenger Video Image Summary



01033

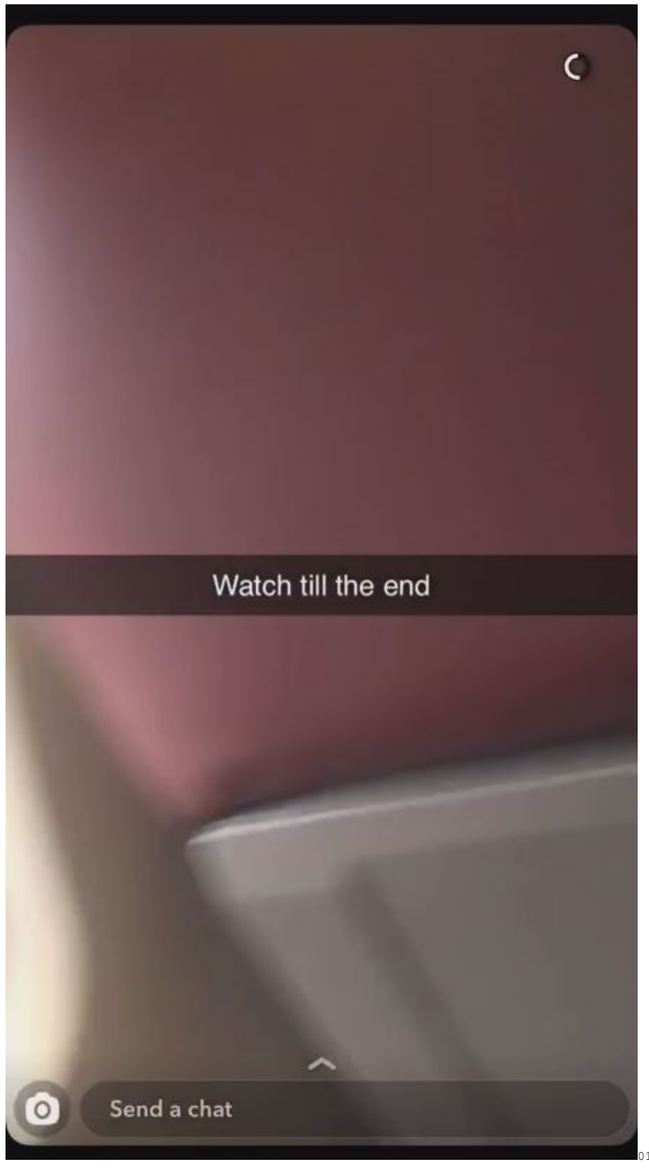


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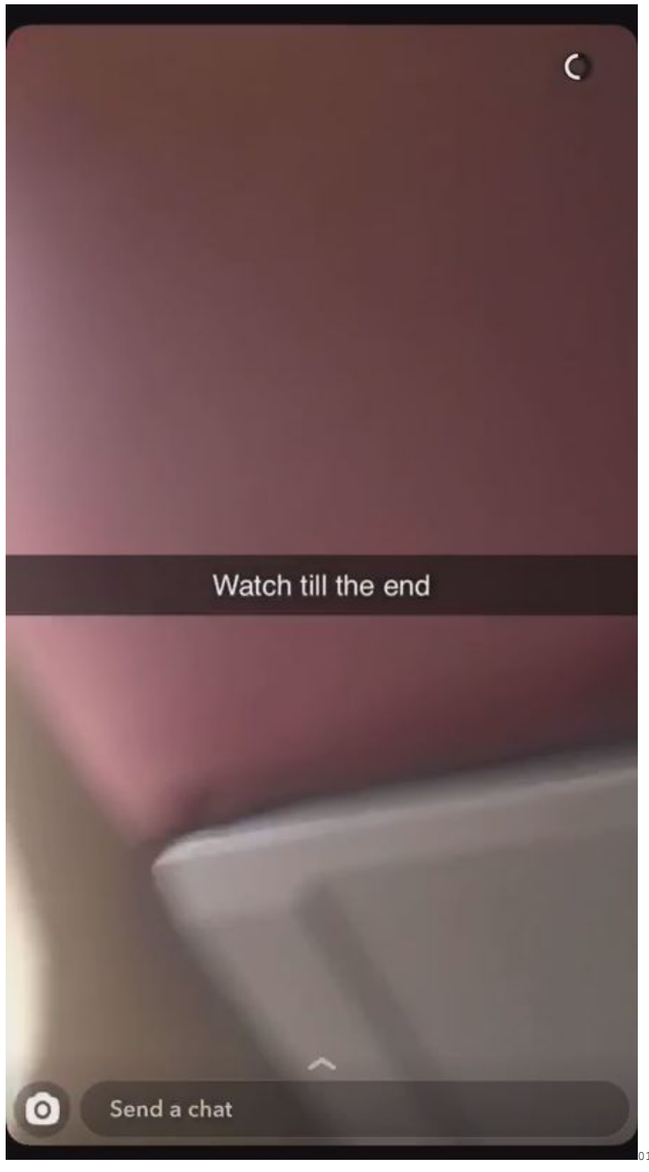


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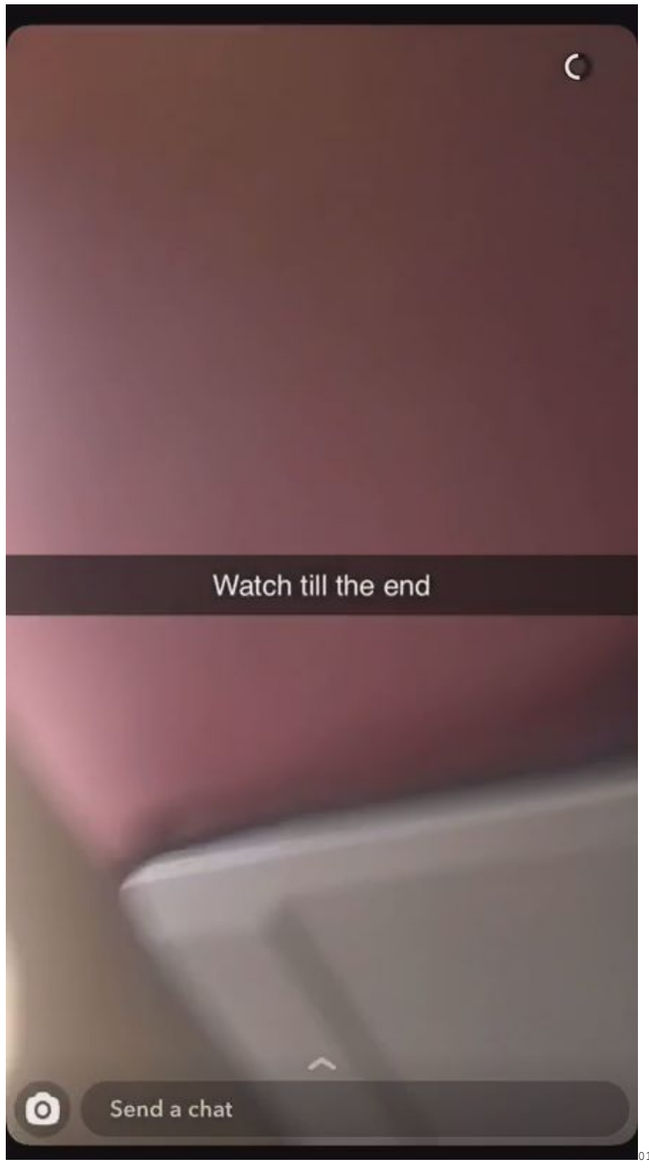
Passenger Video Image Summary



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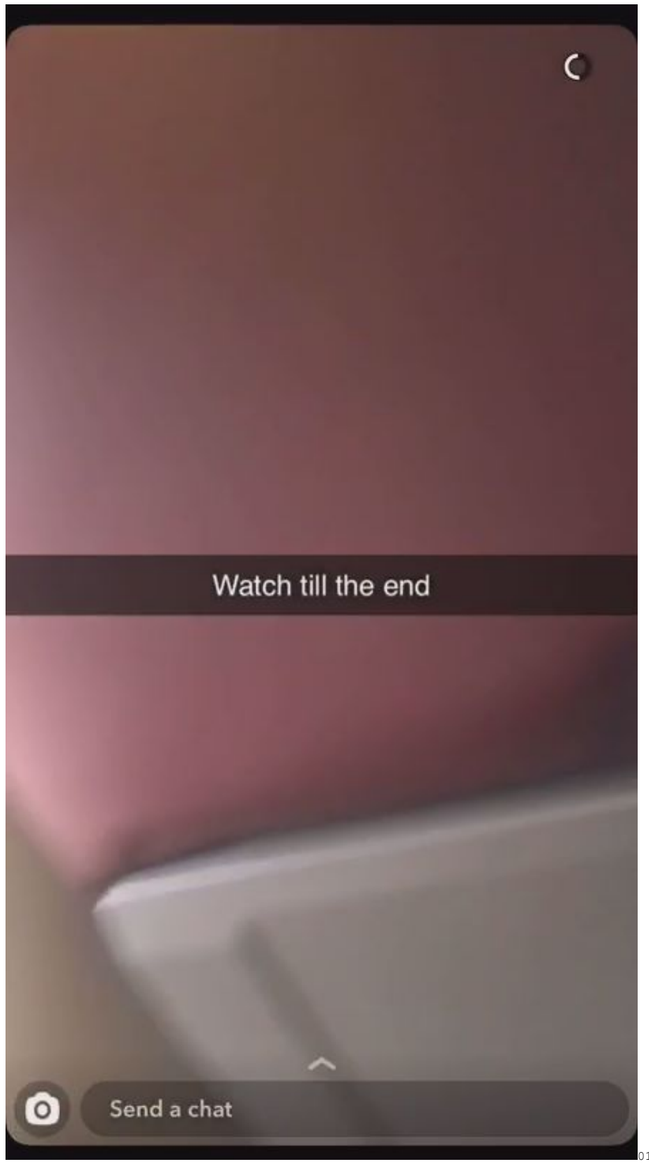


01037

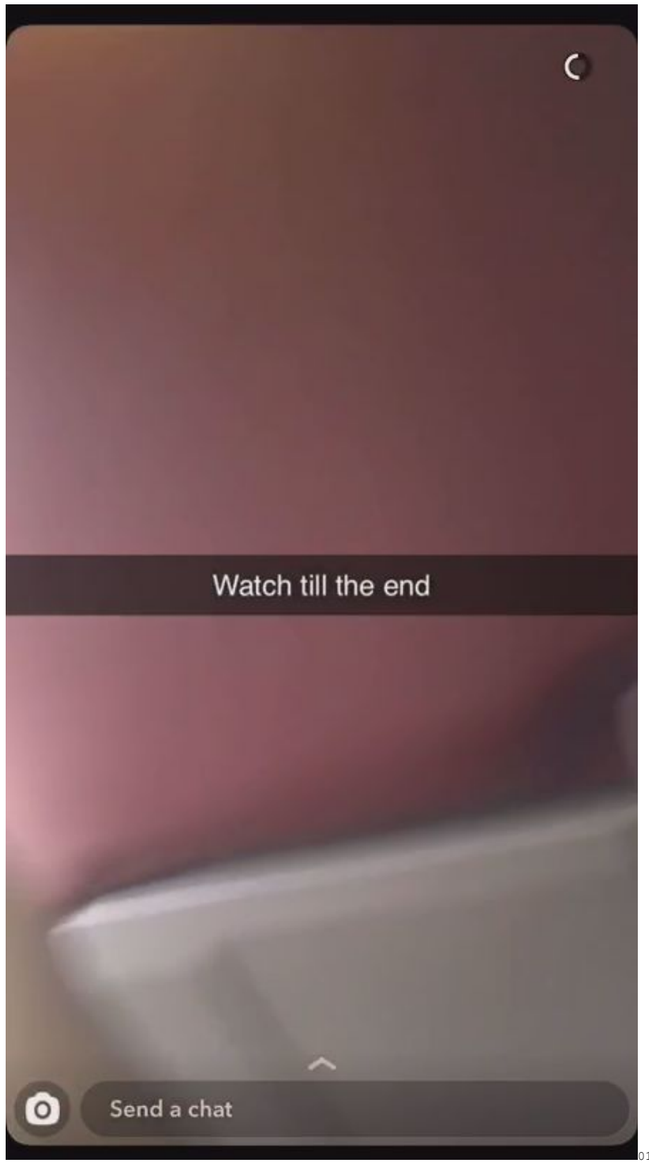


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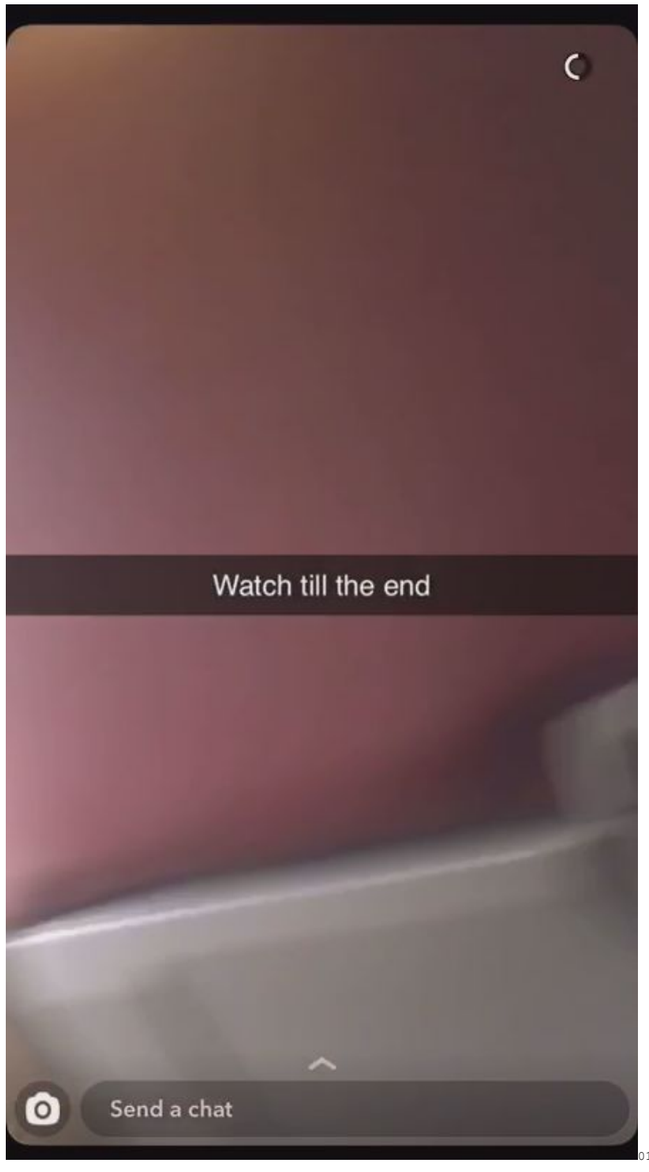
Passenger Video Image Summary



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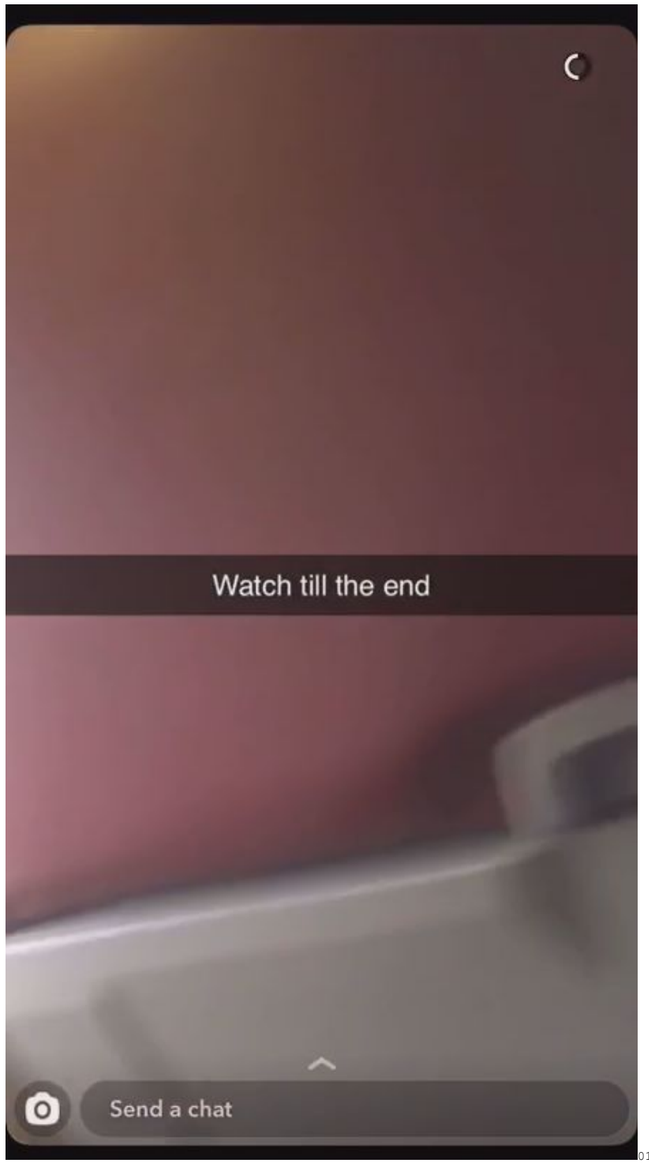


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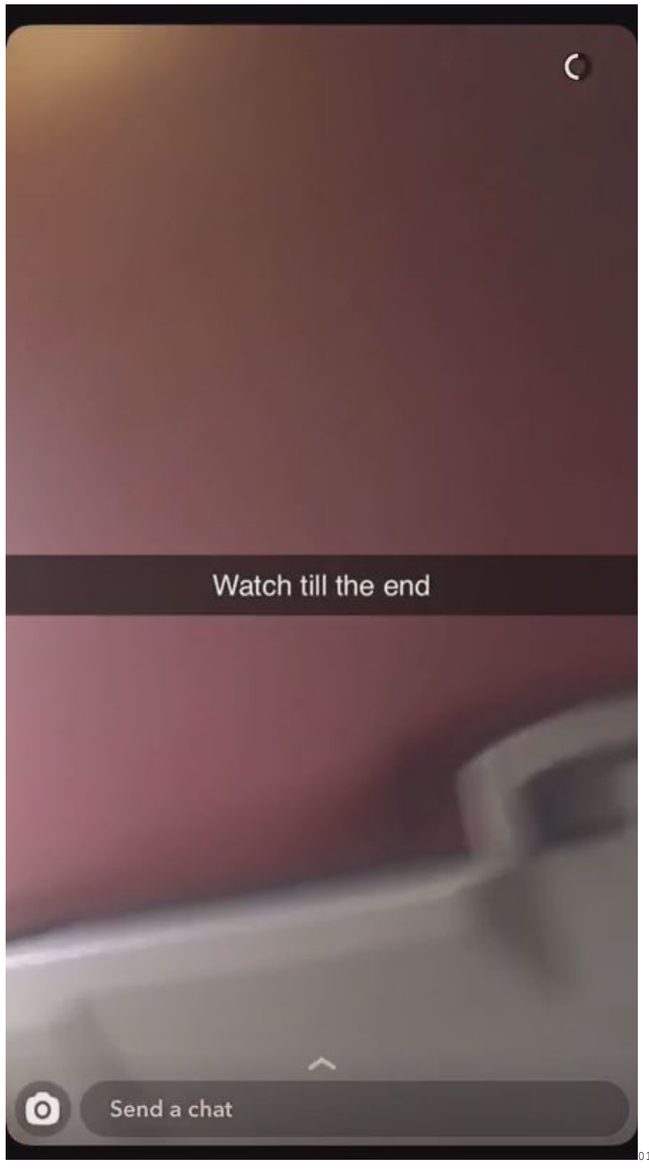


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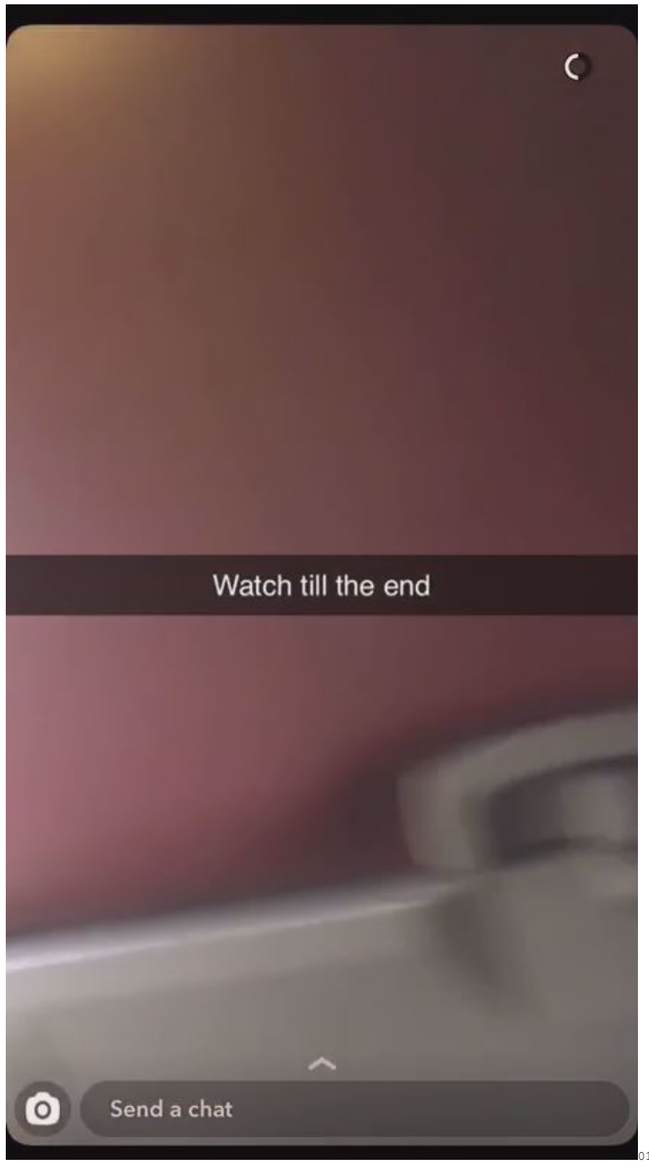
Passenger Video Image Summary



01042

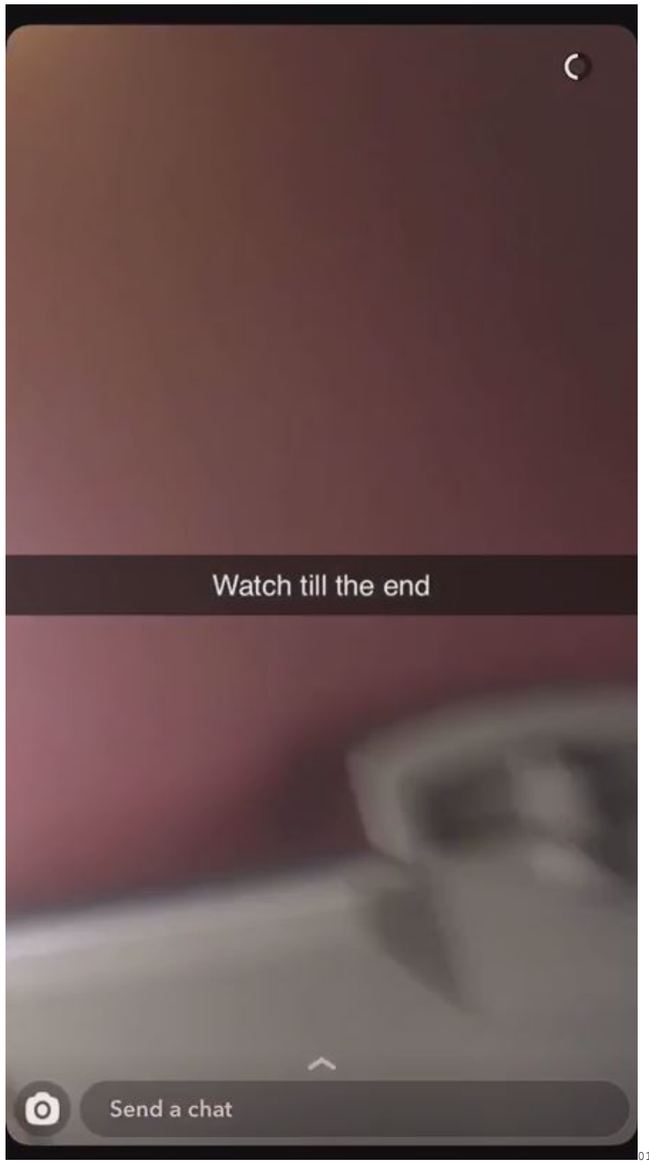


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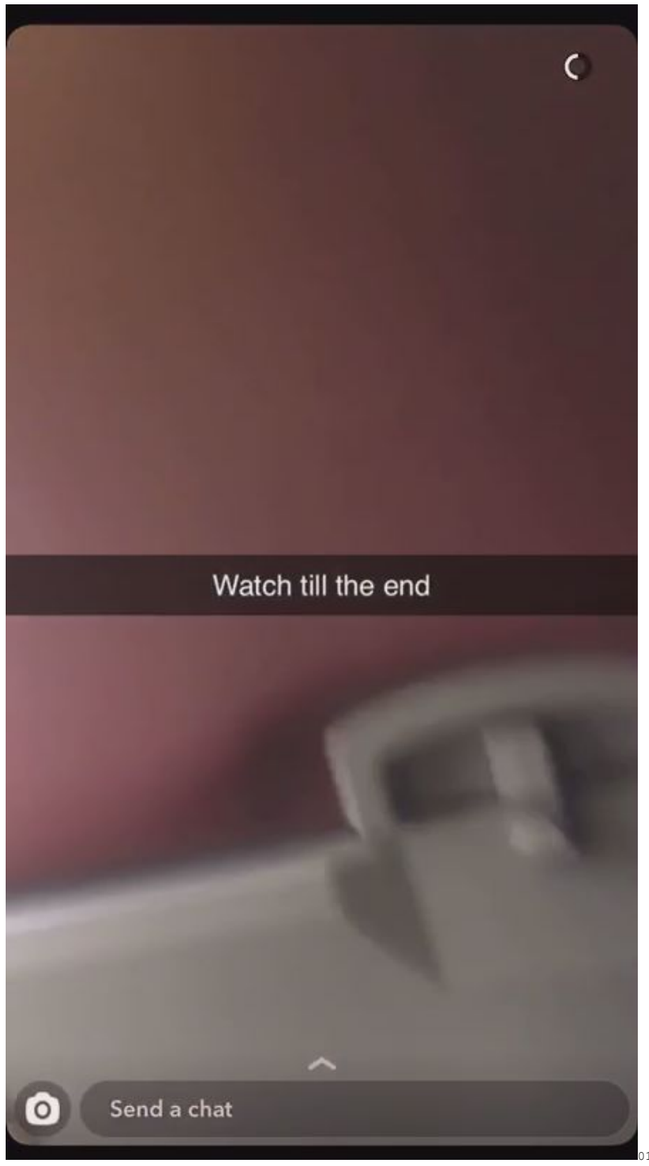


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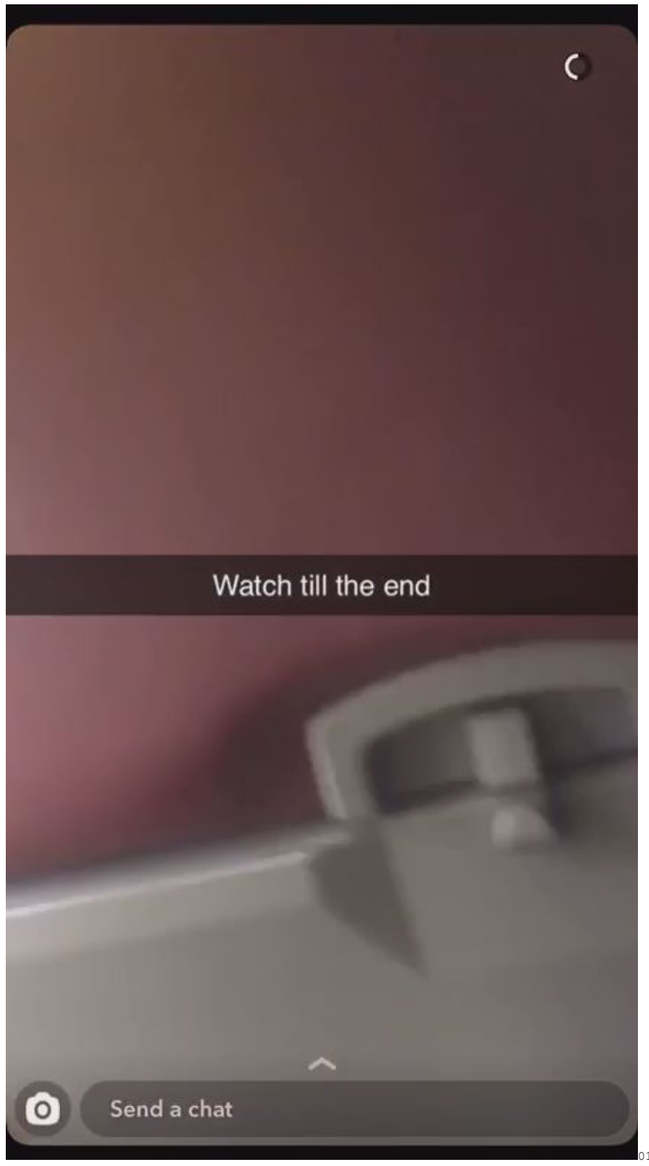
Passenger Video Image Summary



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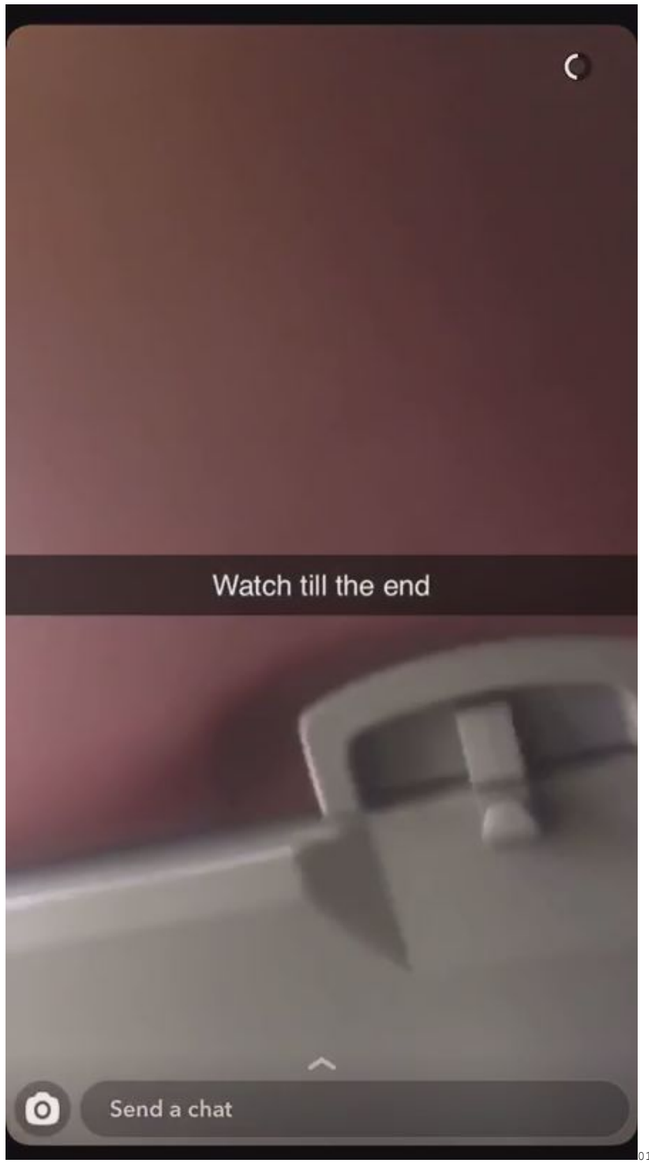


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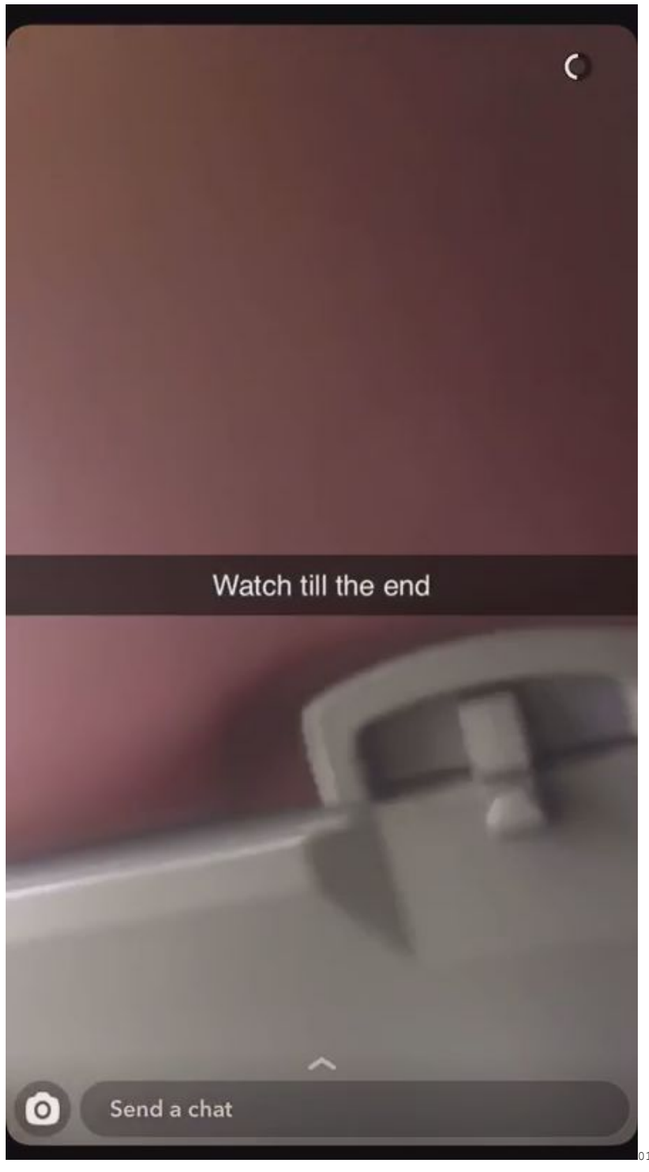


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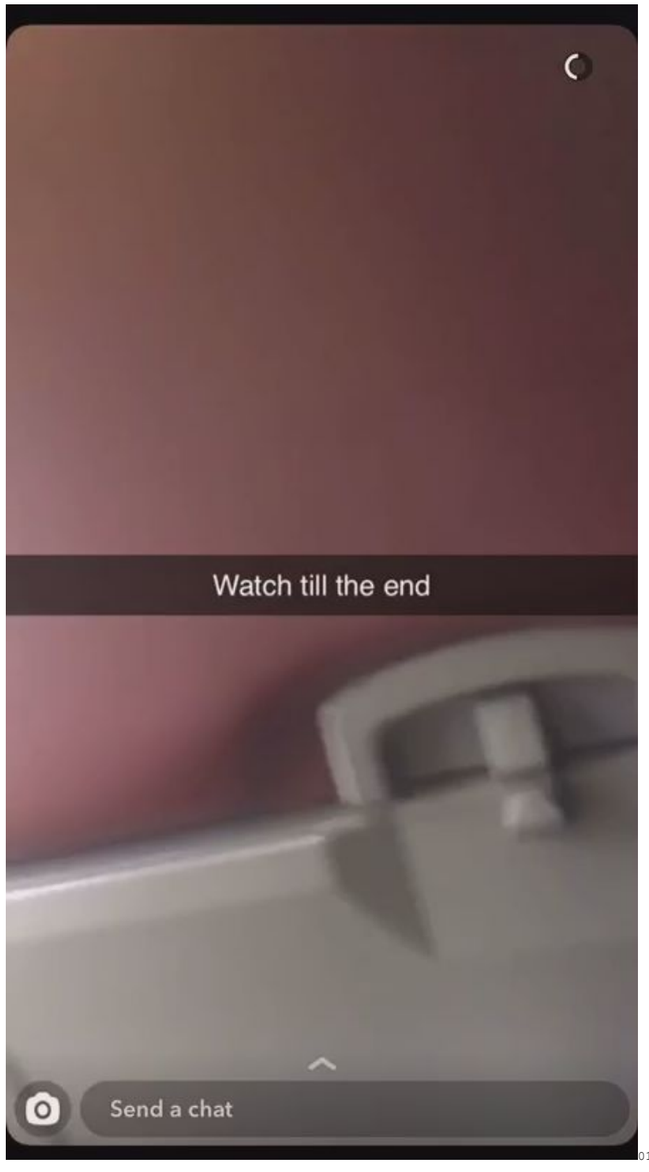
Passenger Video Image Summary



01048

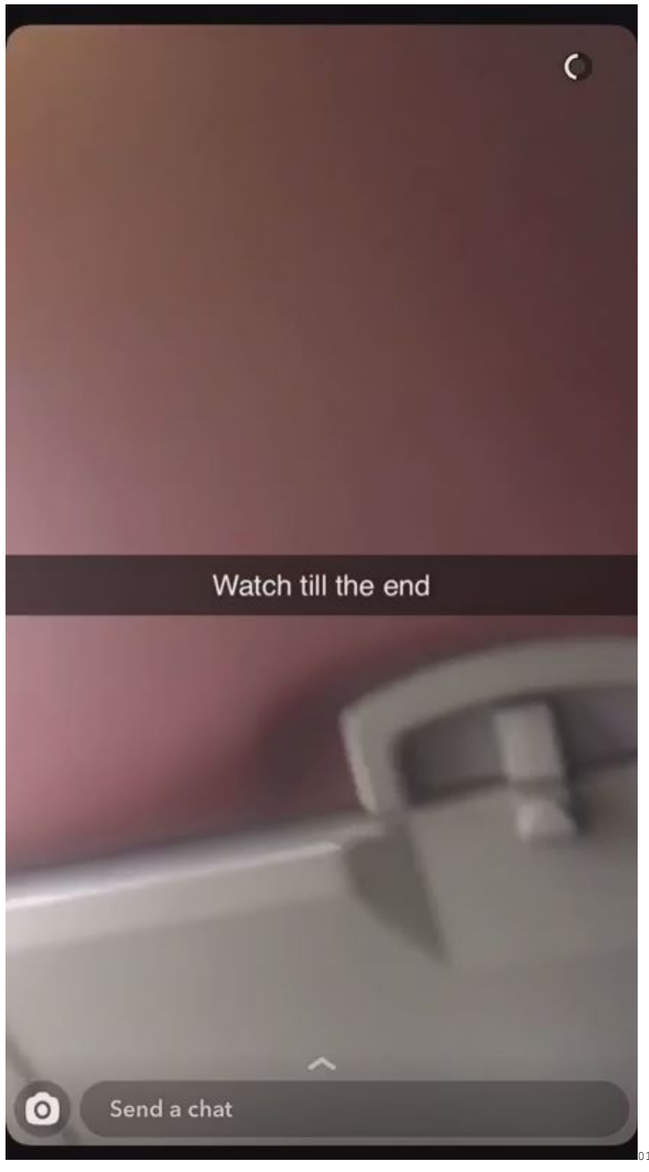


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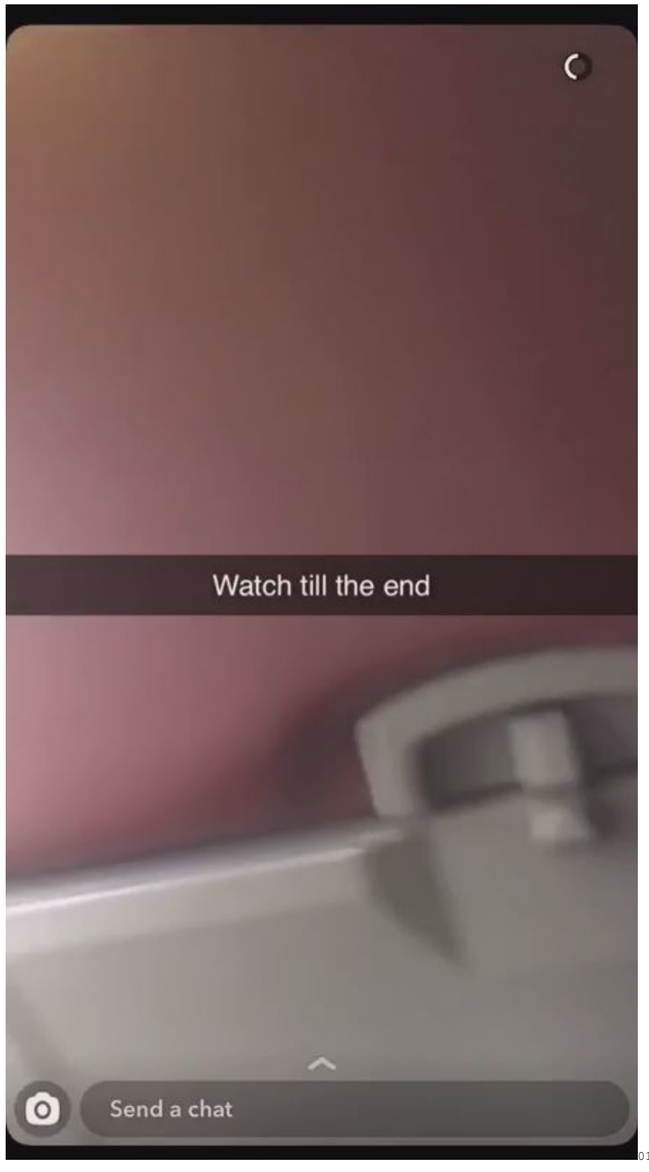


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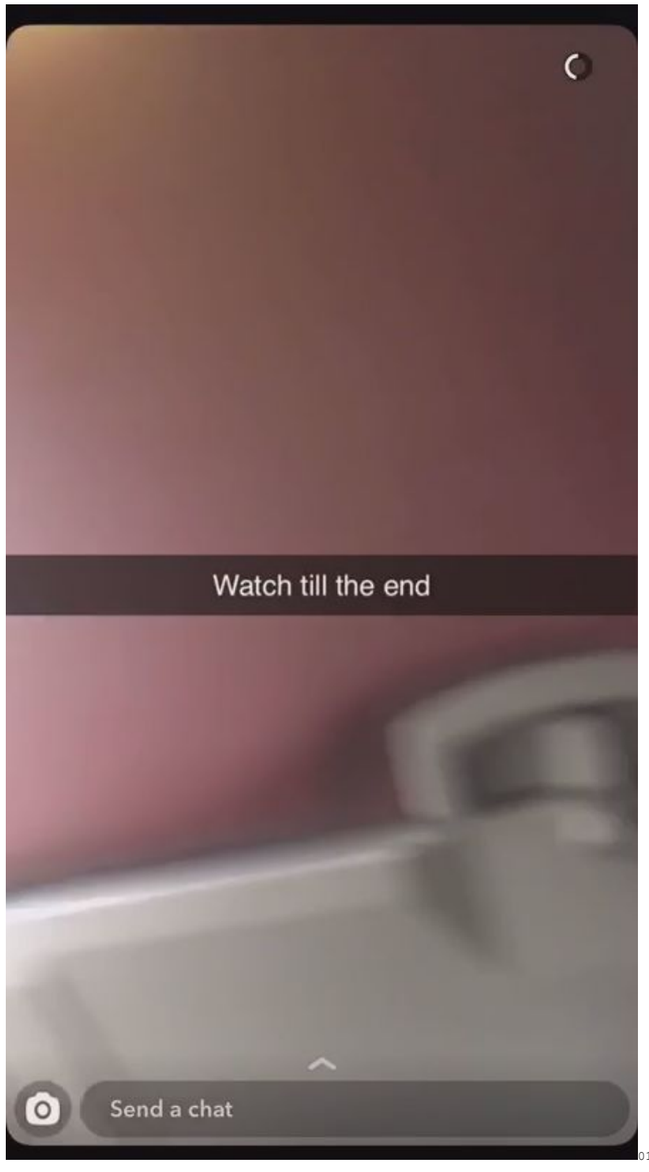
Passenger Video Image Summary



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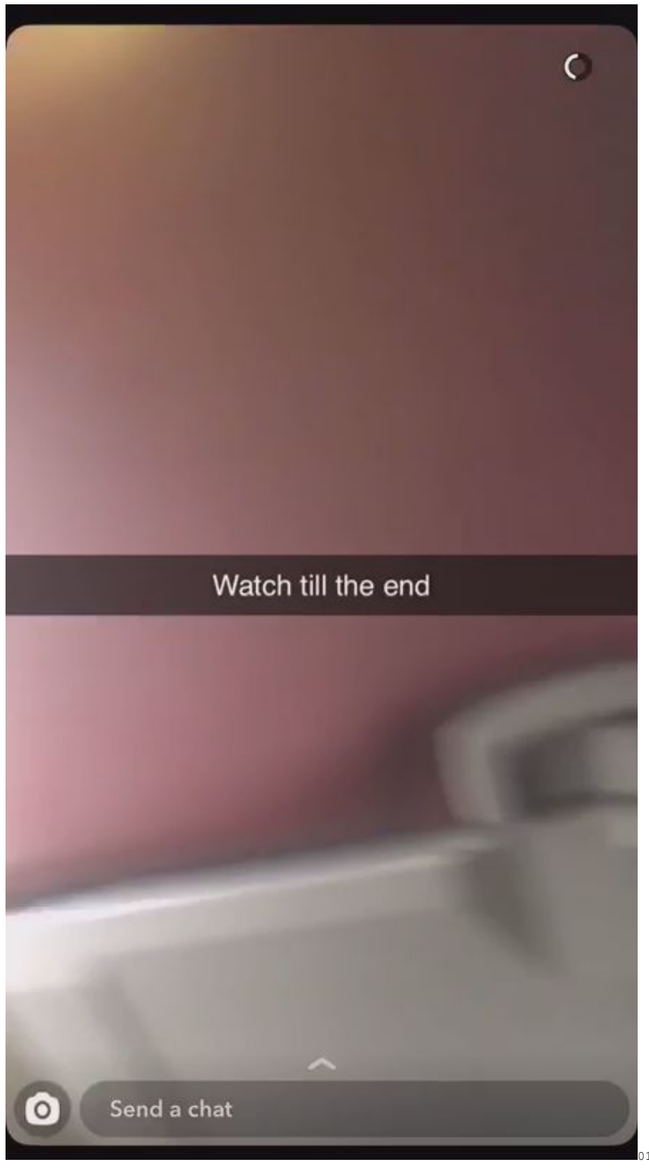


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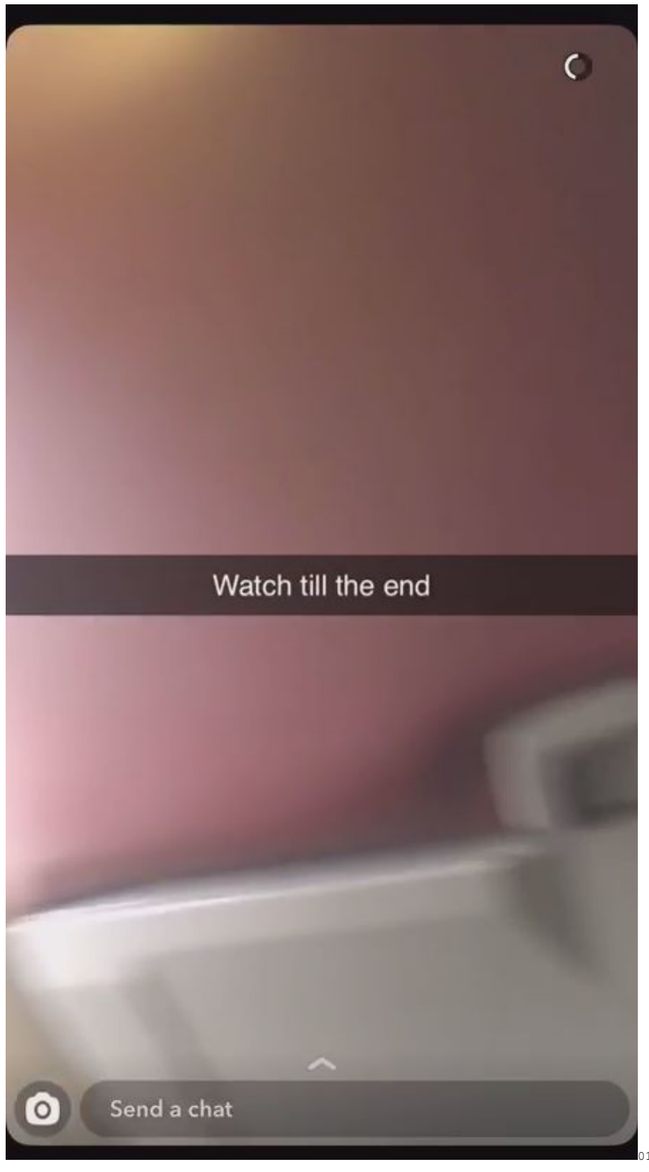


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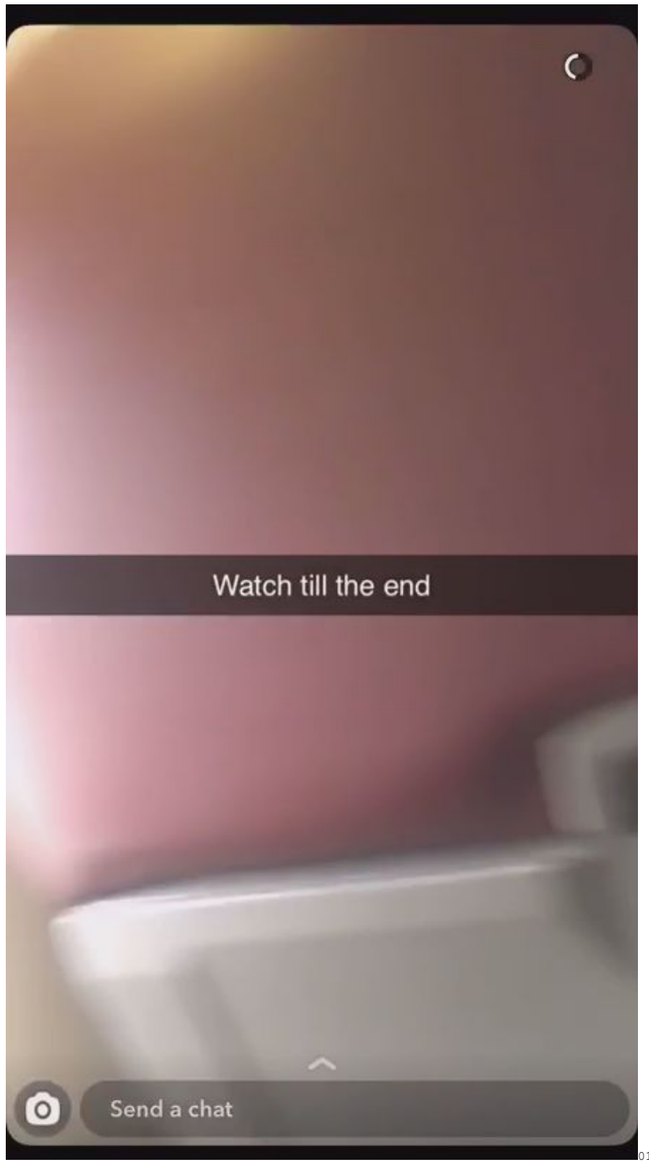
Passenger Video Image Summary



01054

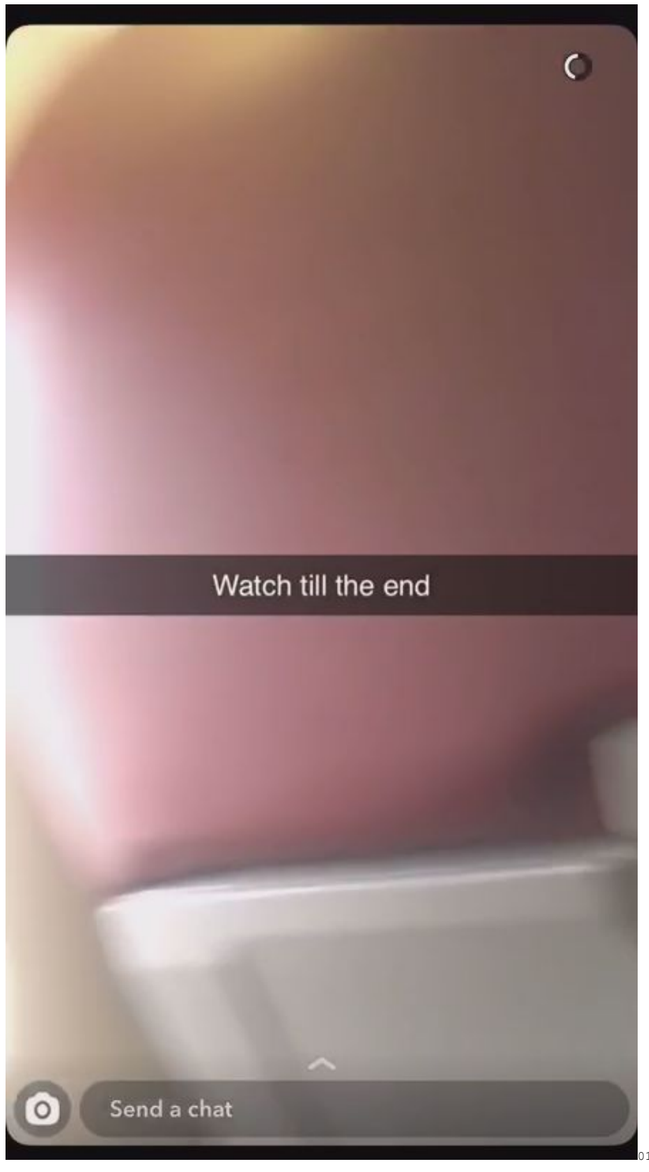


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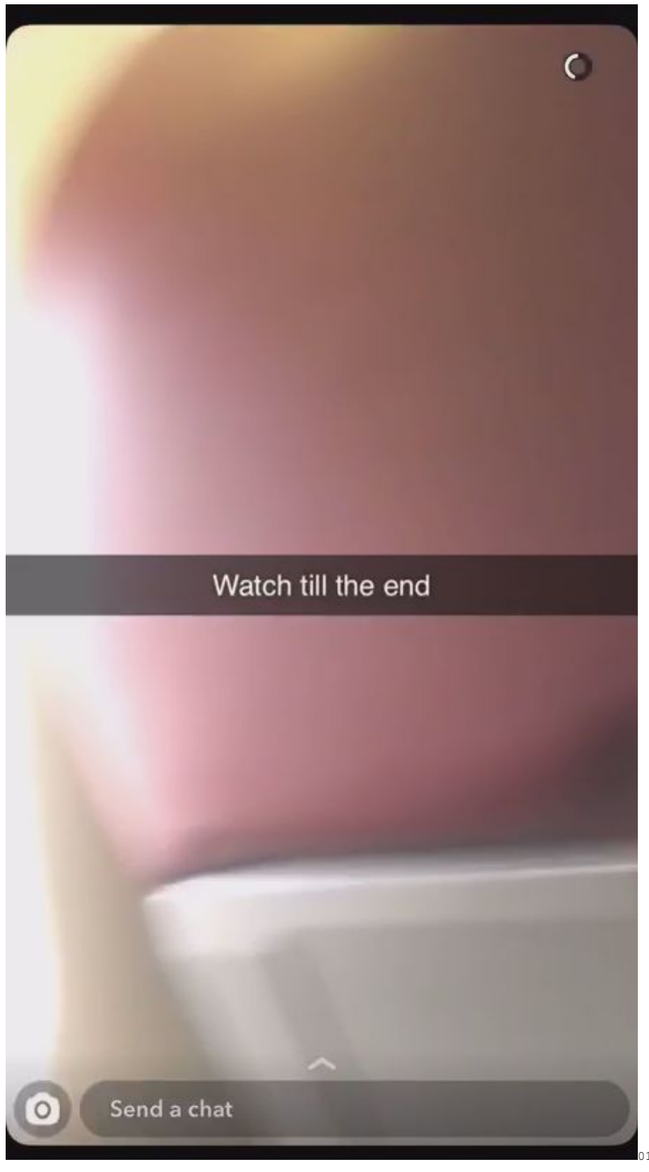


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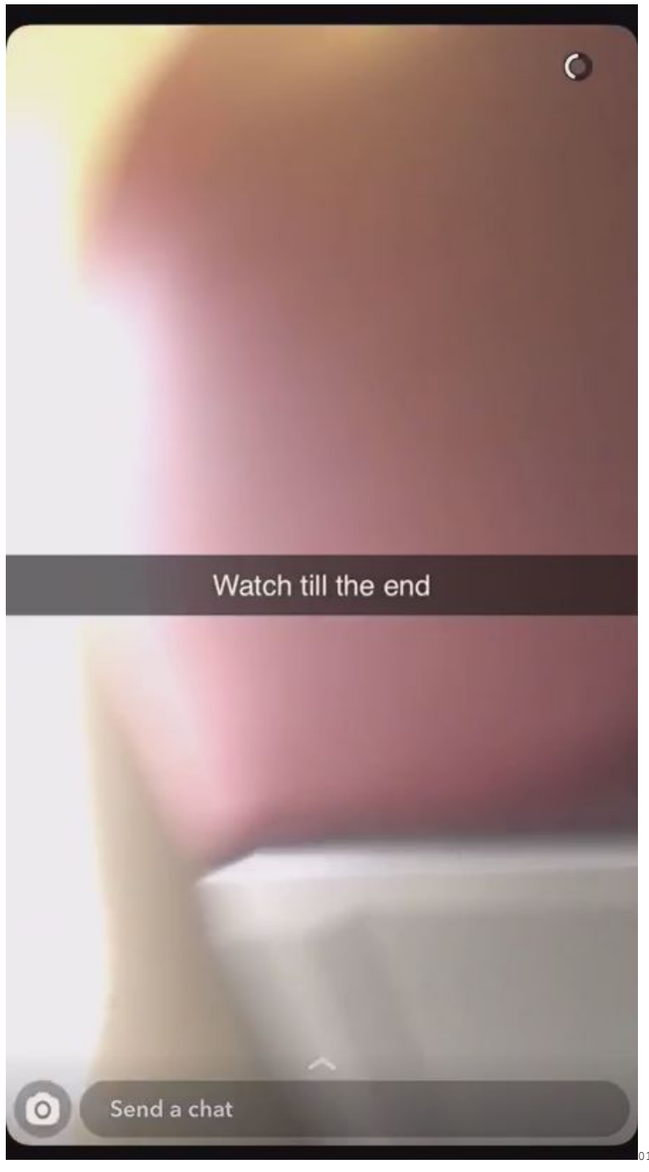
Passenger Video Image Summary



01057

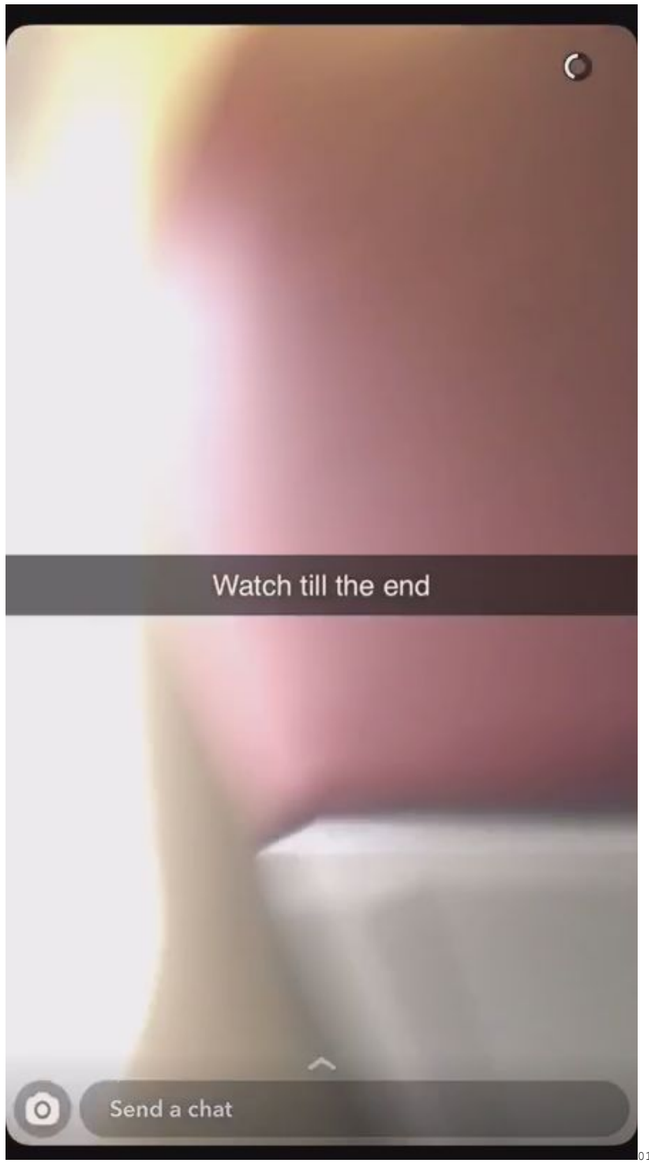


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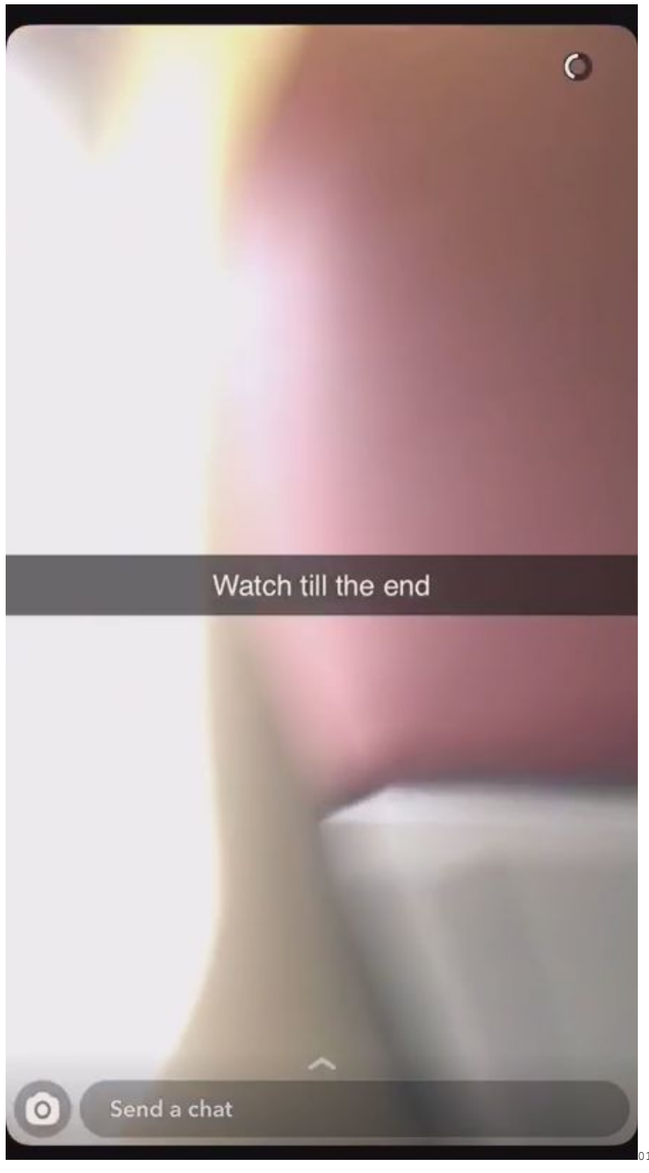


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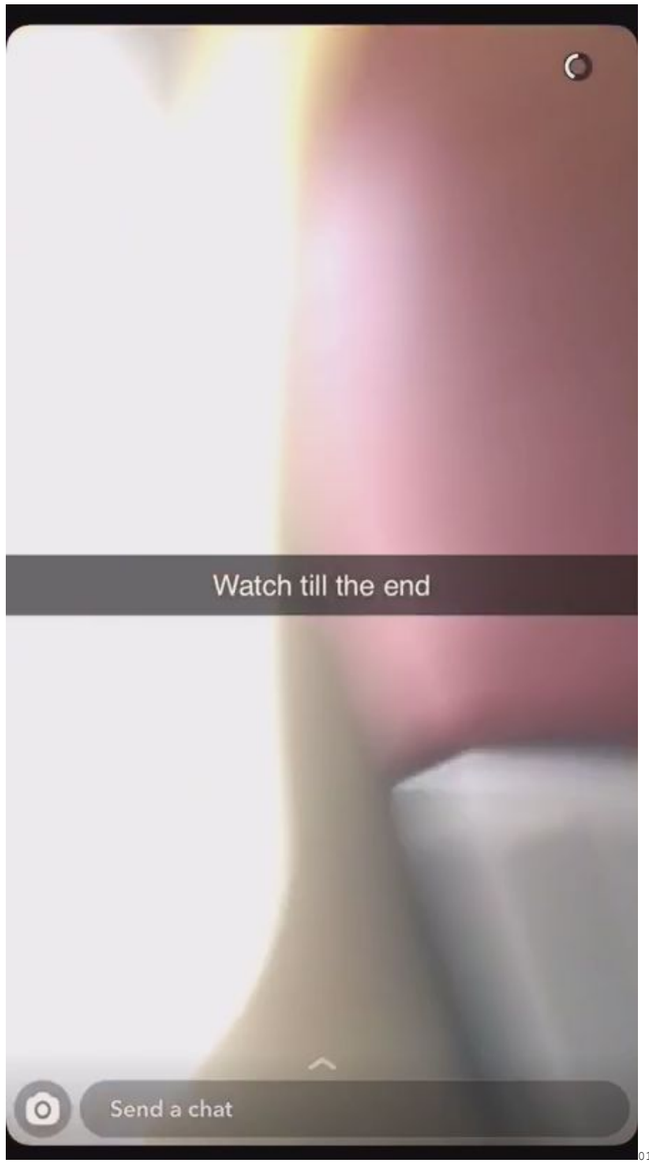
Passenger Video Image Summary



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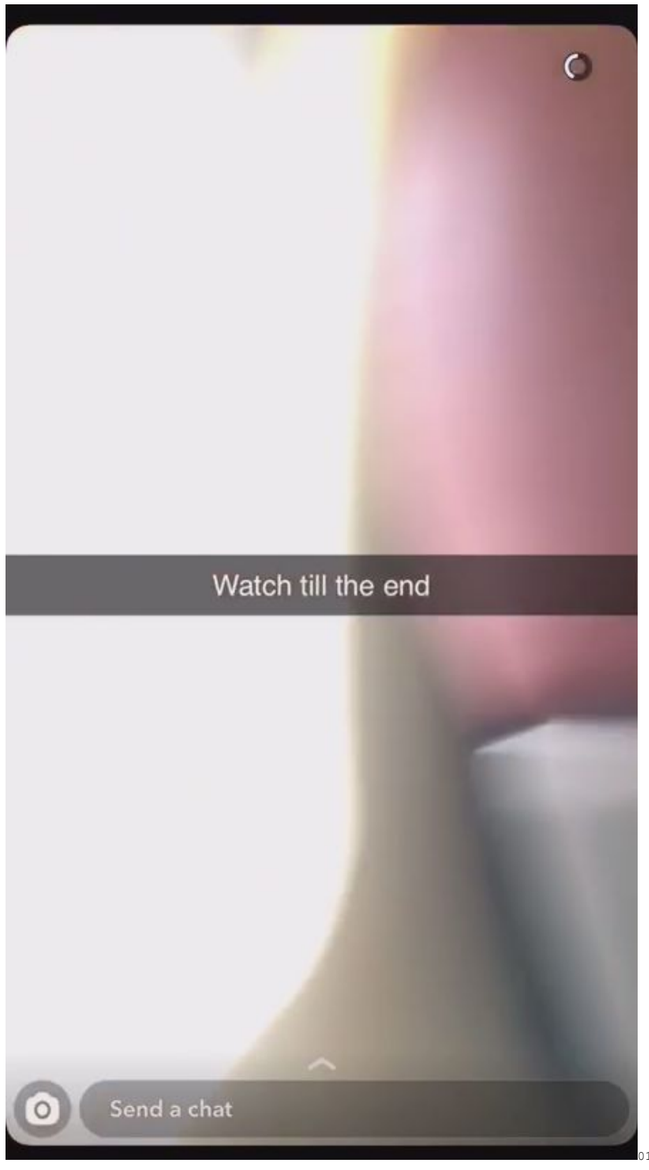


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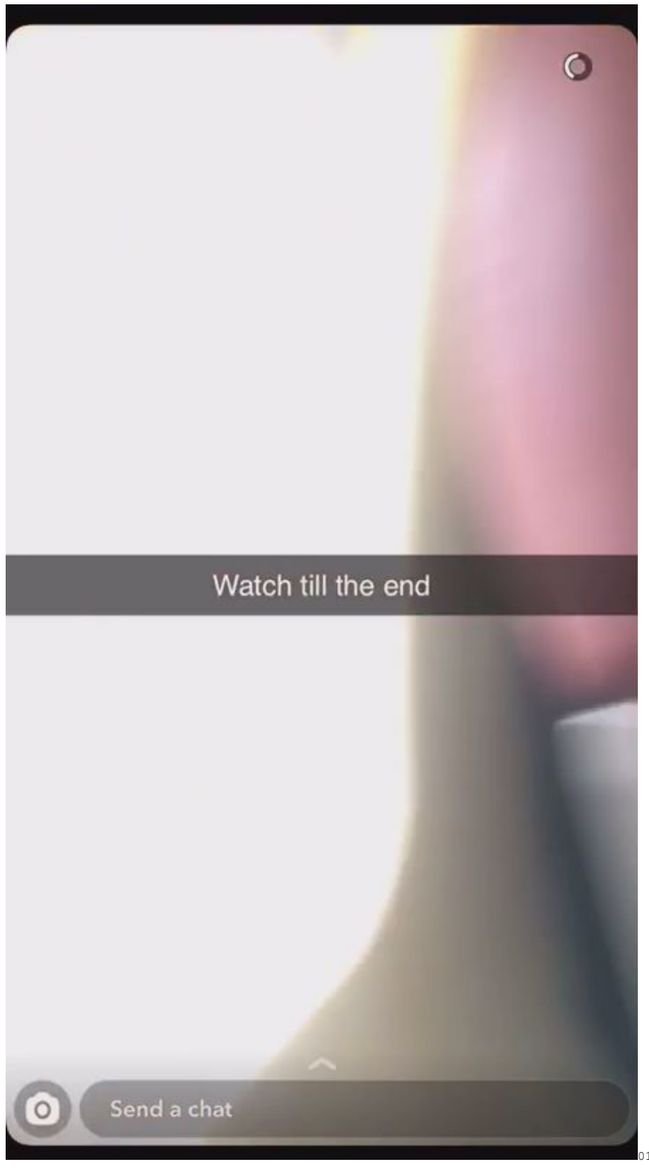


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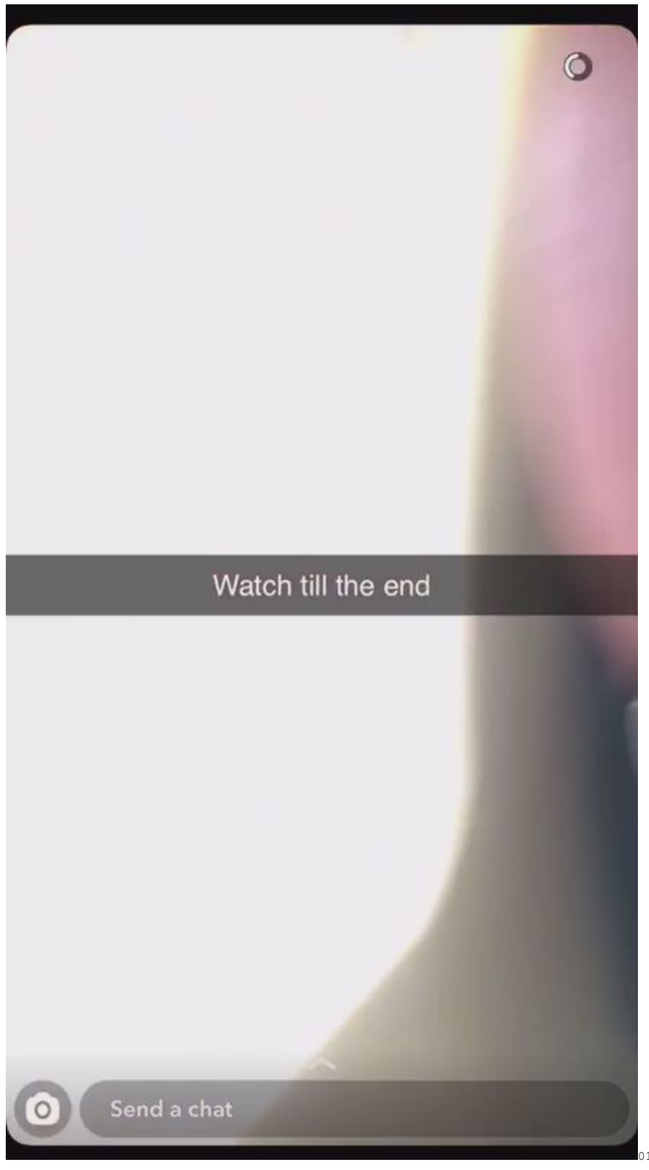
Passenger Video Image Summary



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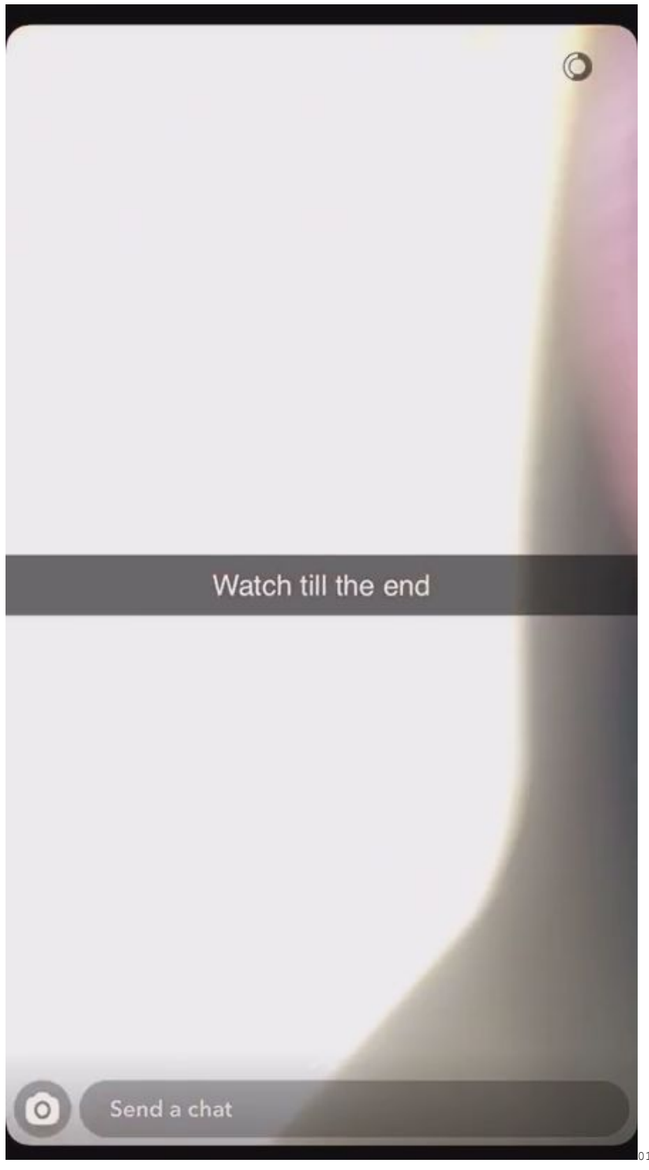


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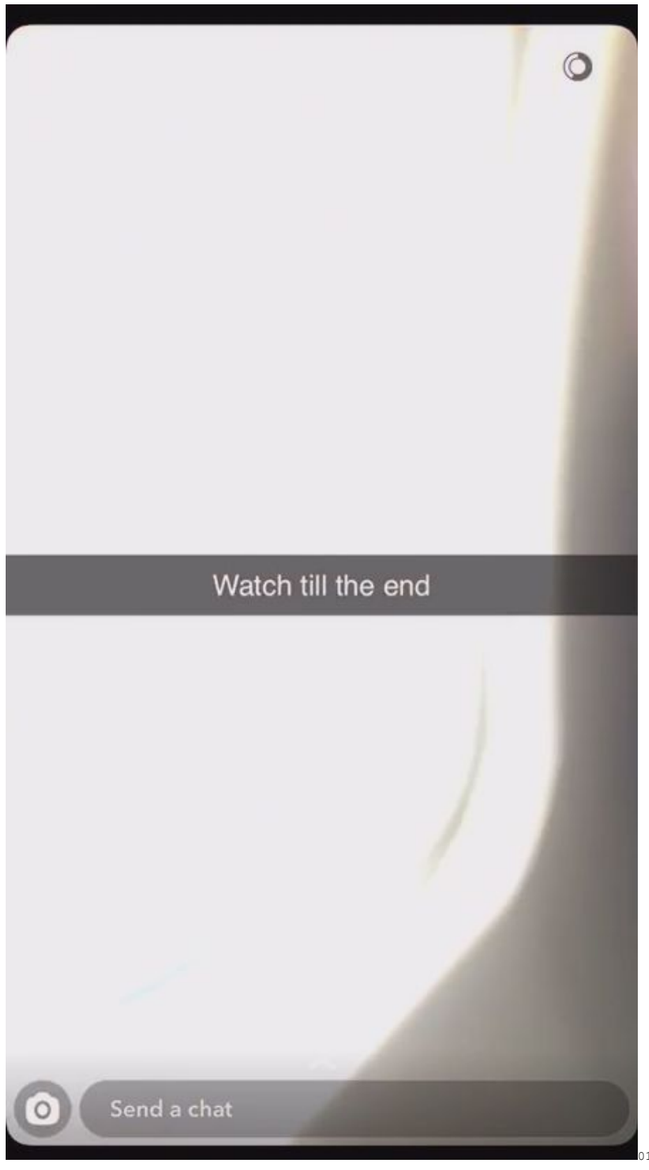


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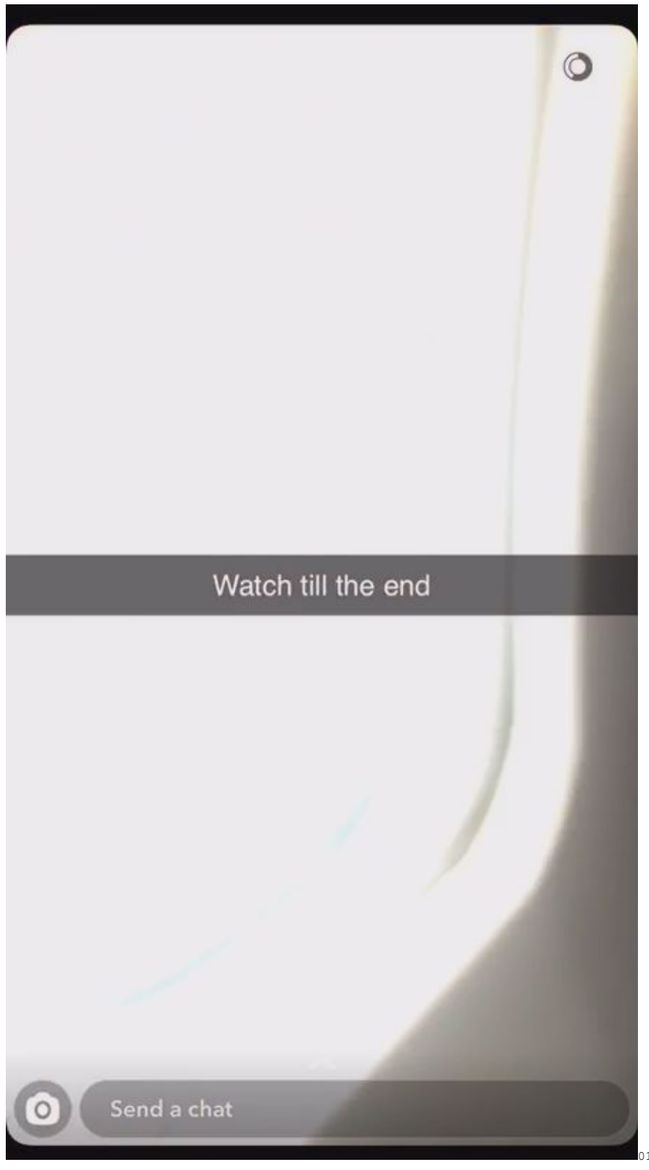
Passenger Video Image Summary



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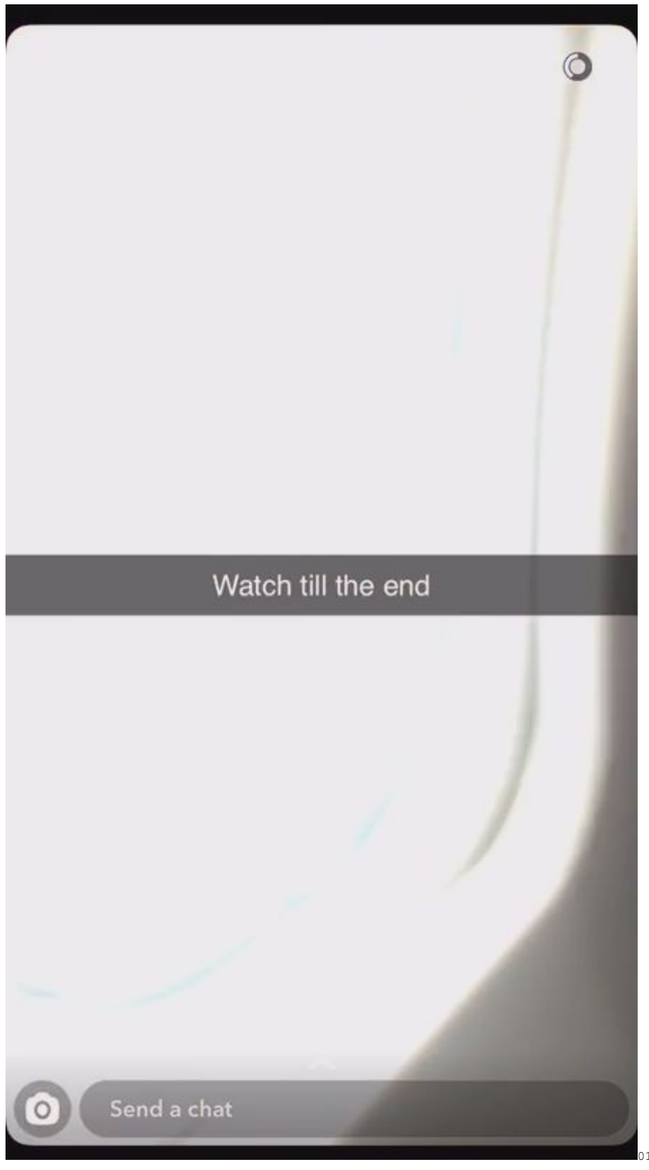


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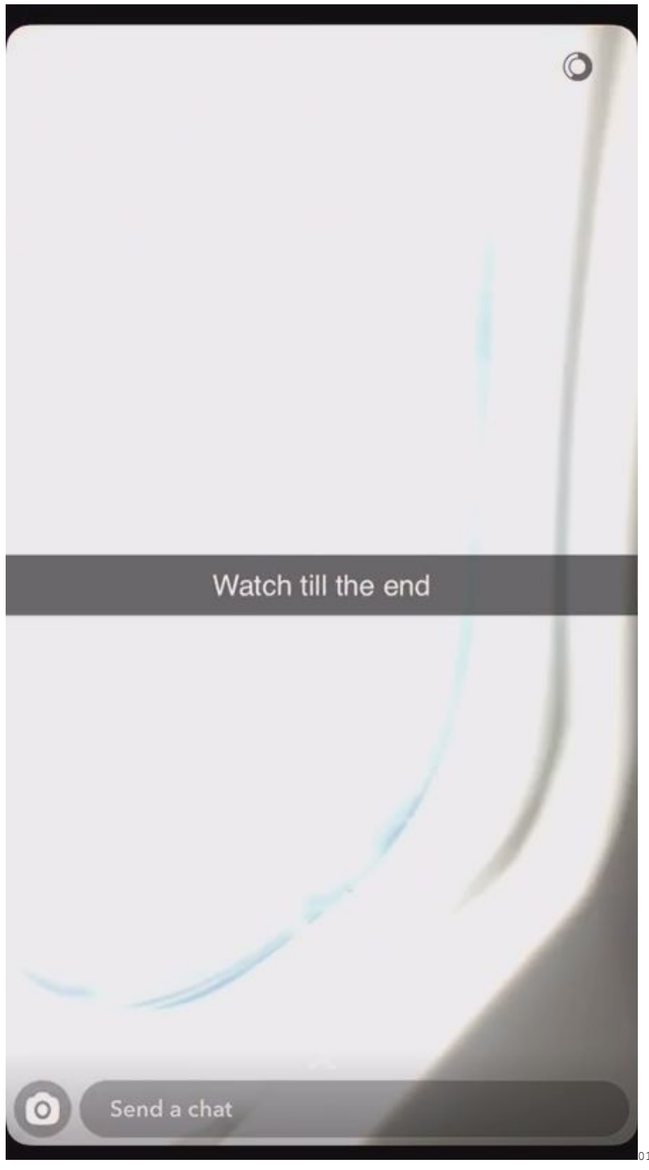


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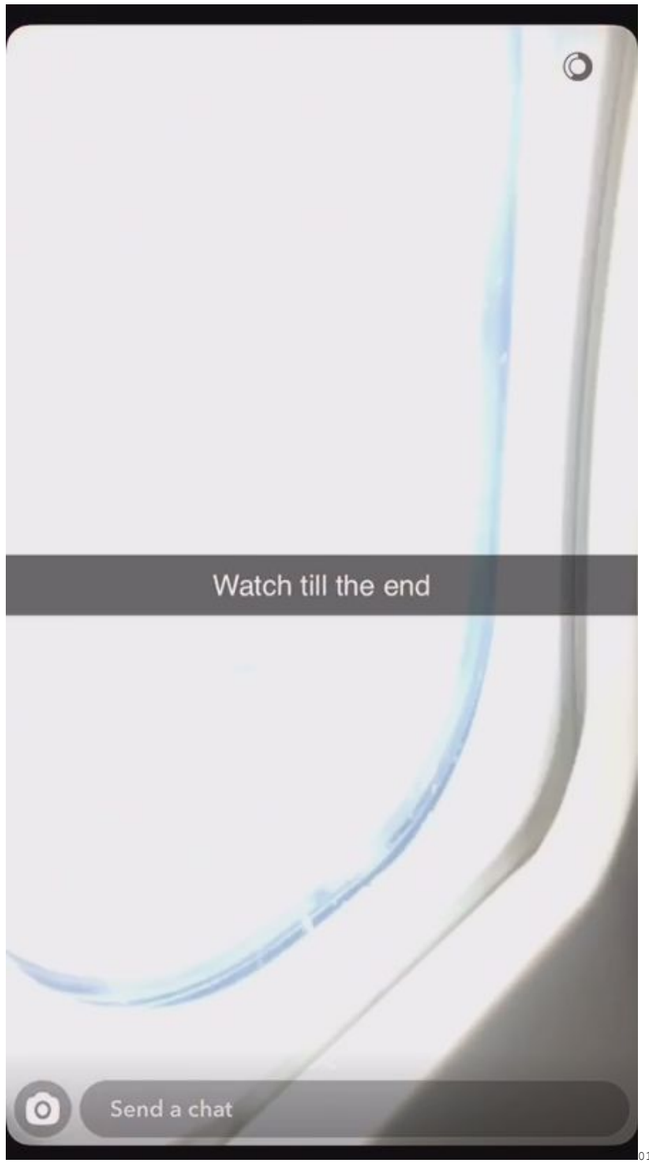
Passenger Video Image Summary



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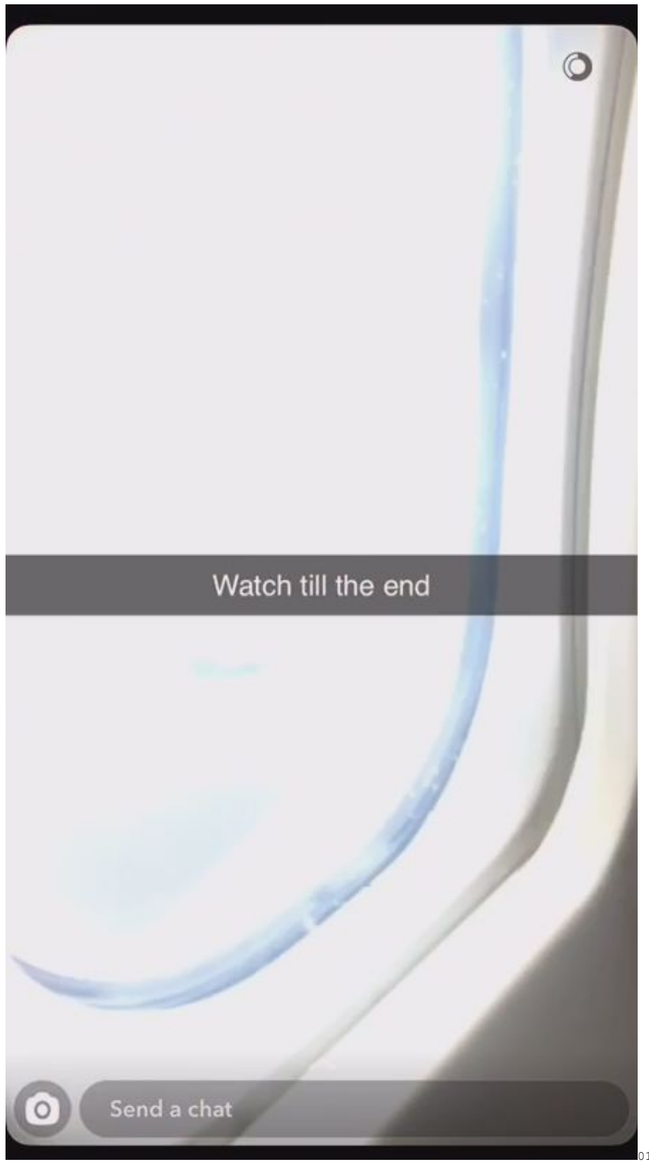


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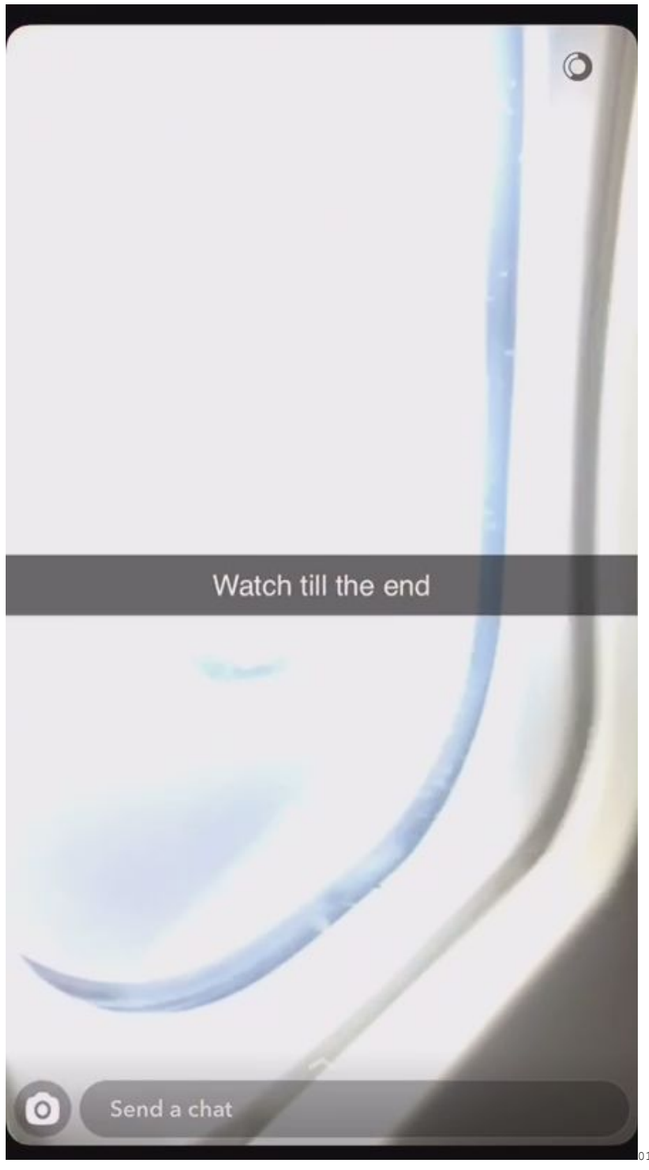


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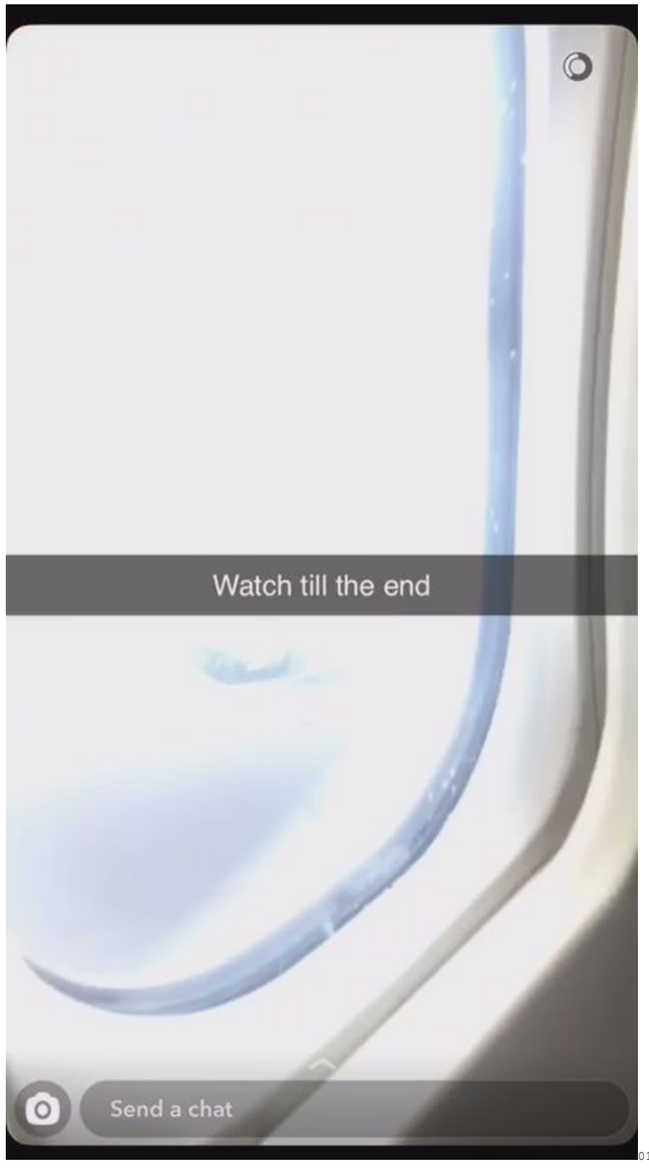
Passenger Video Image Summary



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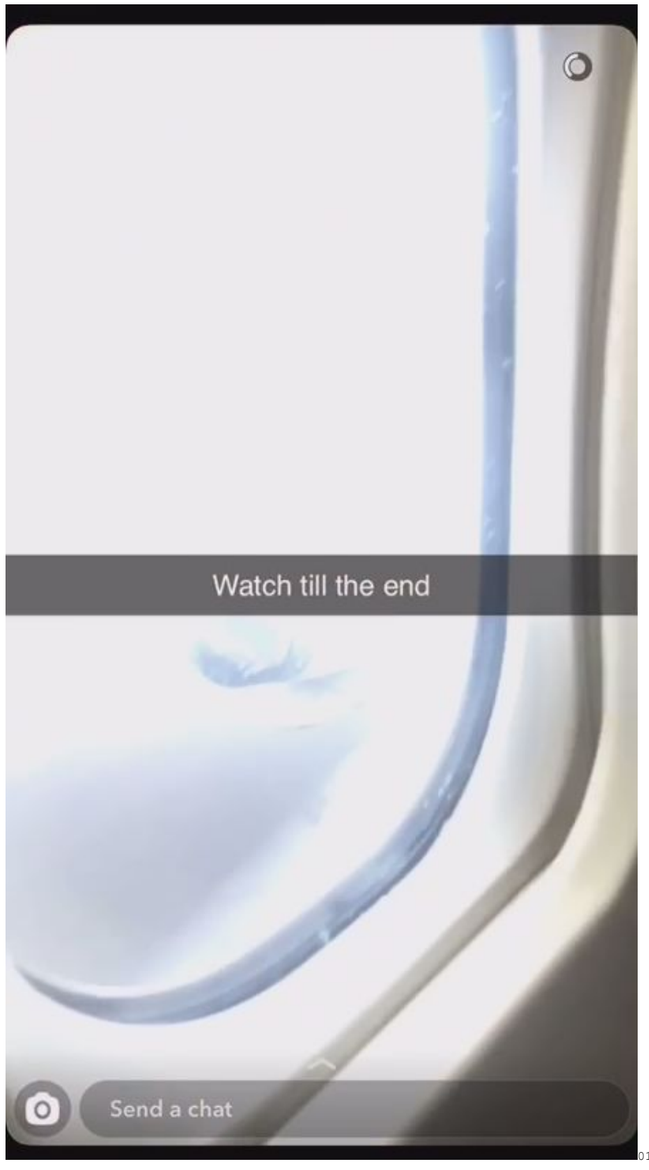


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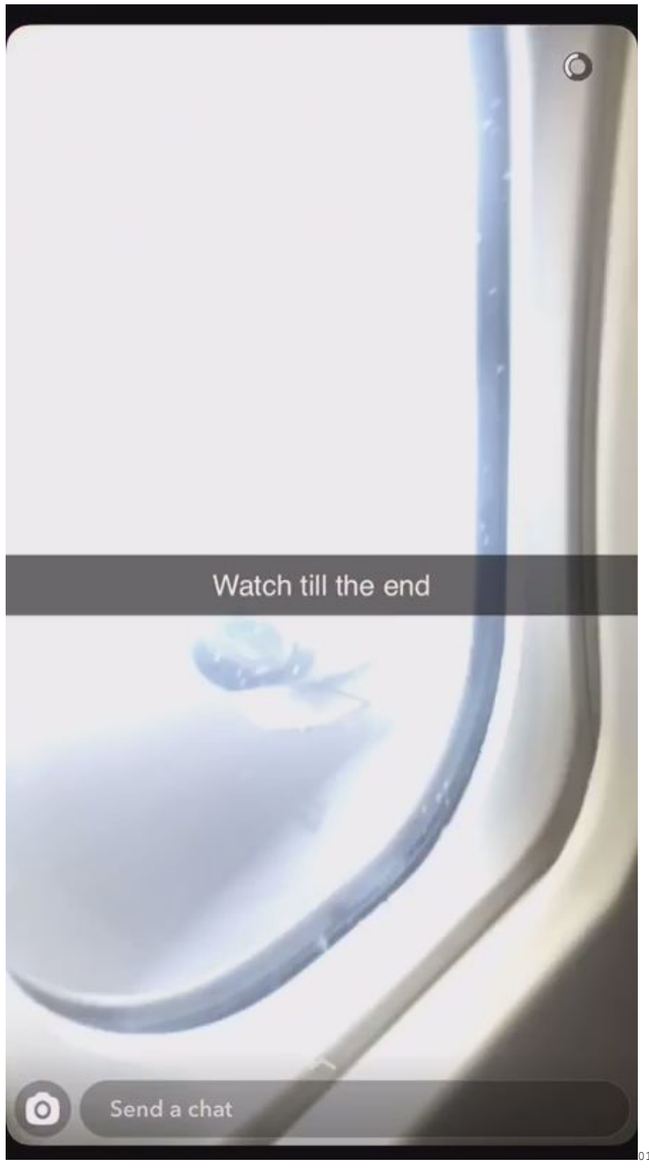


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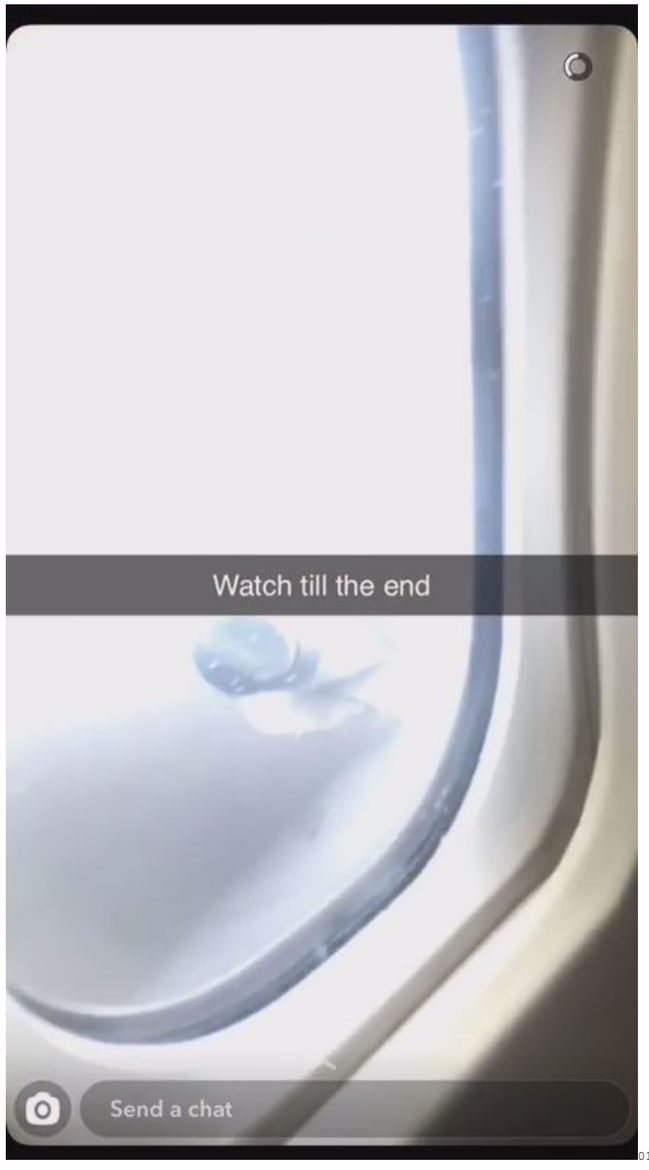
Passenger Video Image Summary



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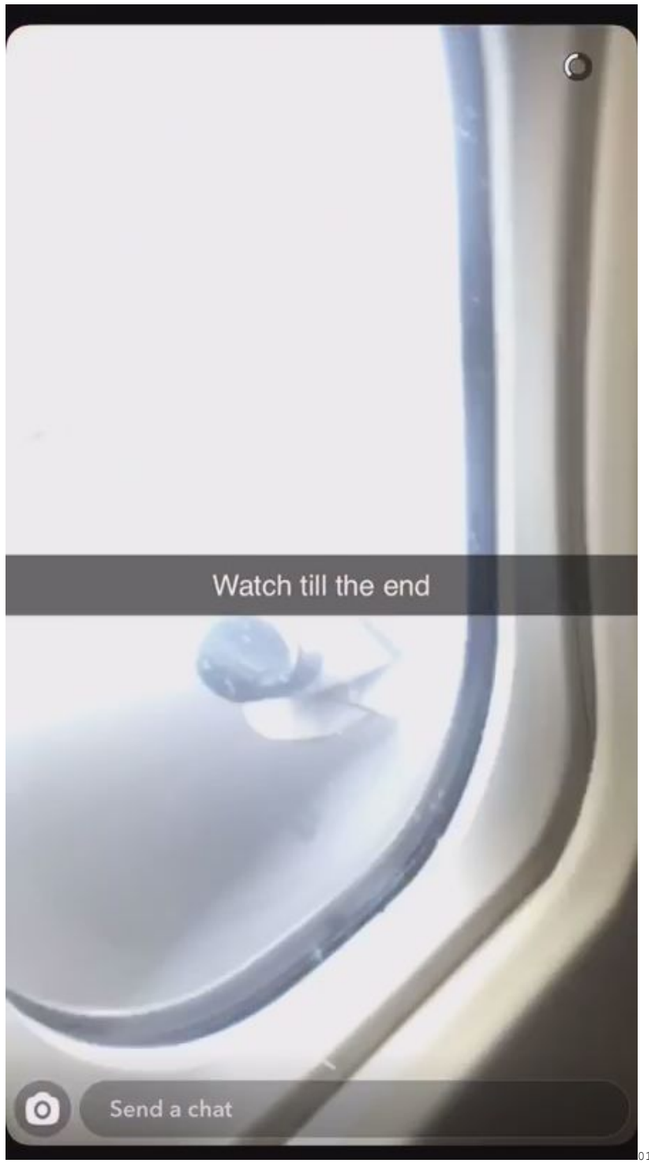


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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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Passenger Video Image Summary



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Attachment 7

Image sequence from the second passenger video (3 frames/page)

Passenger 2 Video Image Summary


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00001


00002



00003



00004

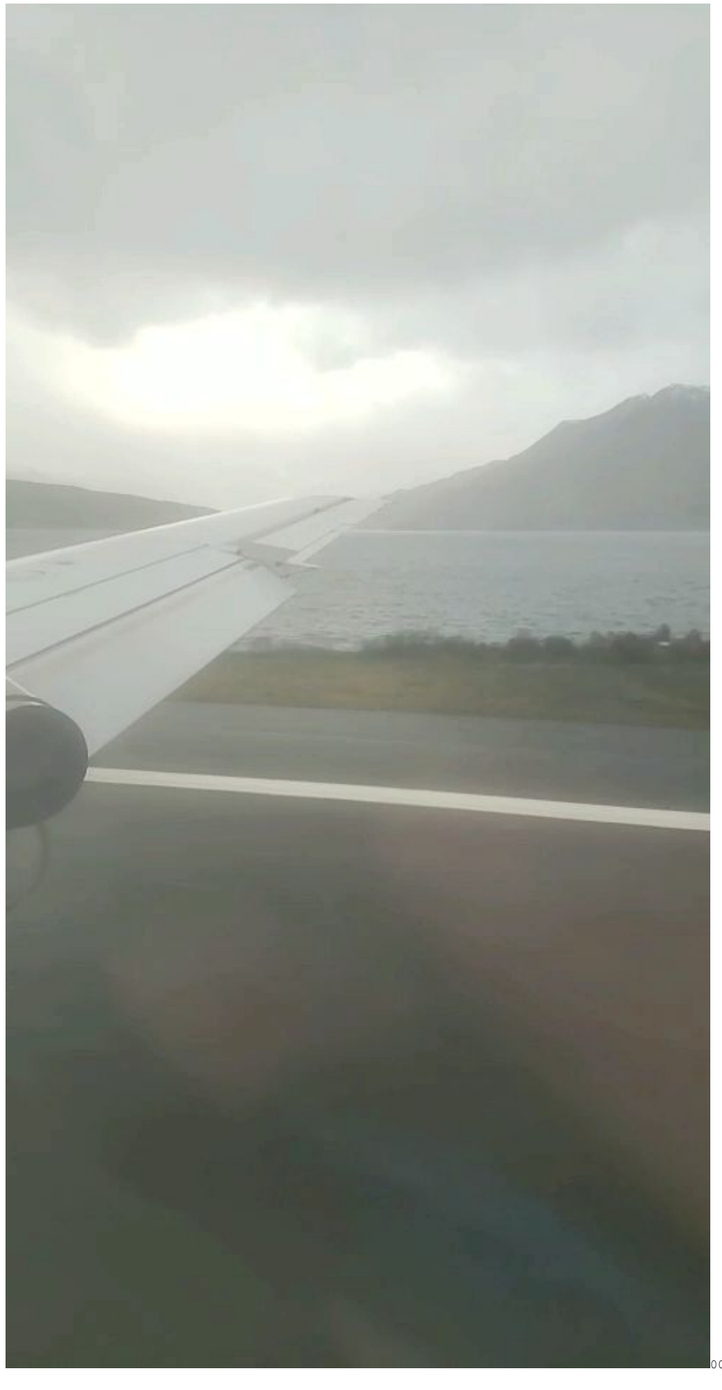


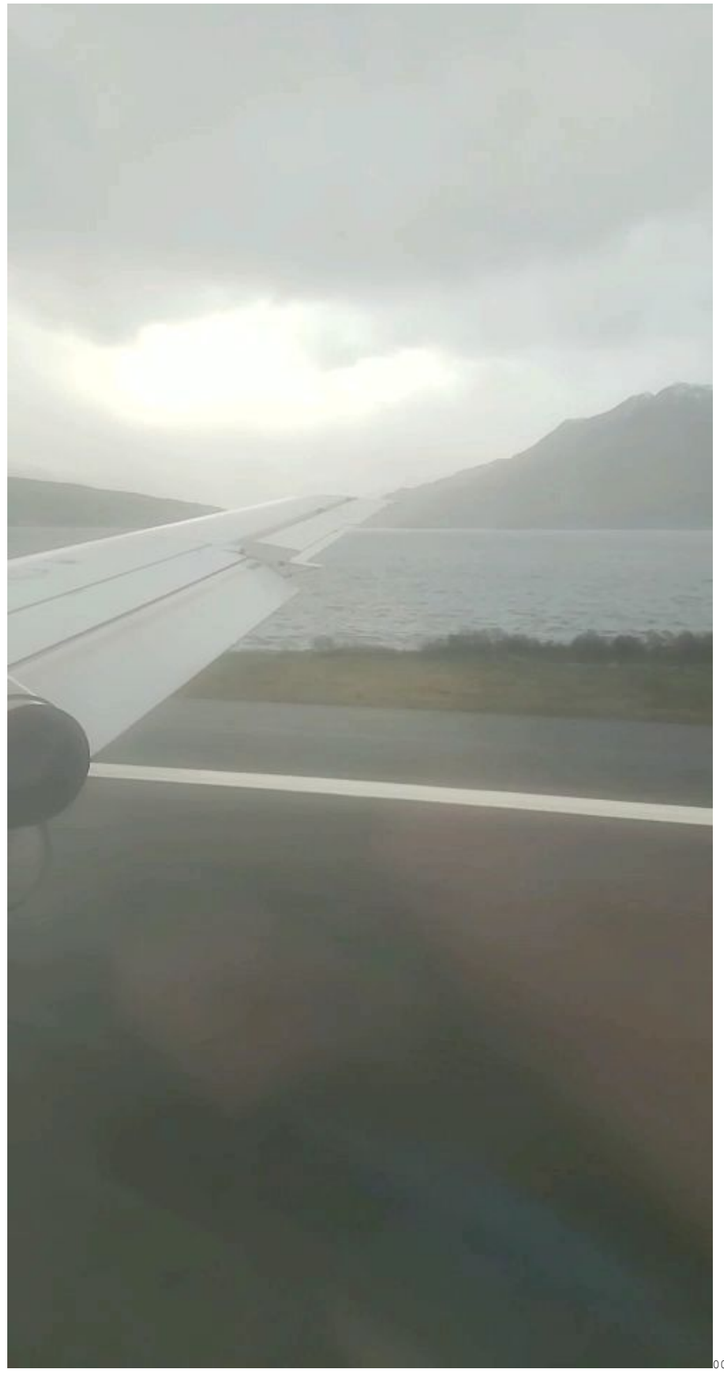
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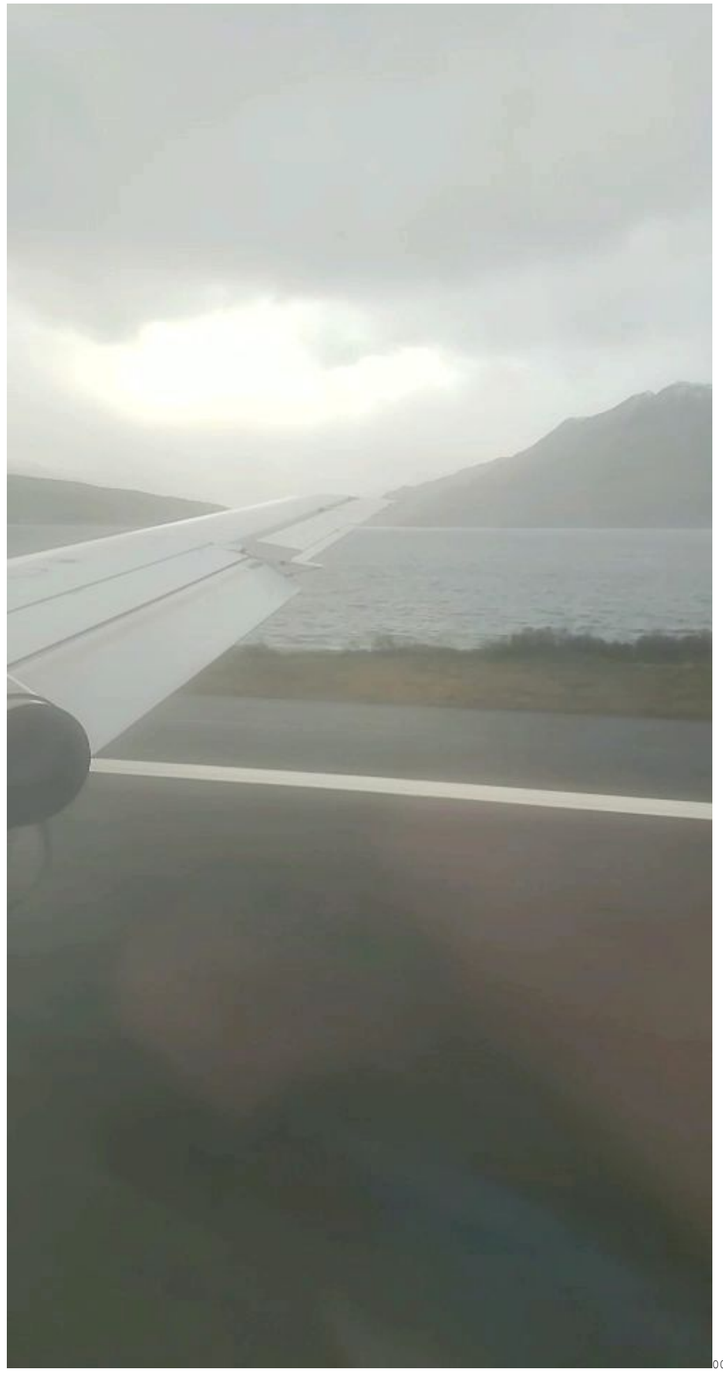

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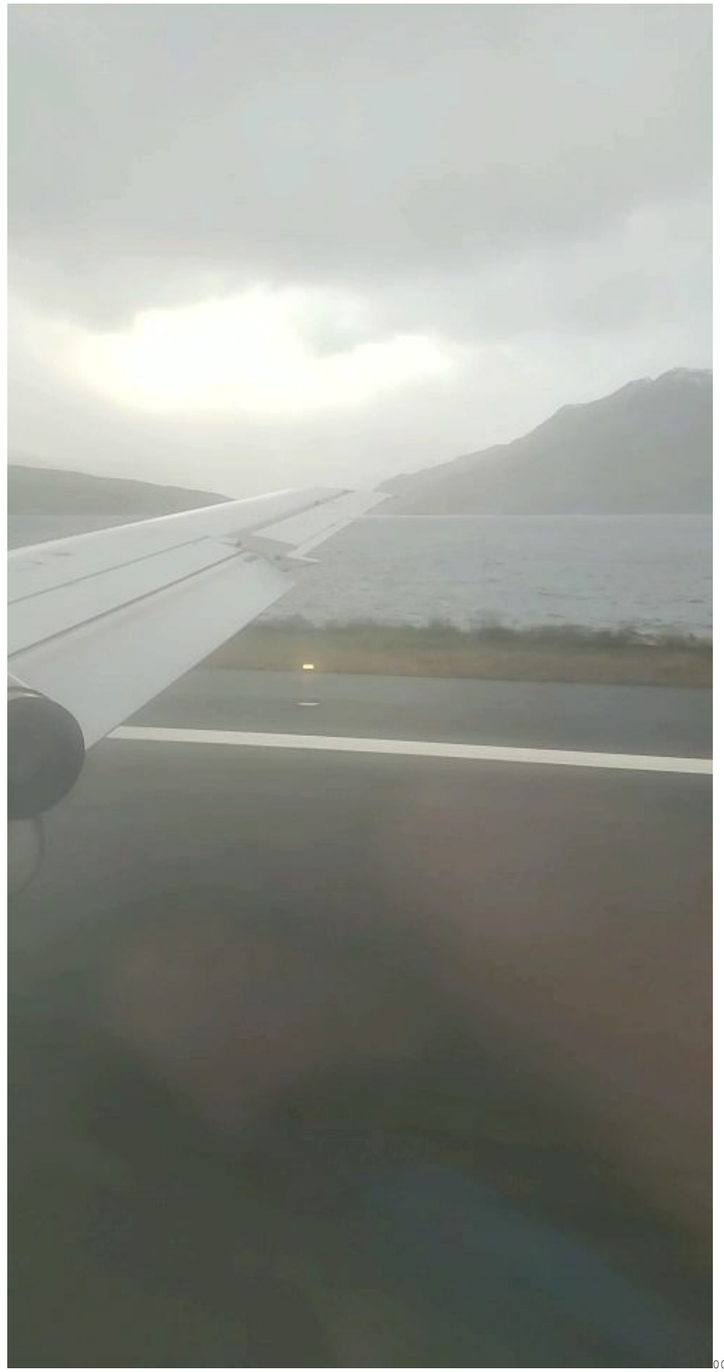

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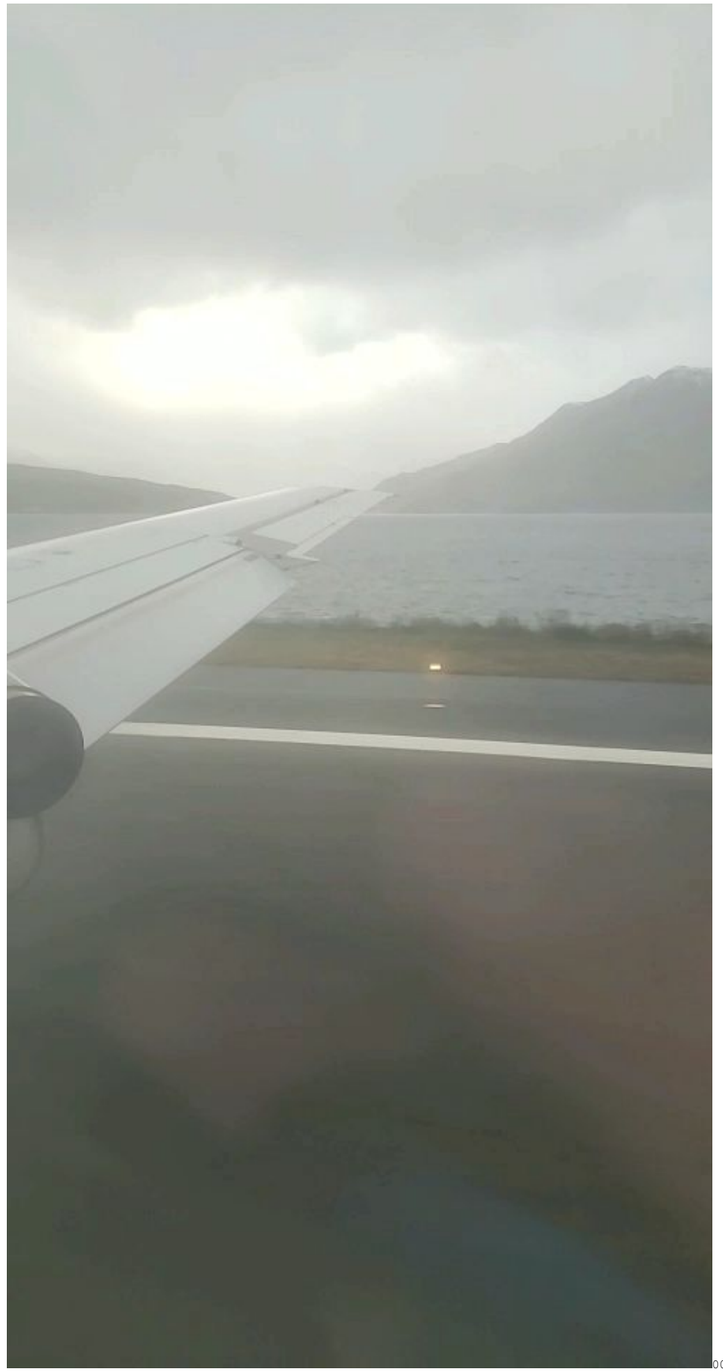

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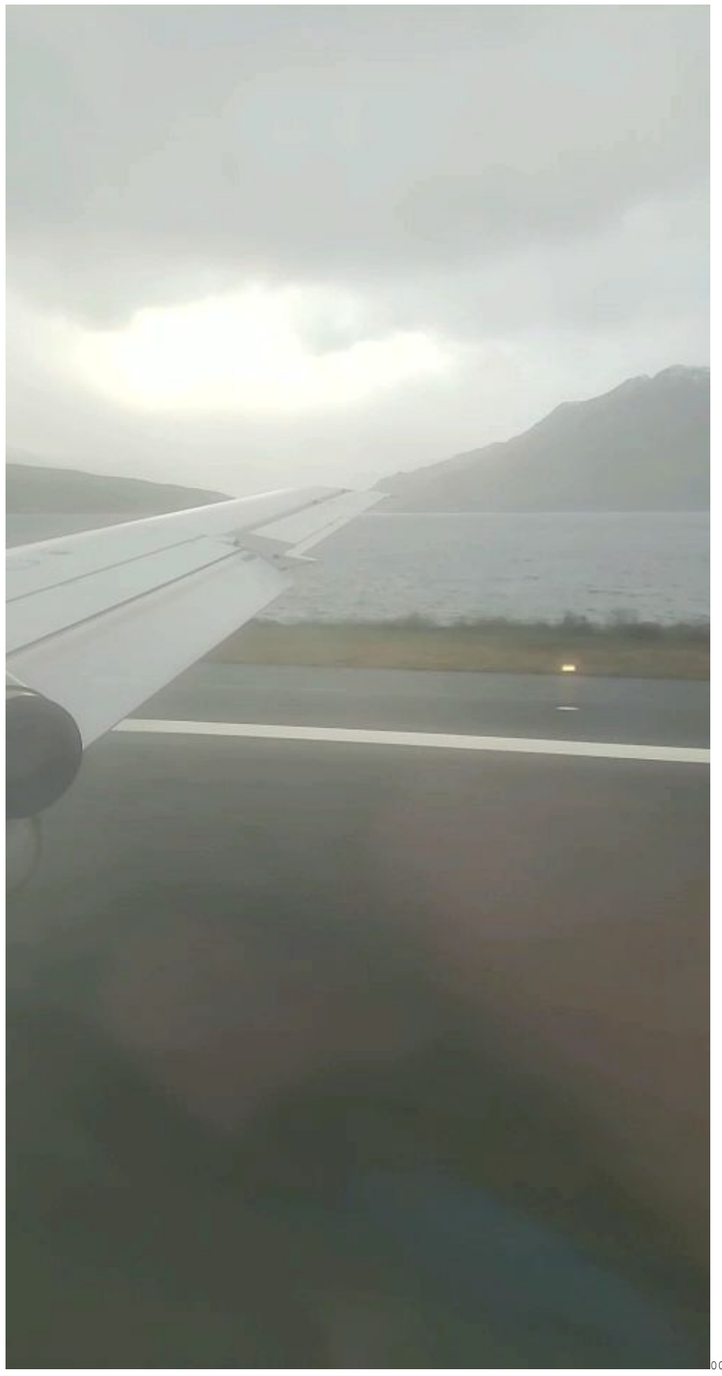

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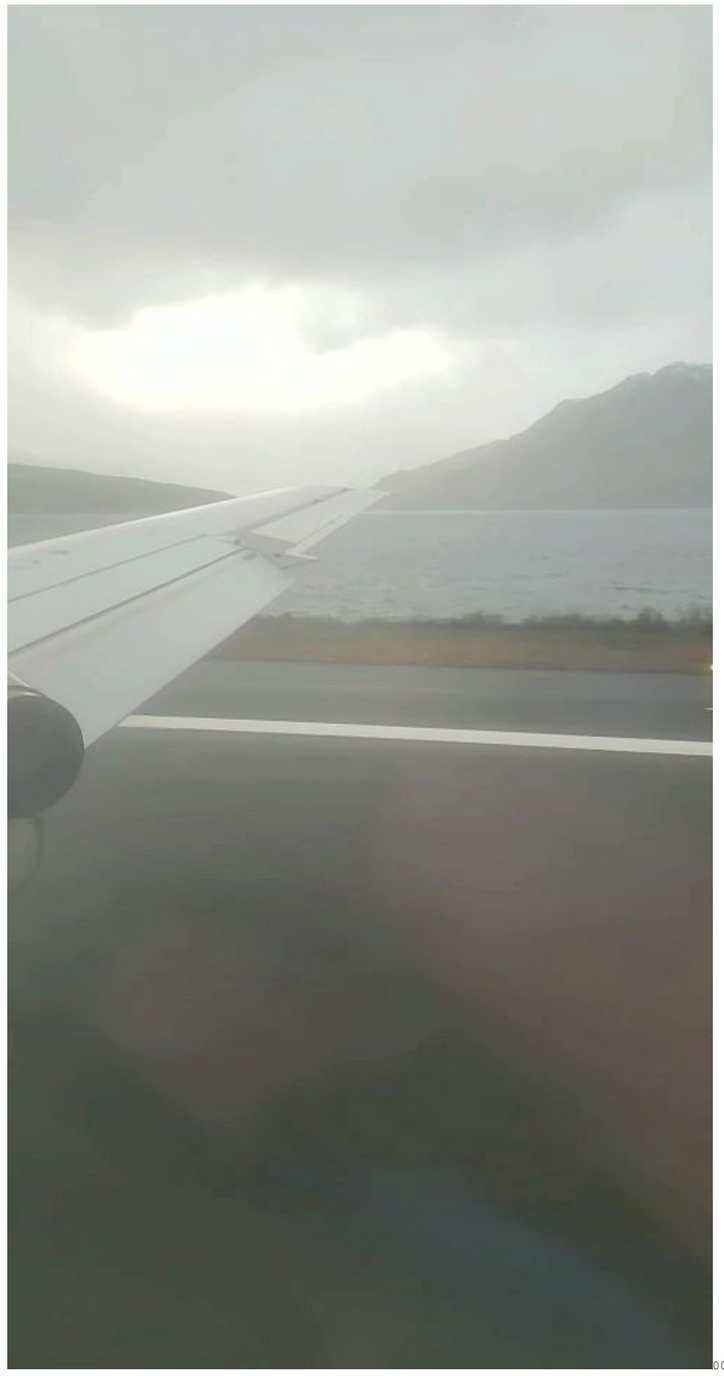

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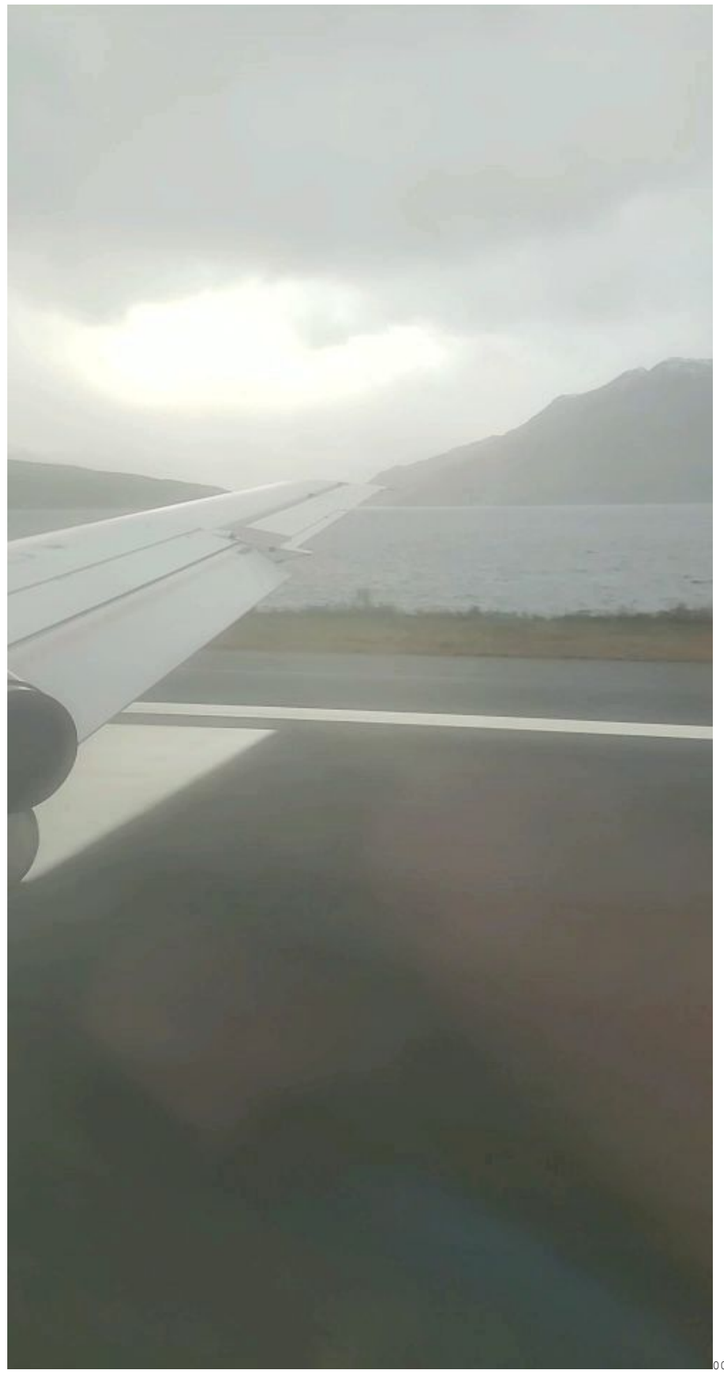


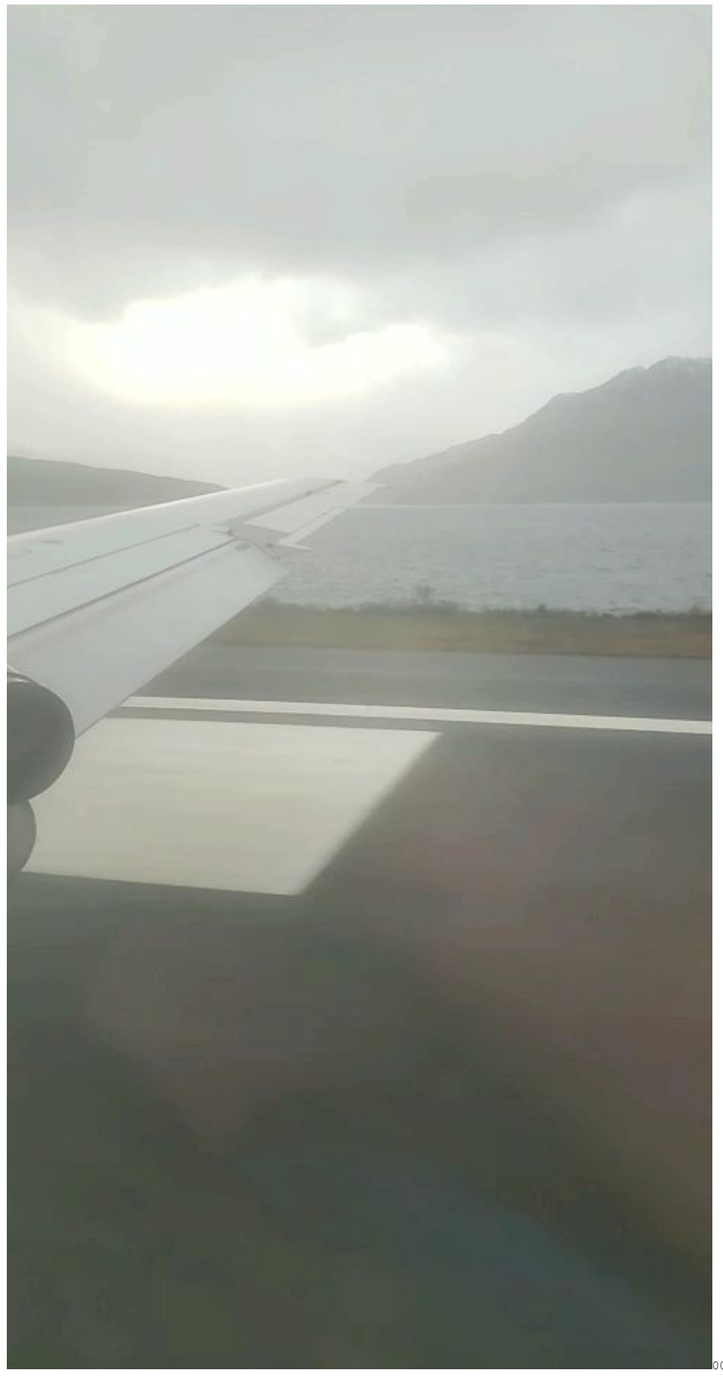
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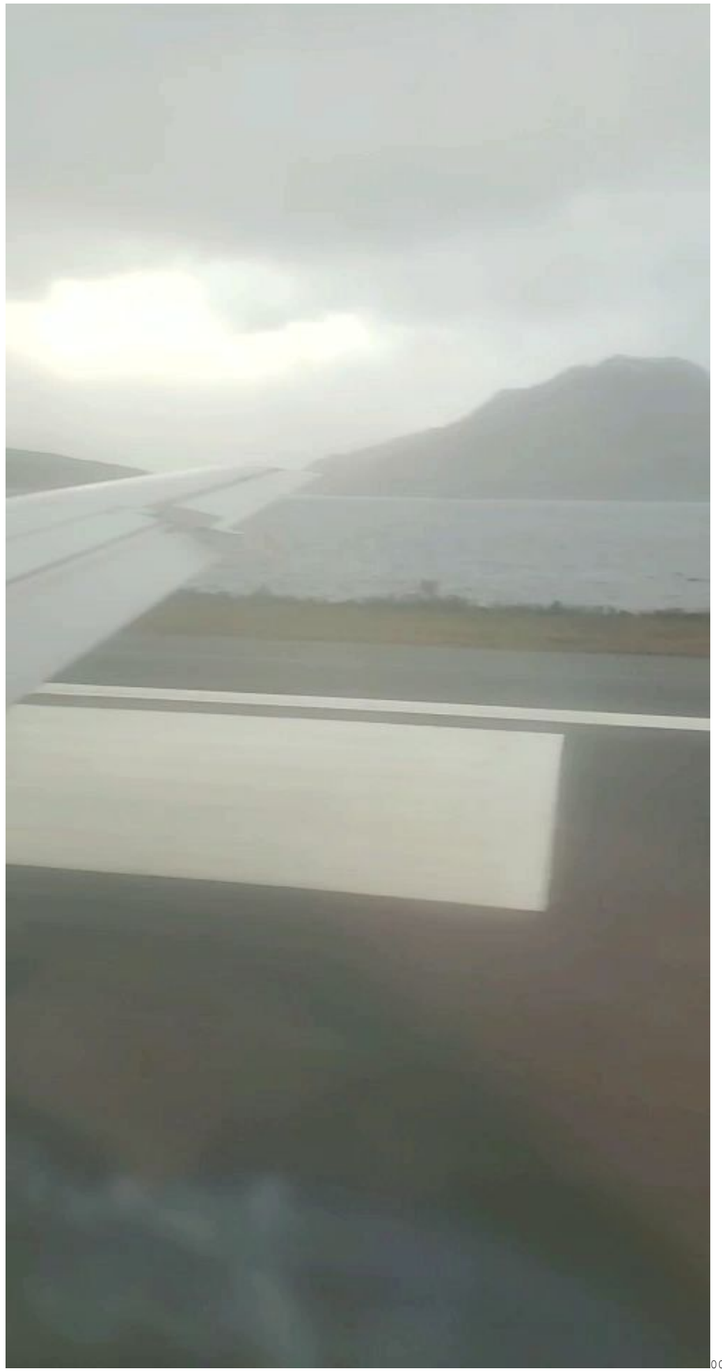


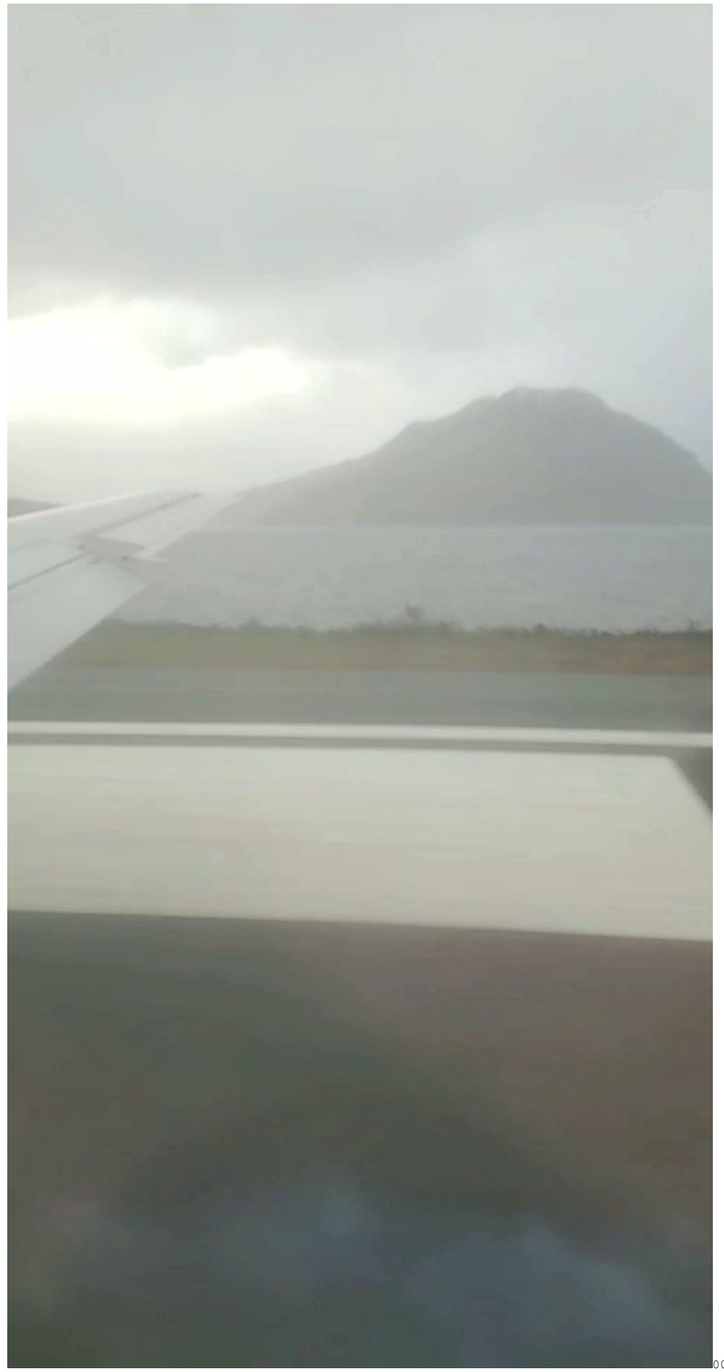
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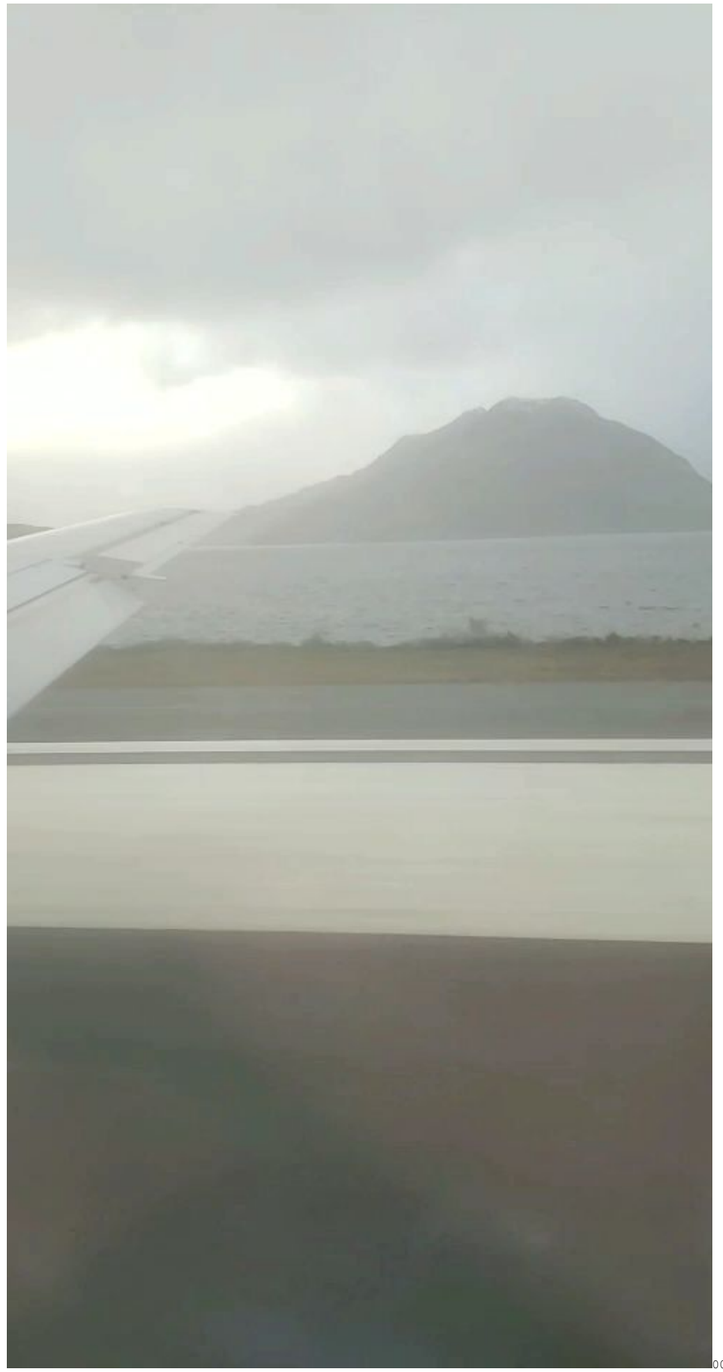

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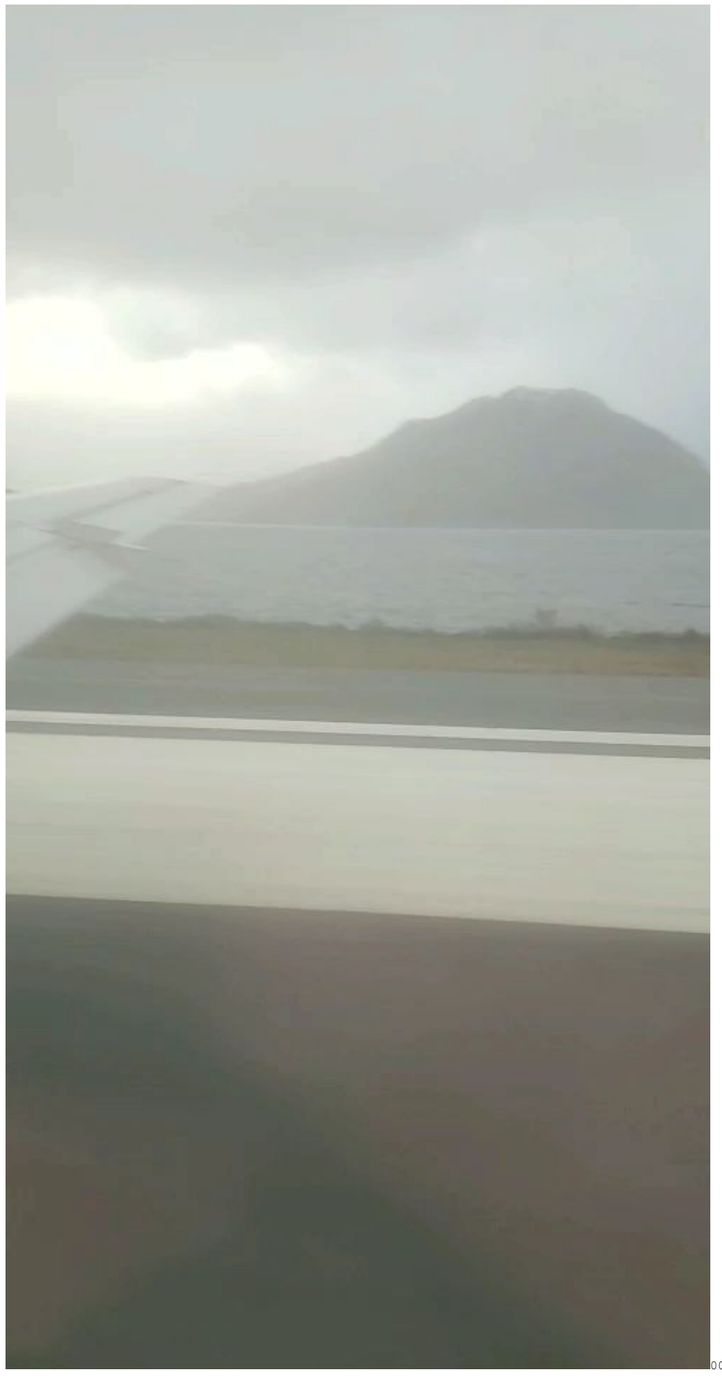

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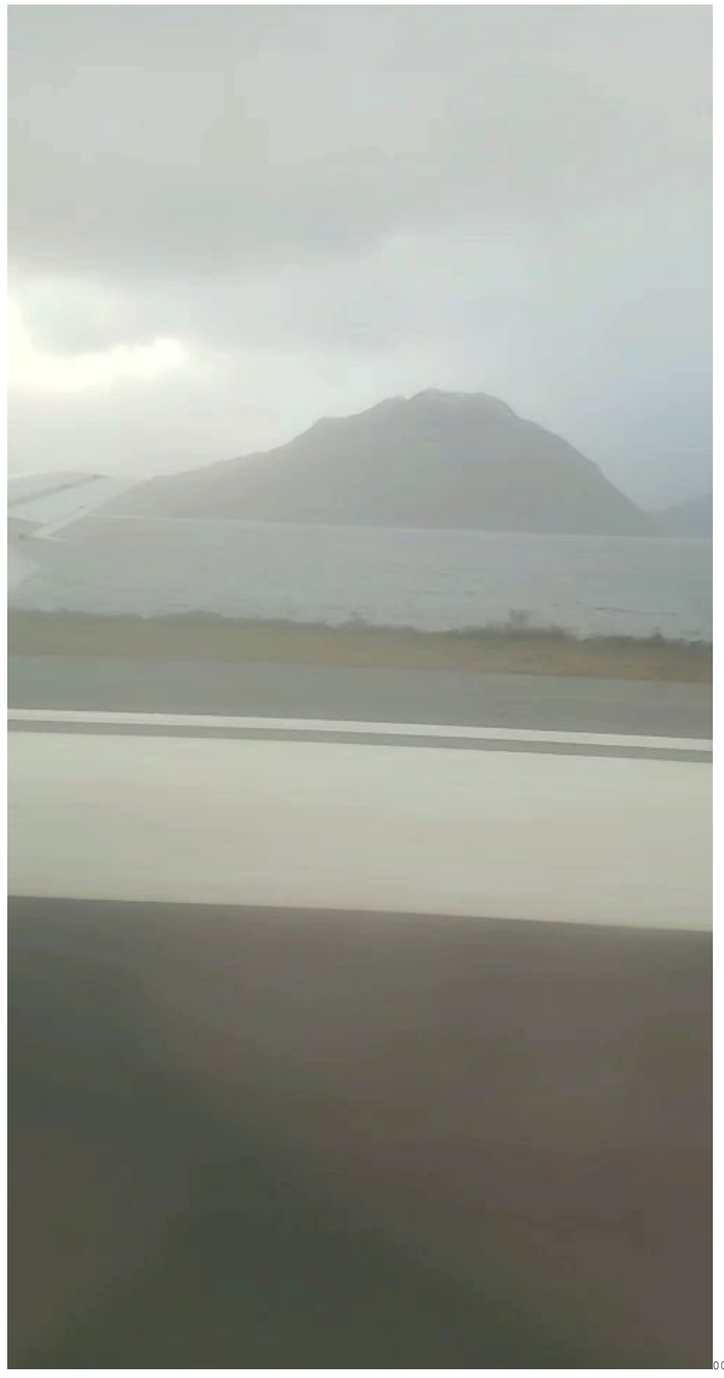

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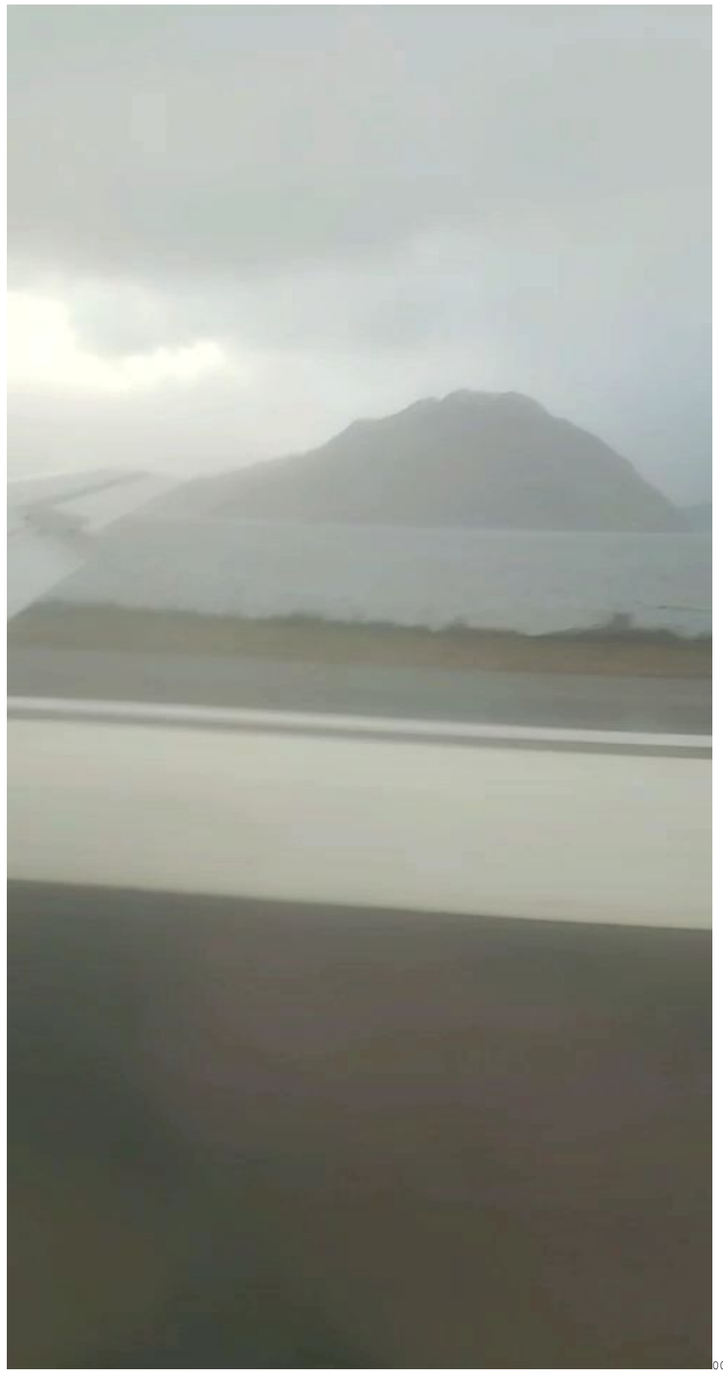

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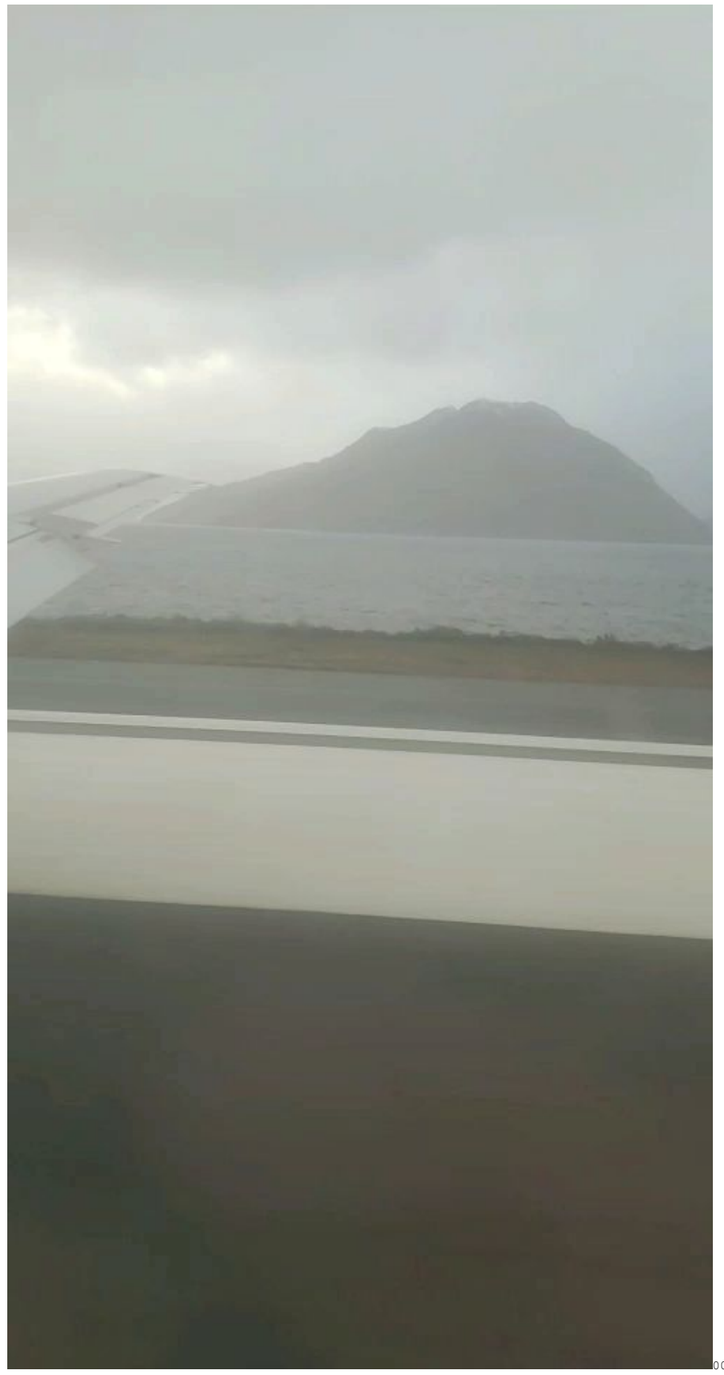

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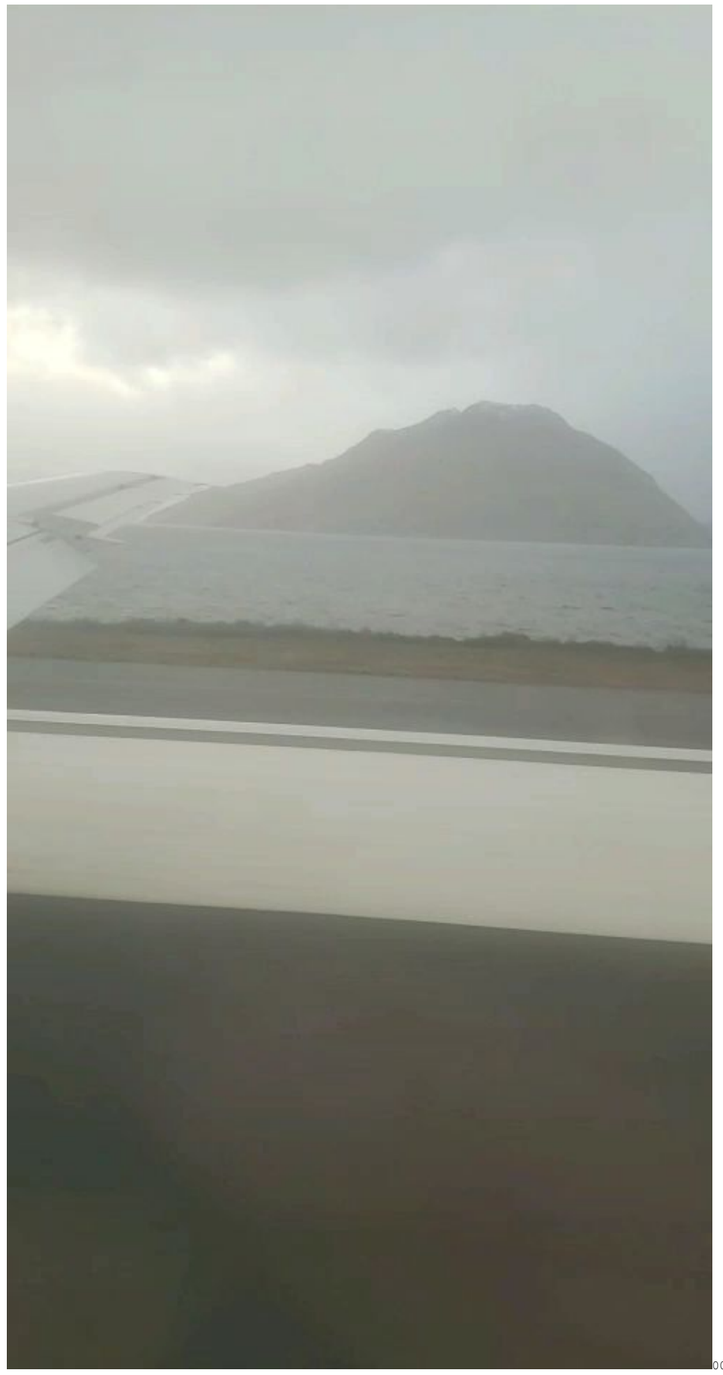

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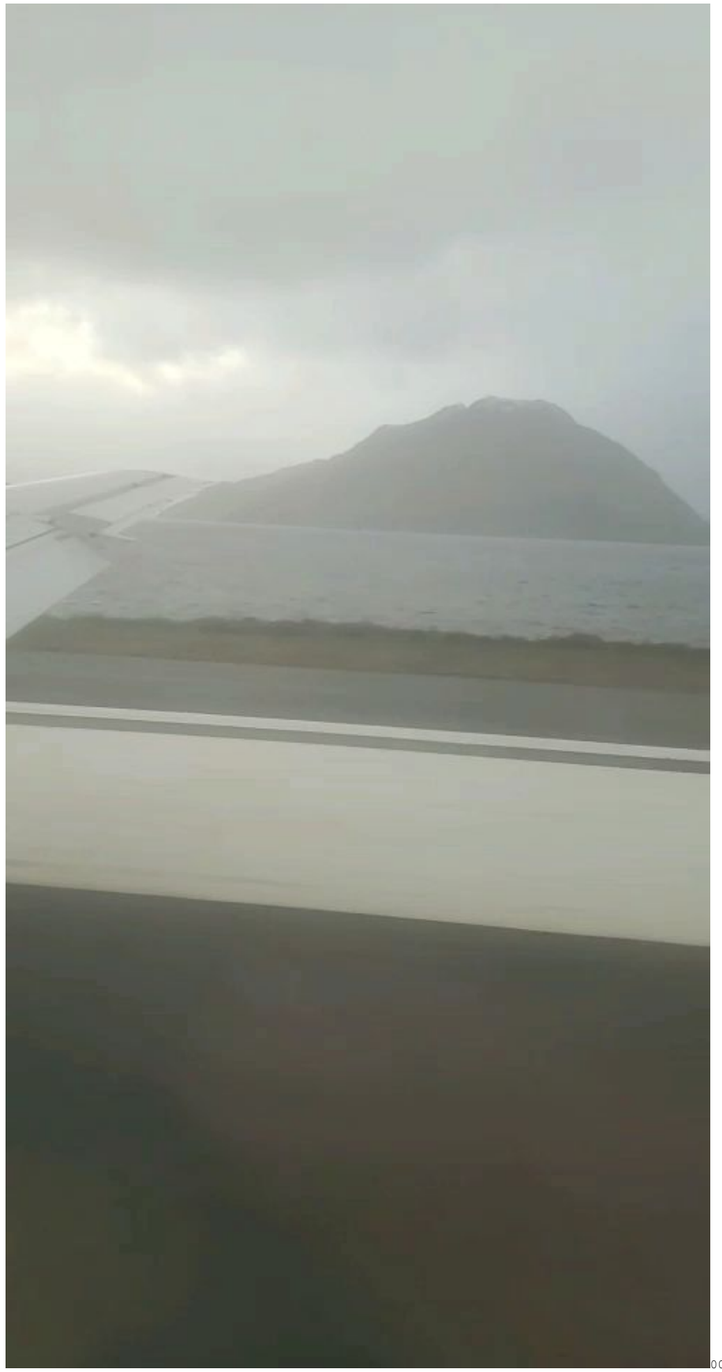

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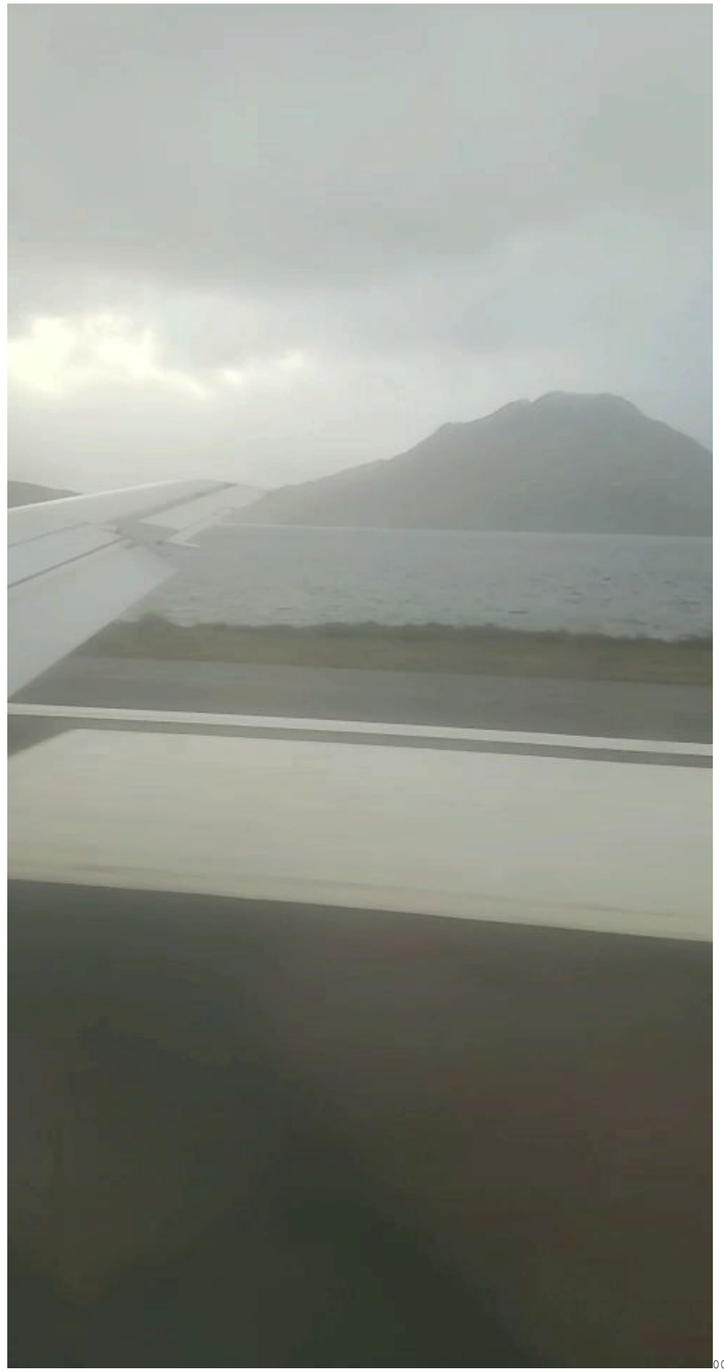

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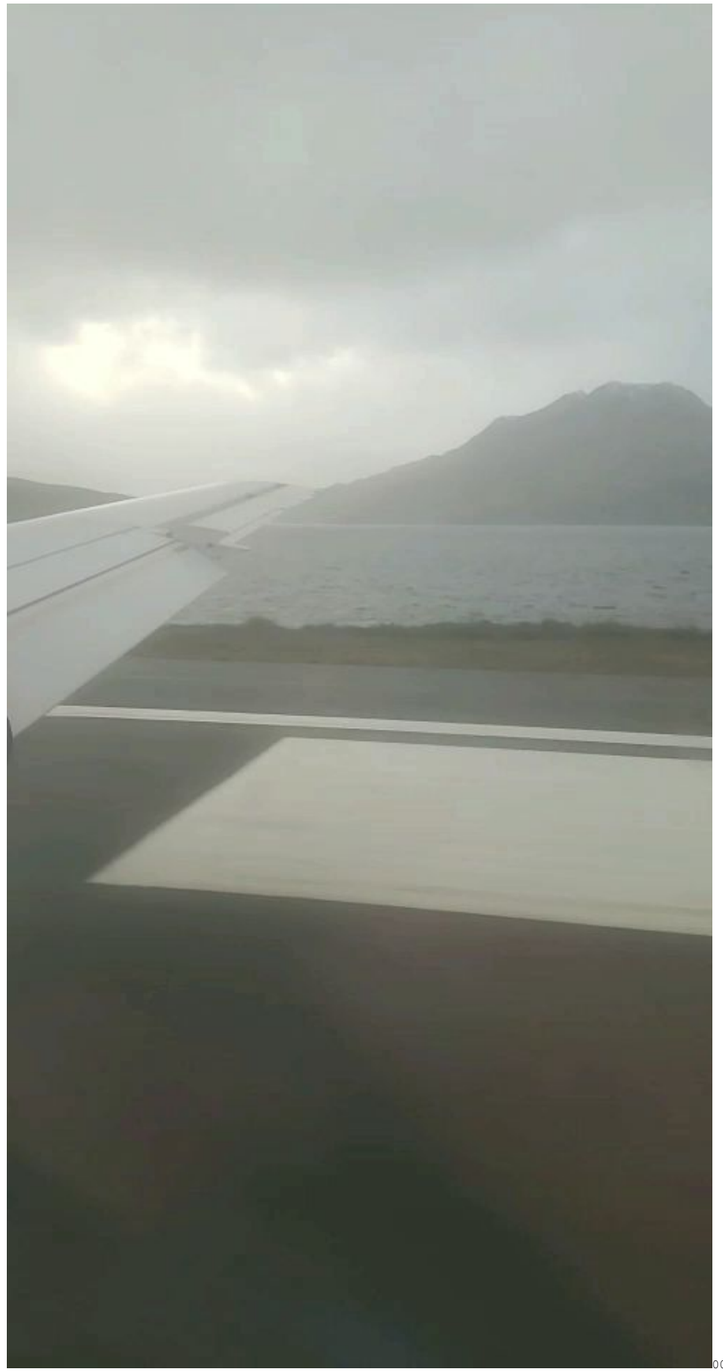

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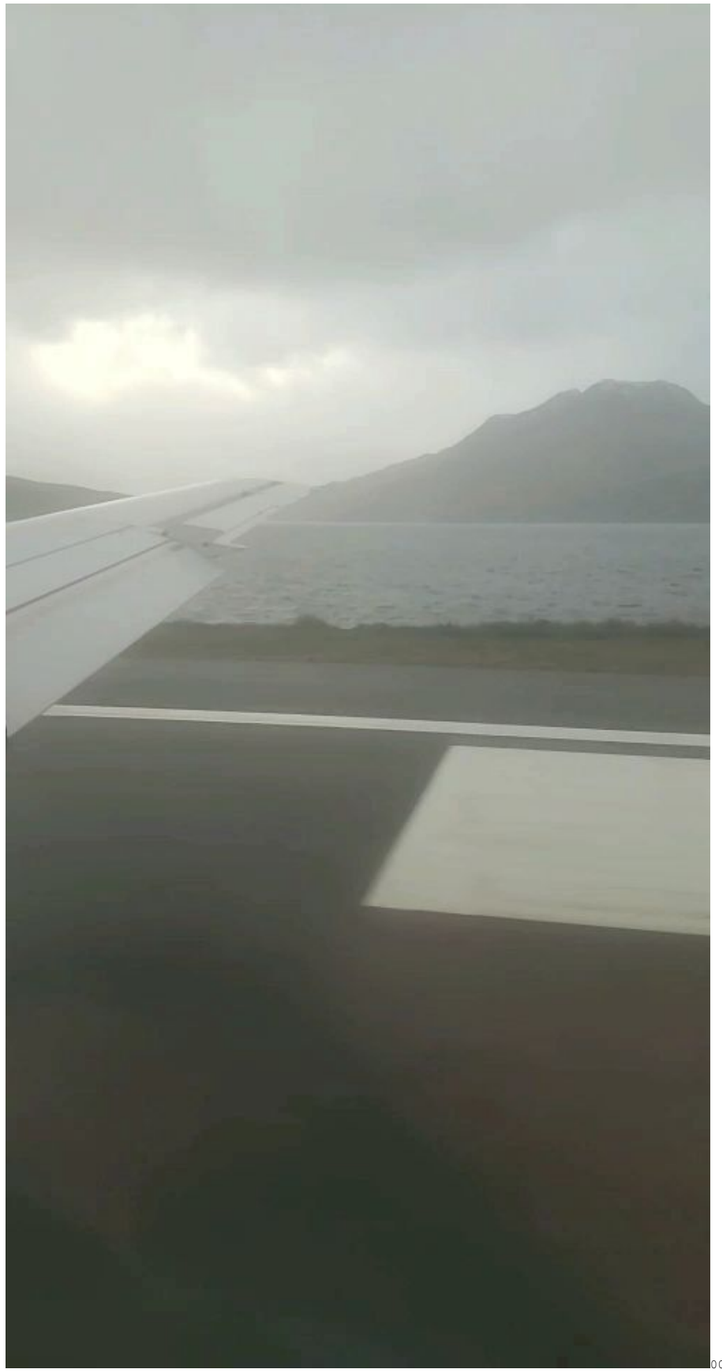

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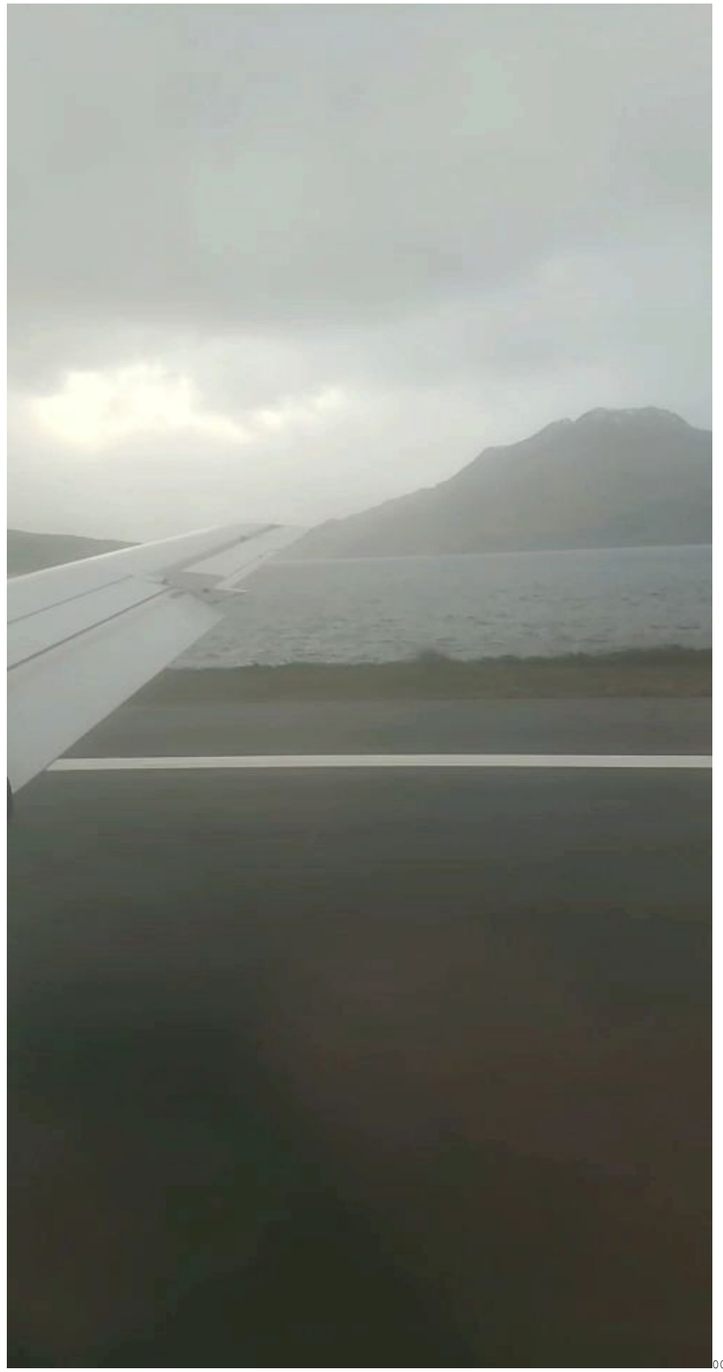

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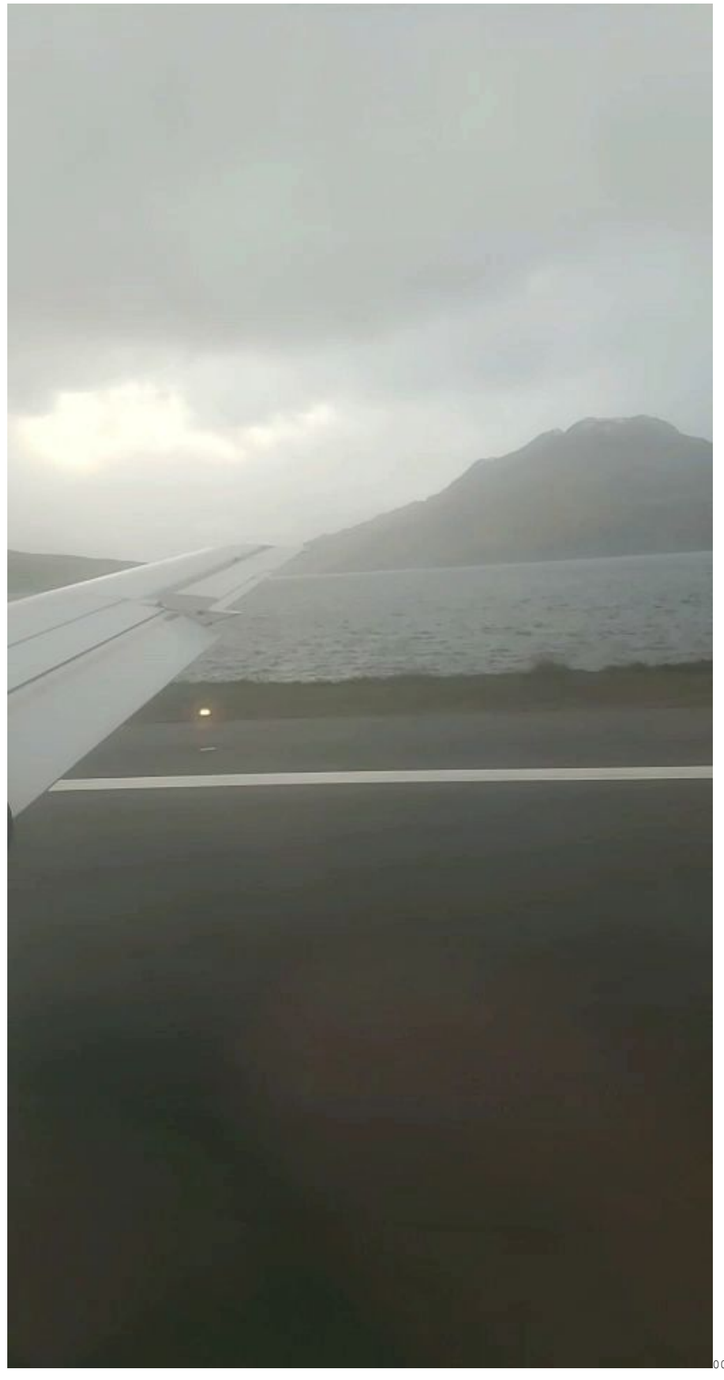

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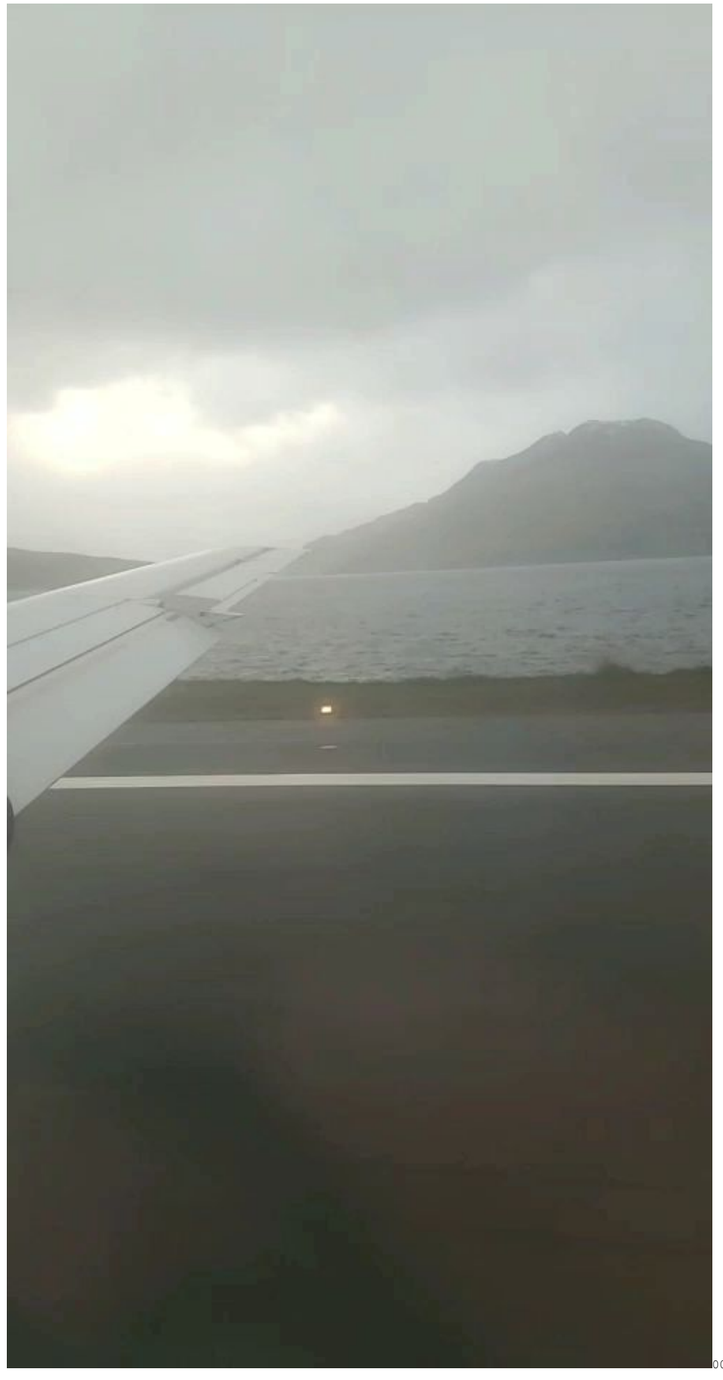

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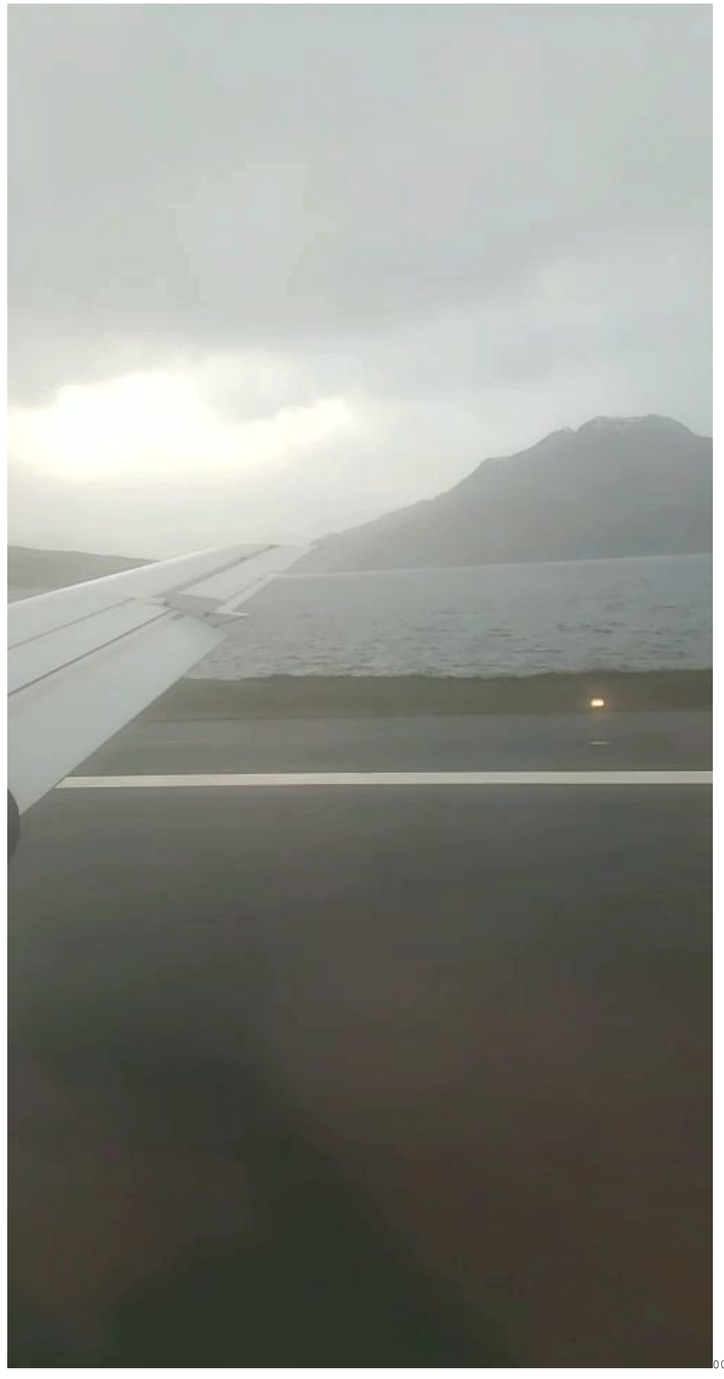


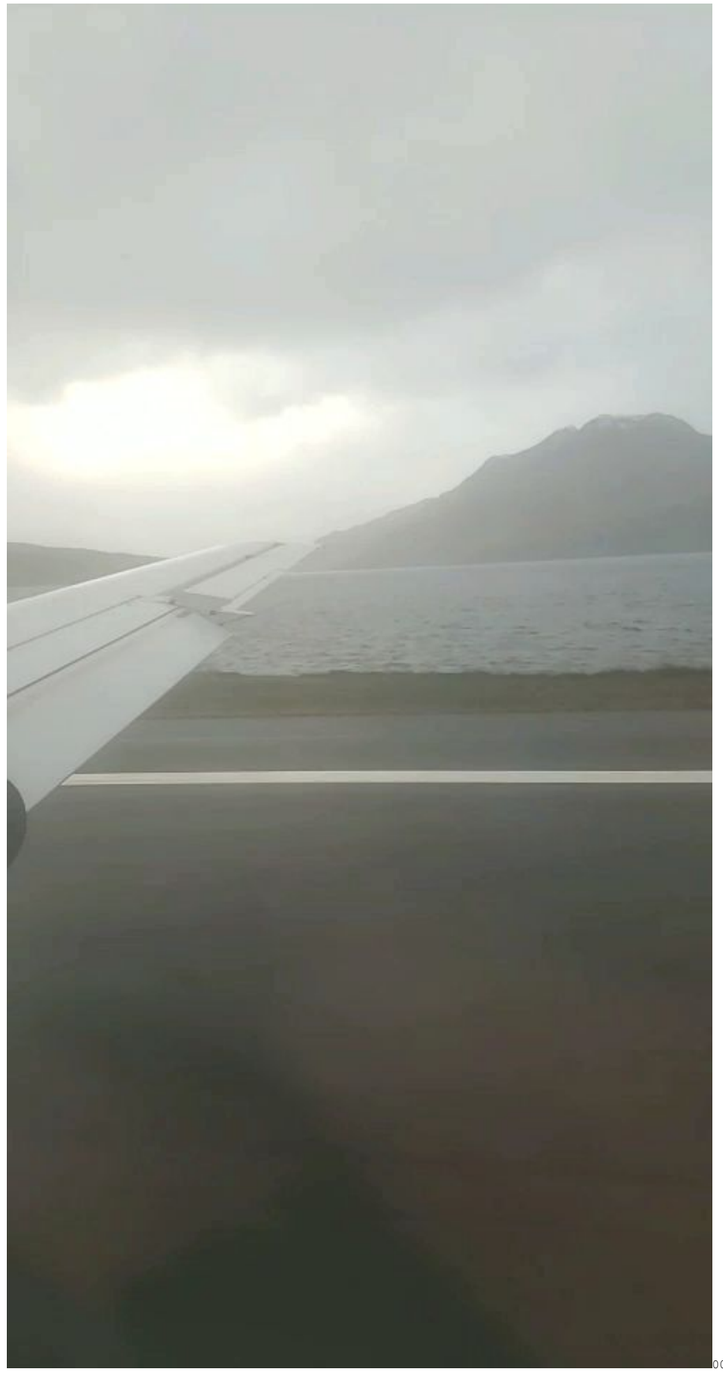
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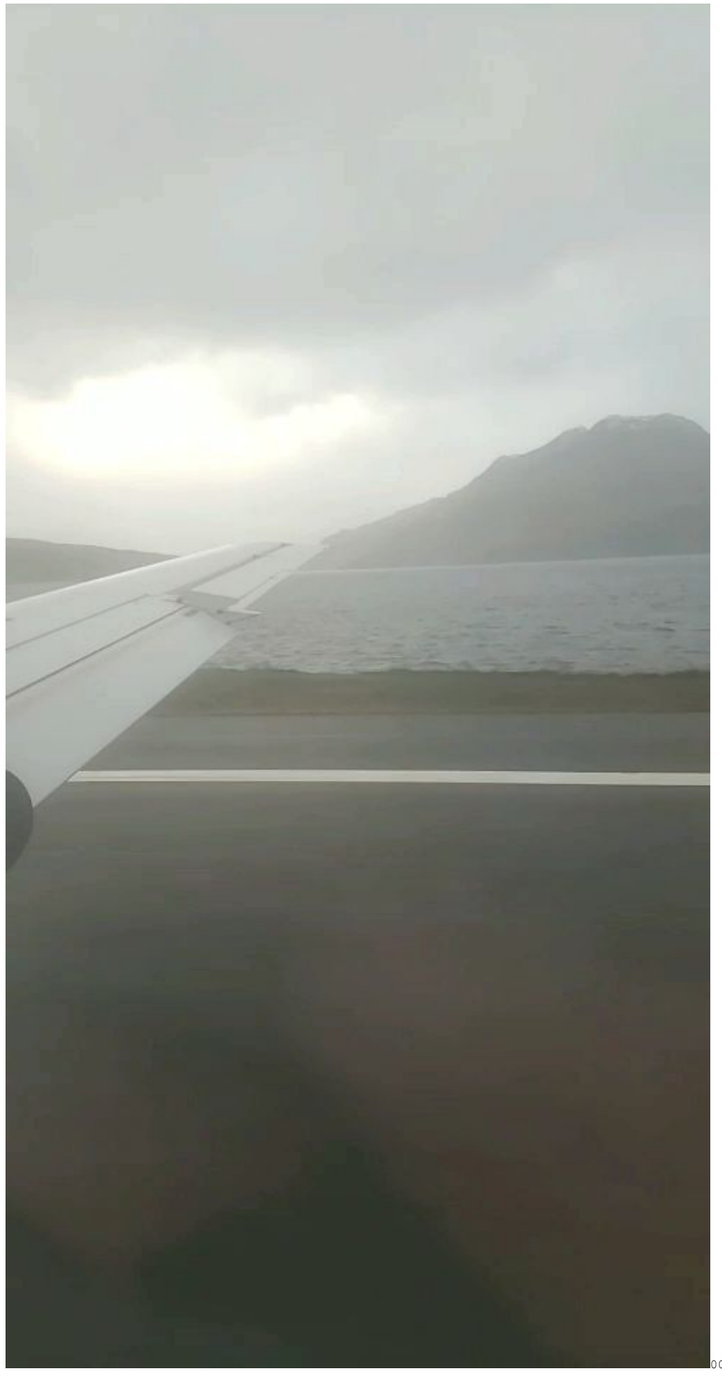


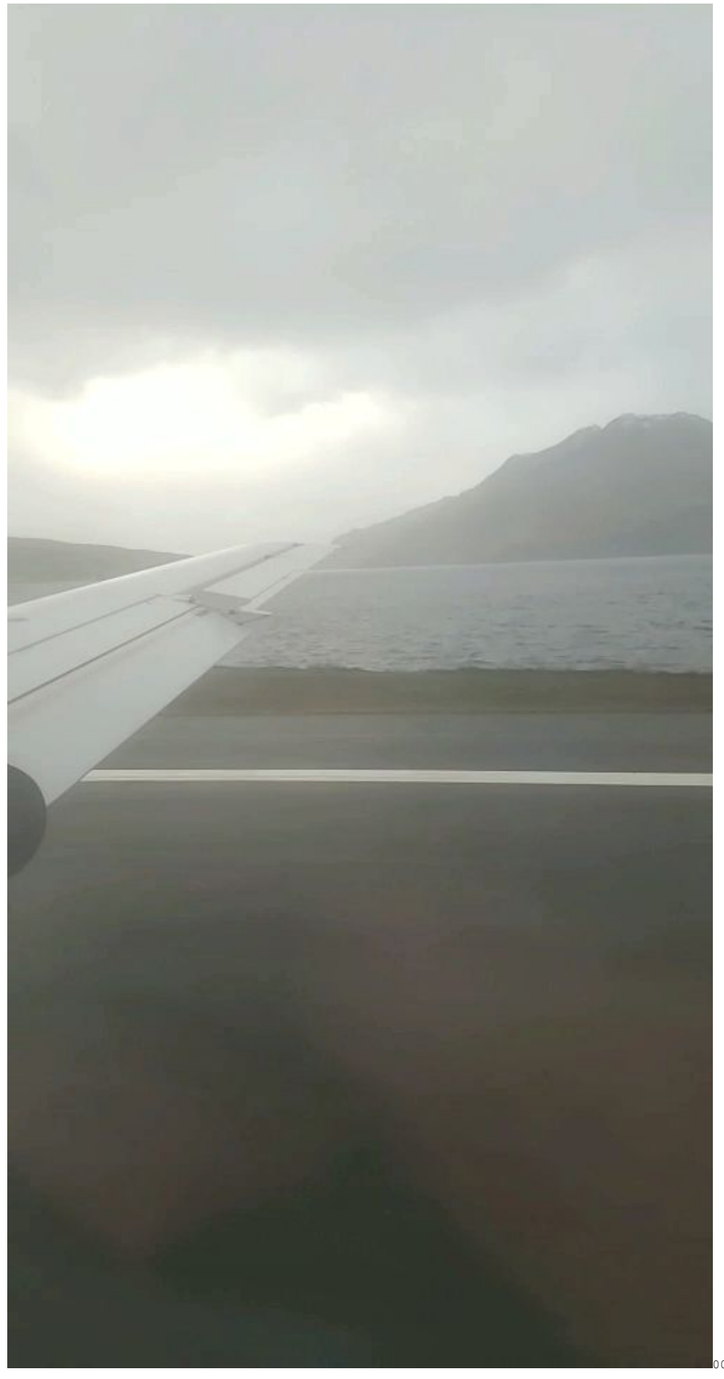
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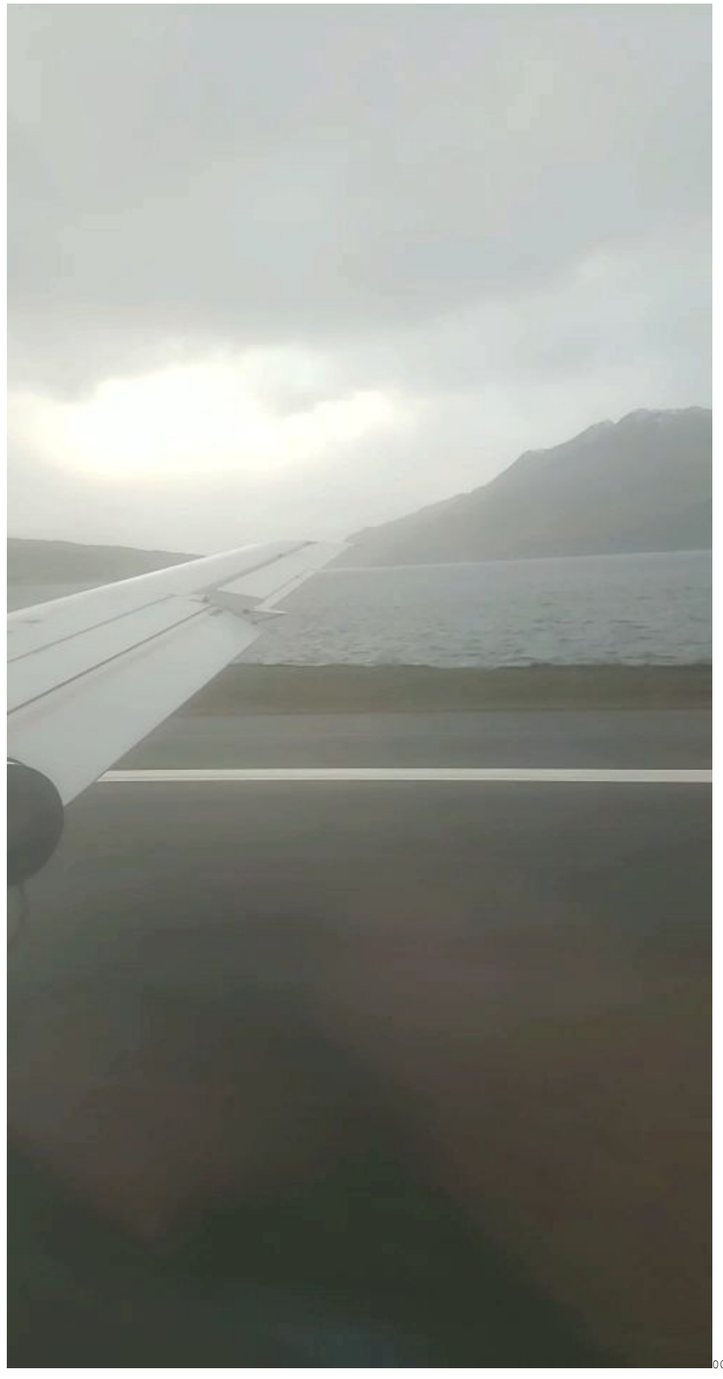

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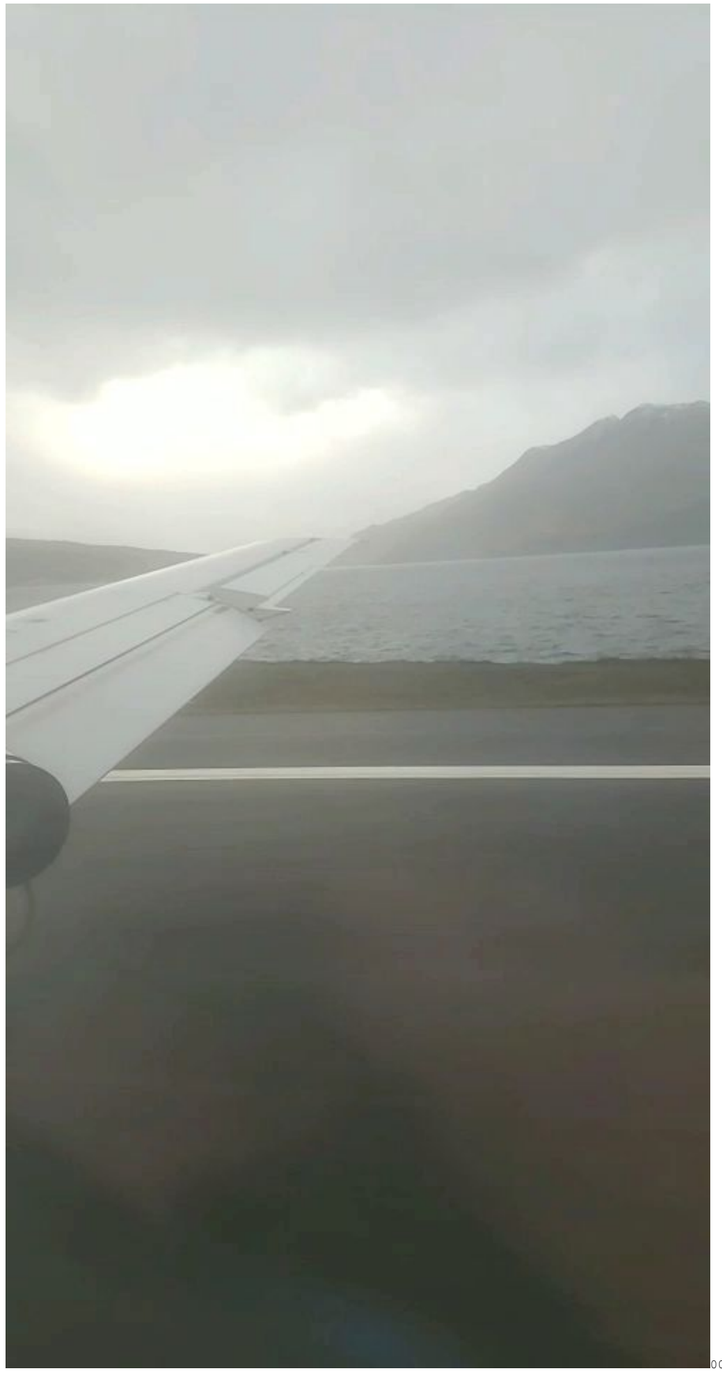

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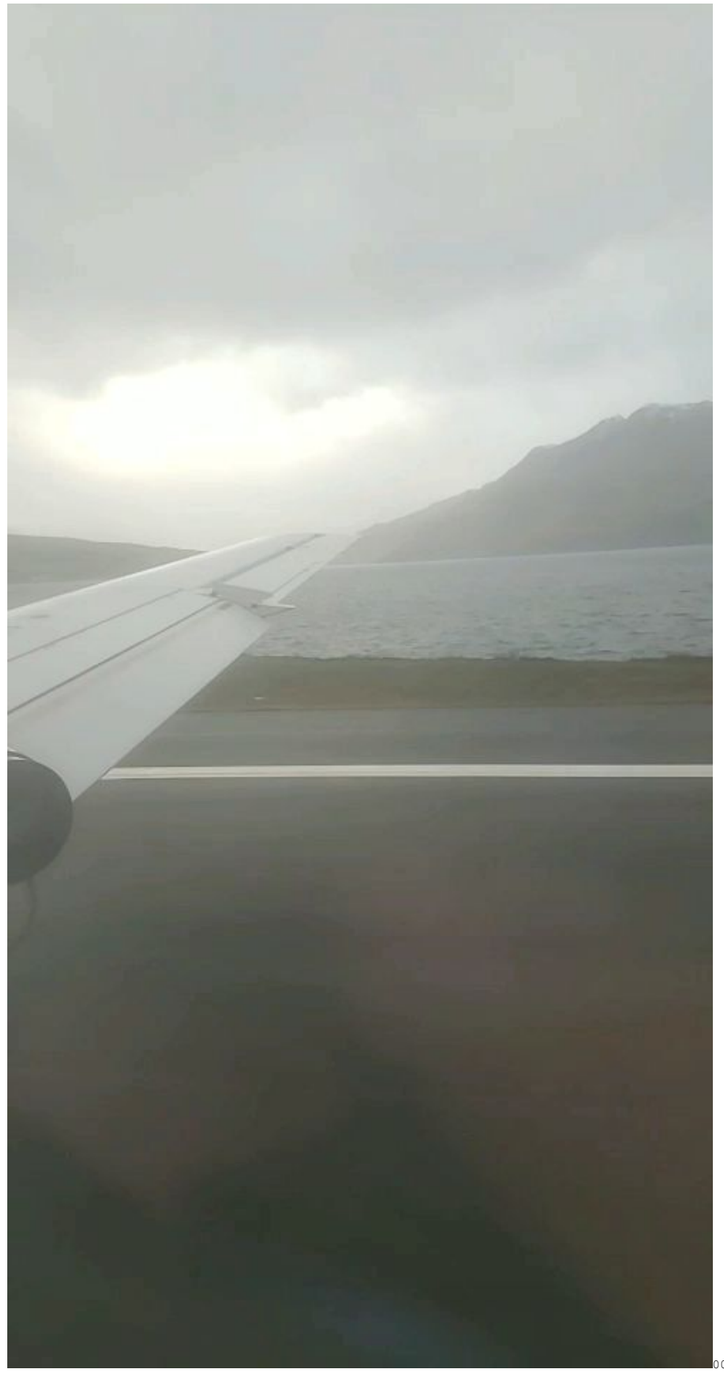

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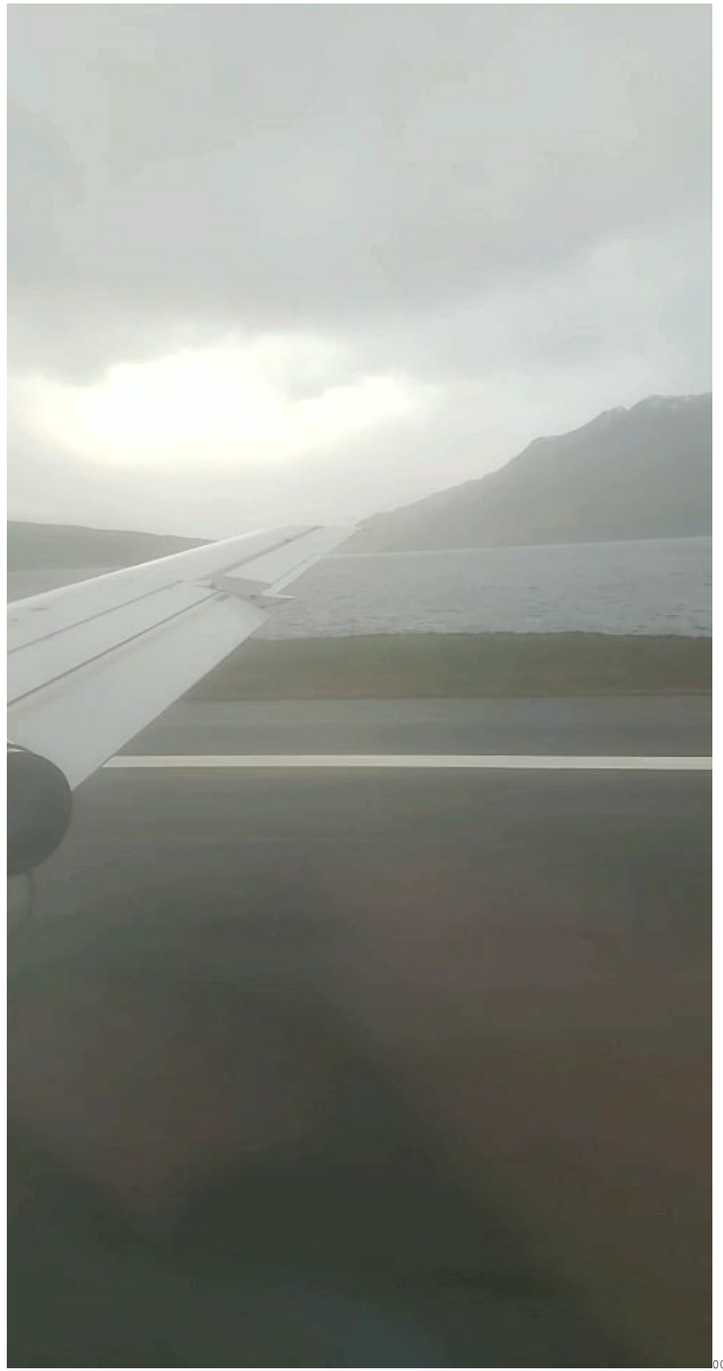

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Passenger 2 Video Image Summary

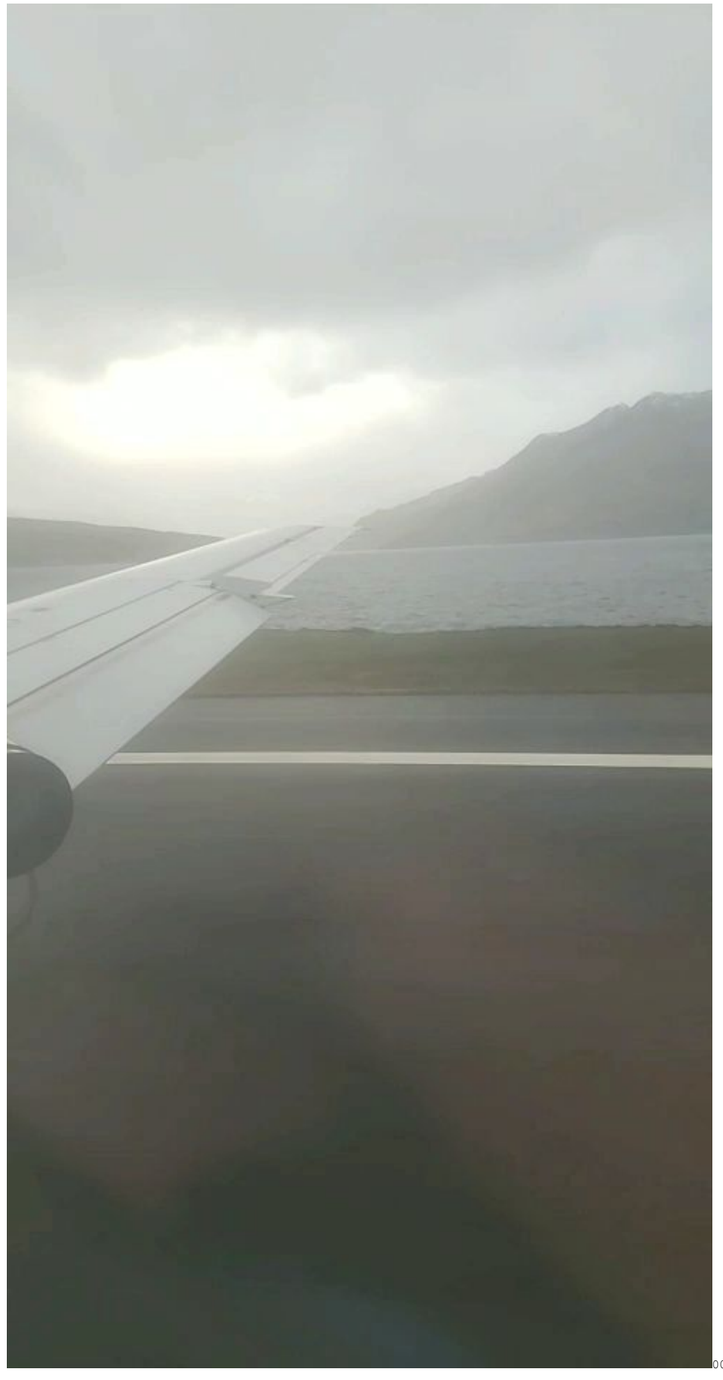

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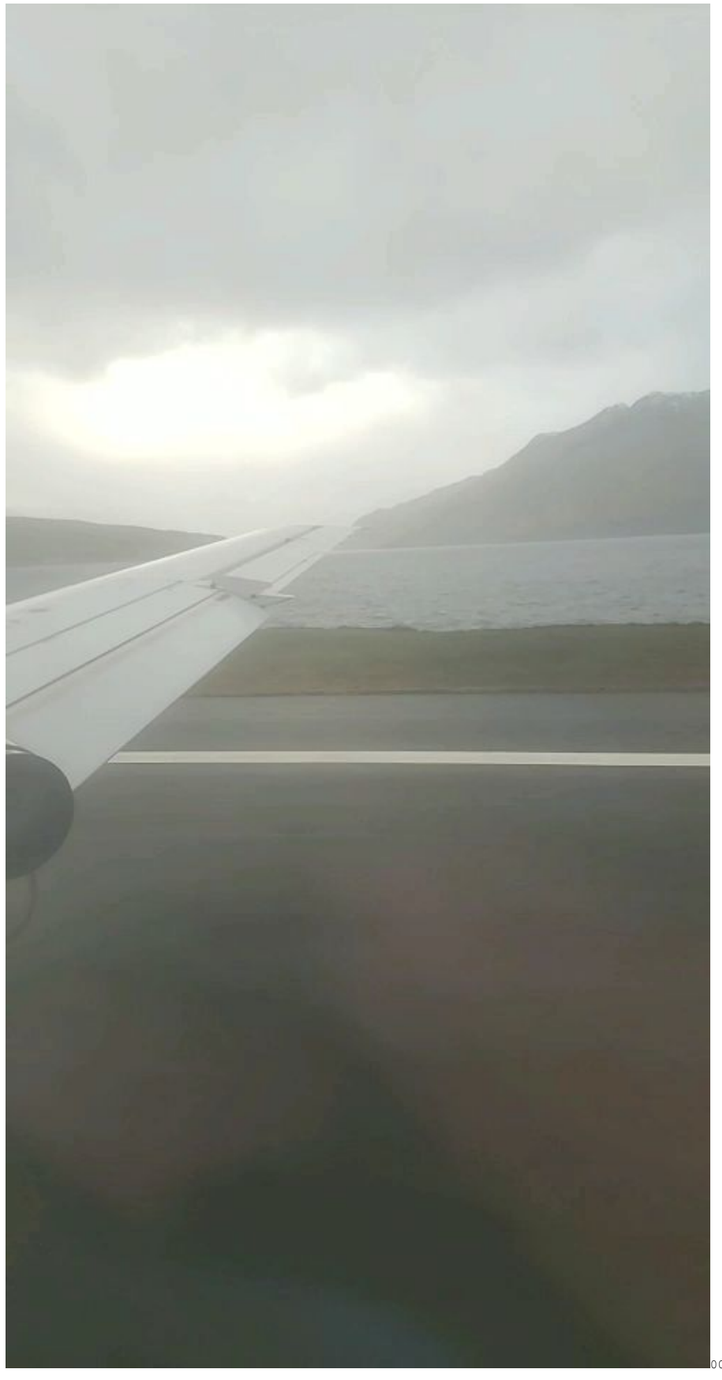

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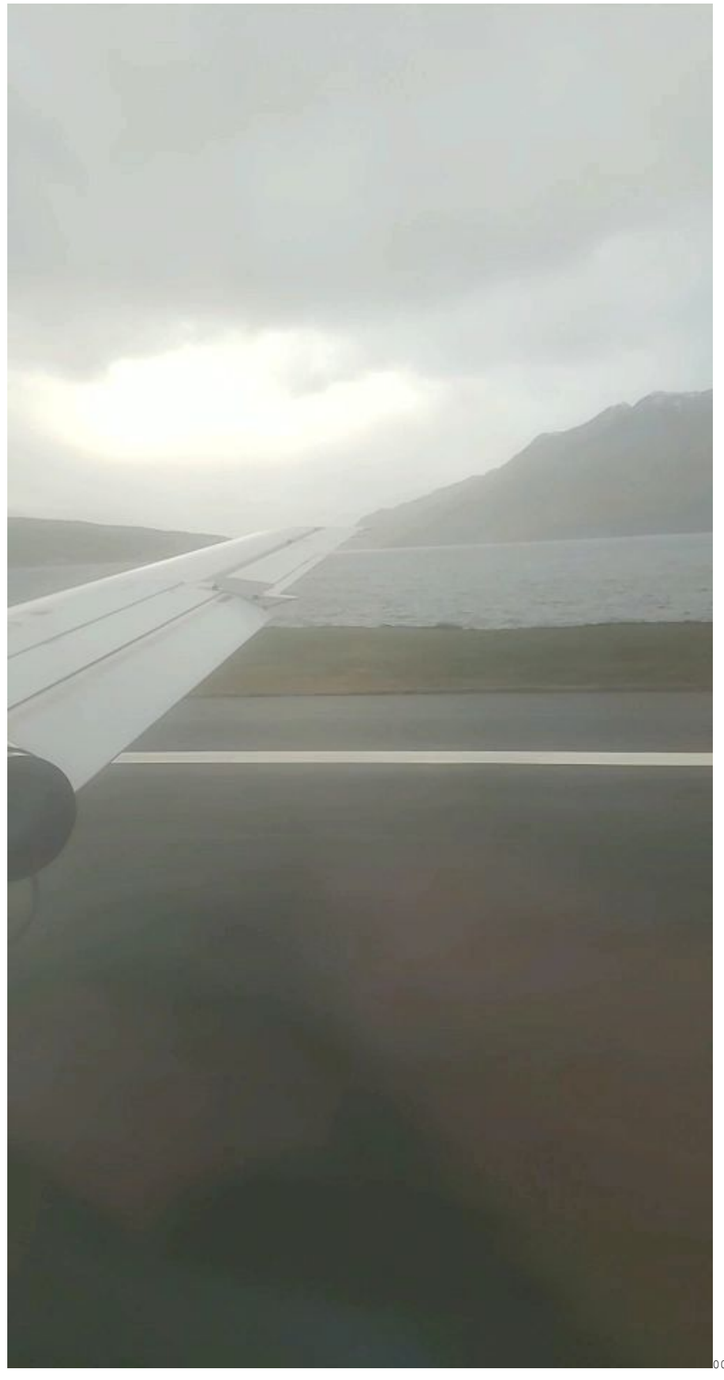

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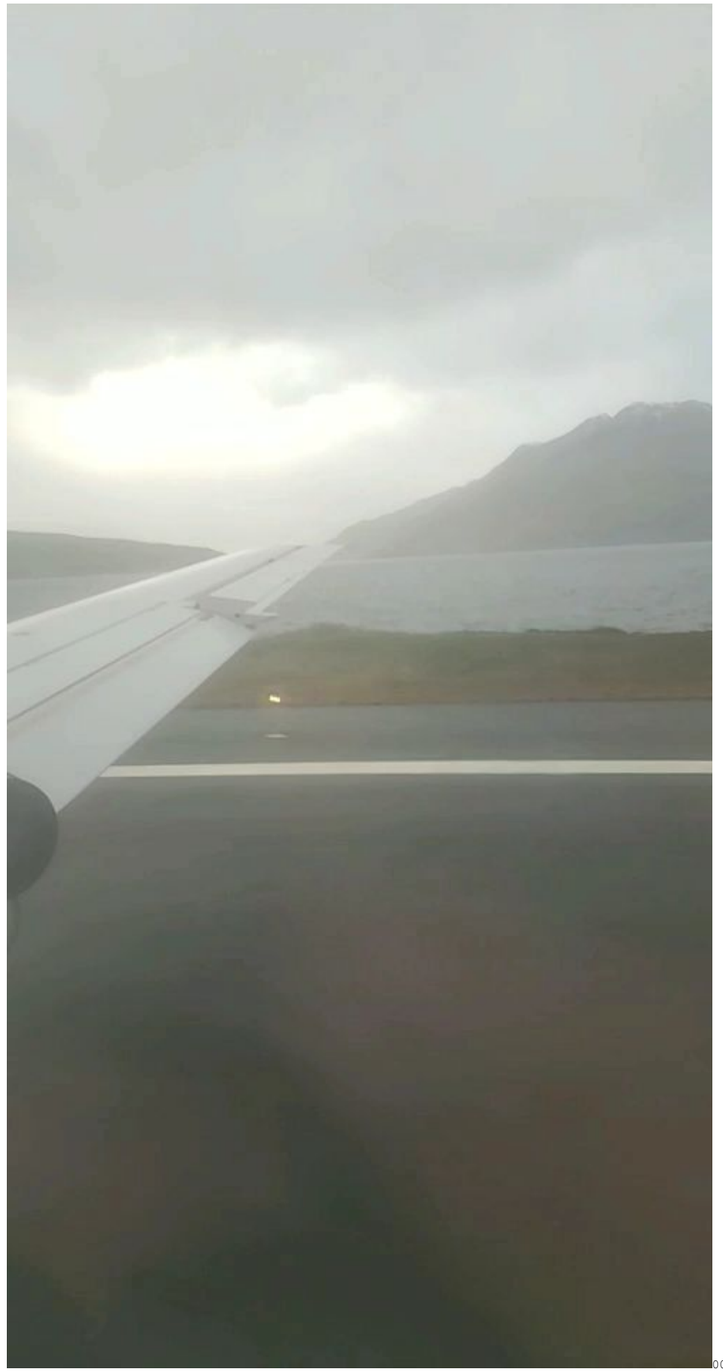

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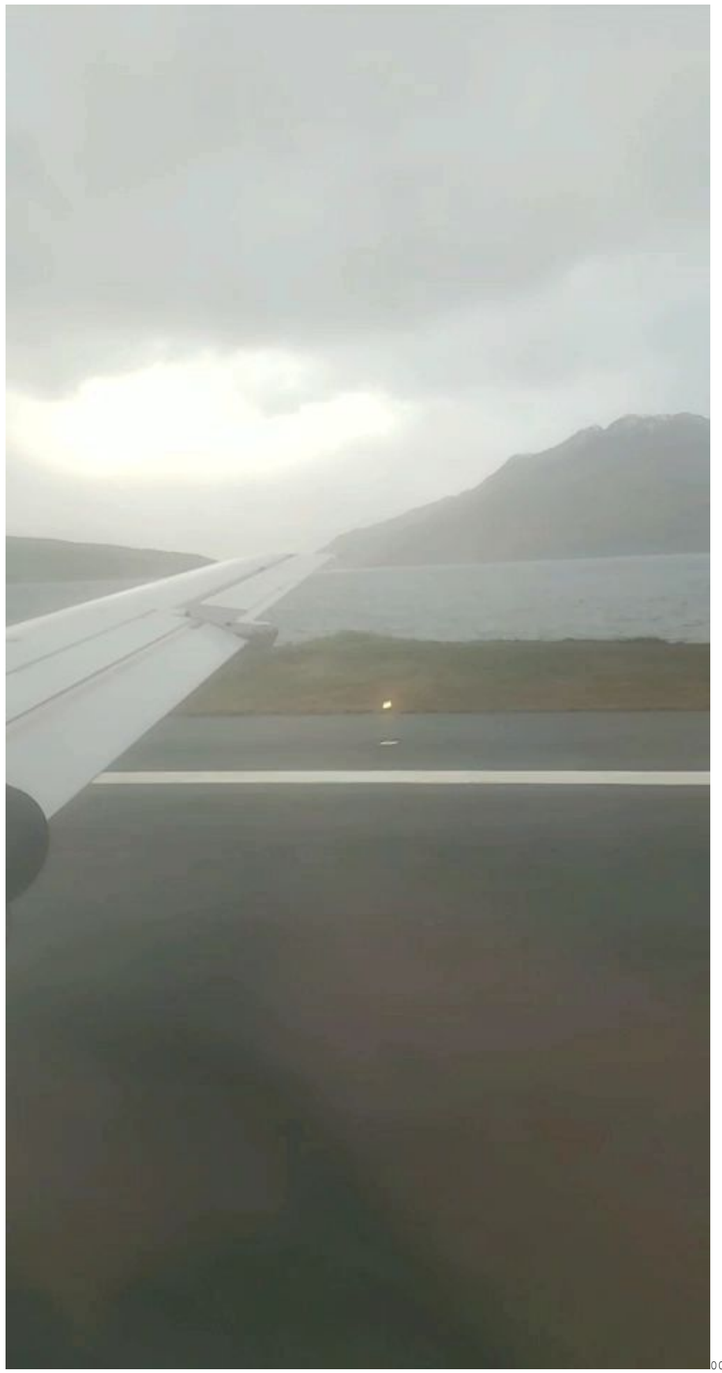

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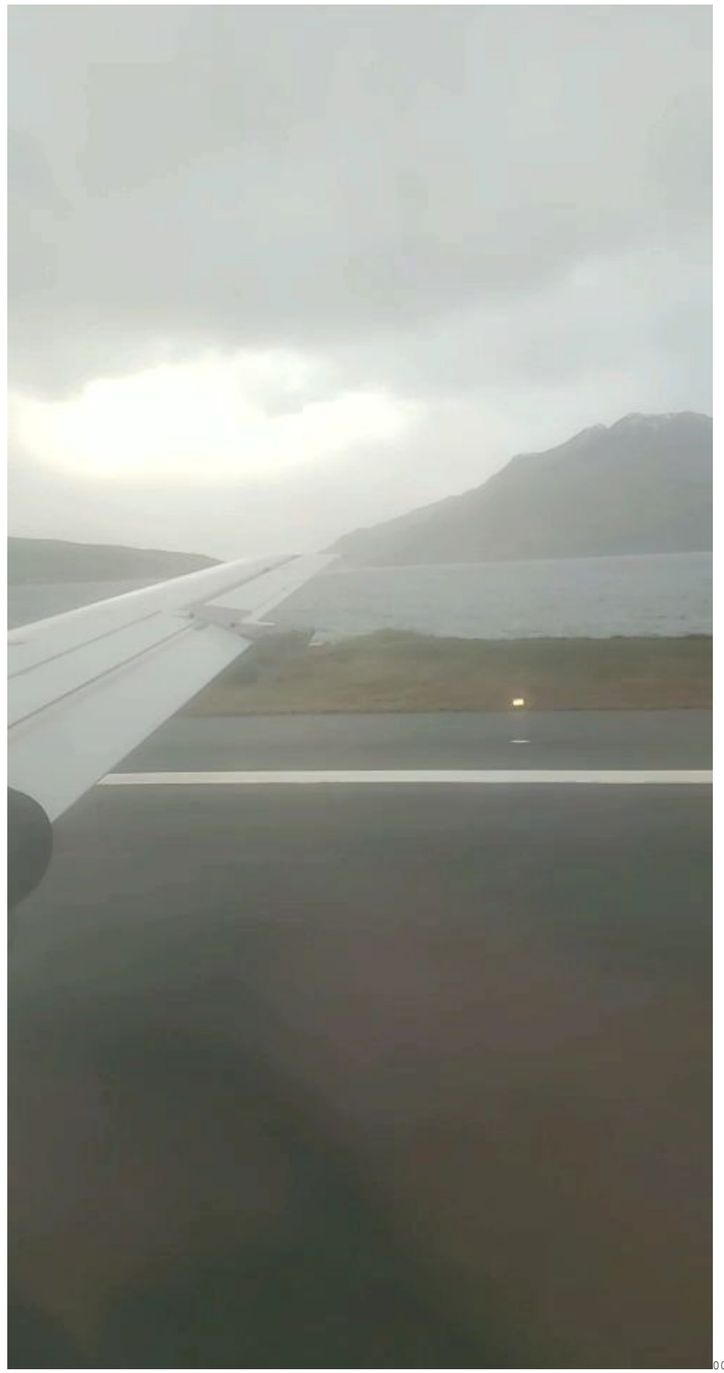

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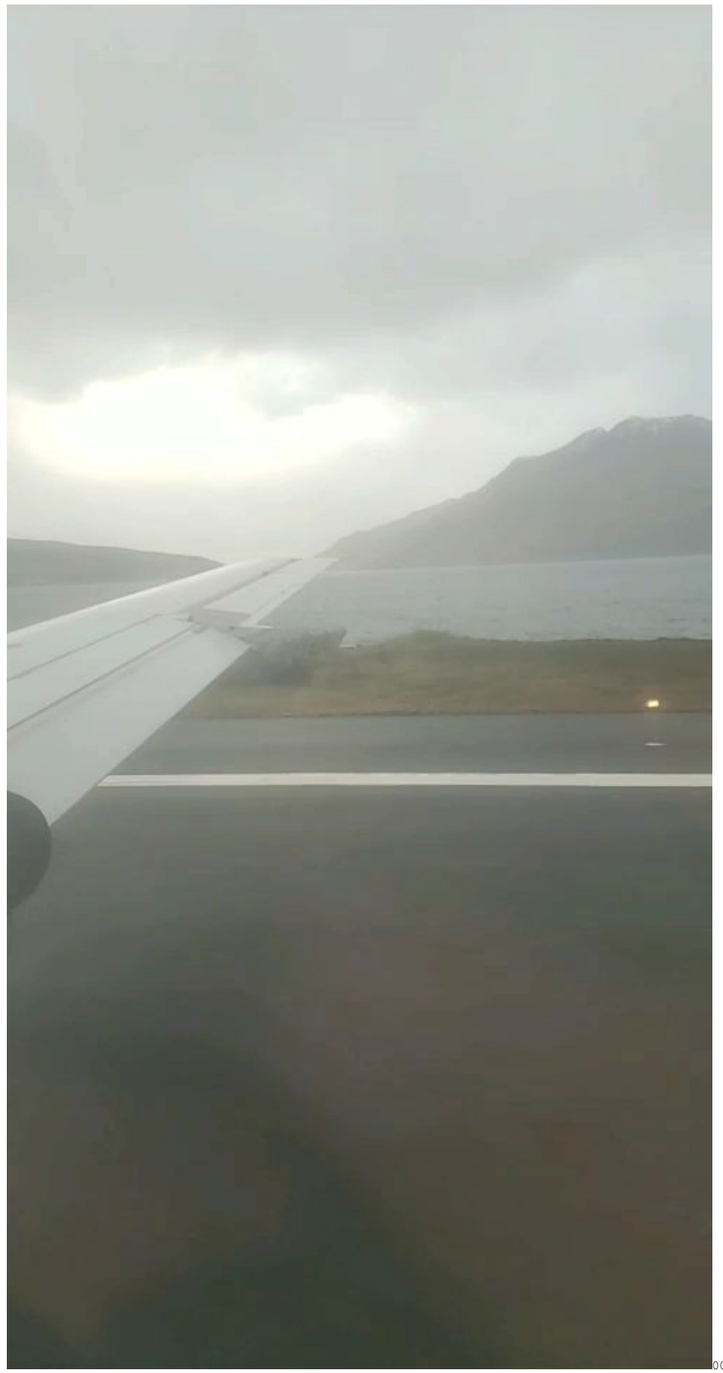

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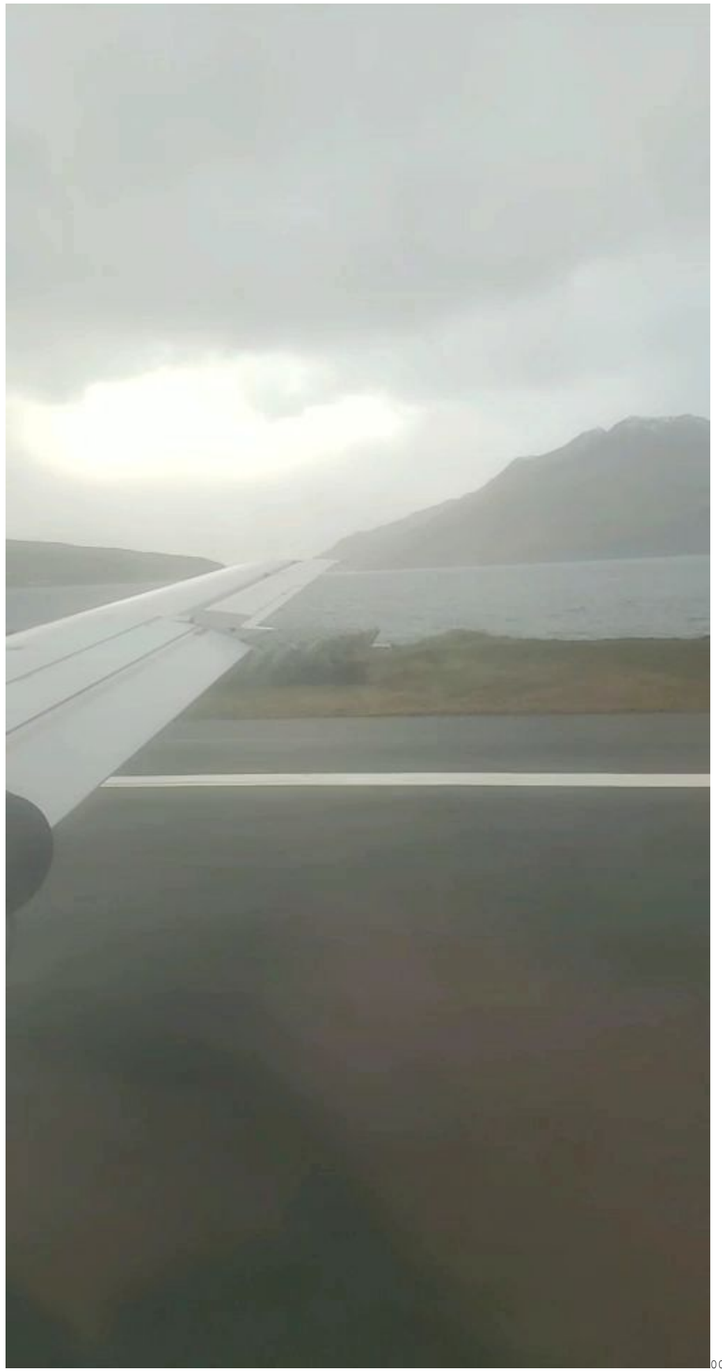

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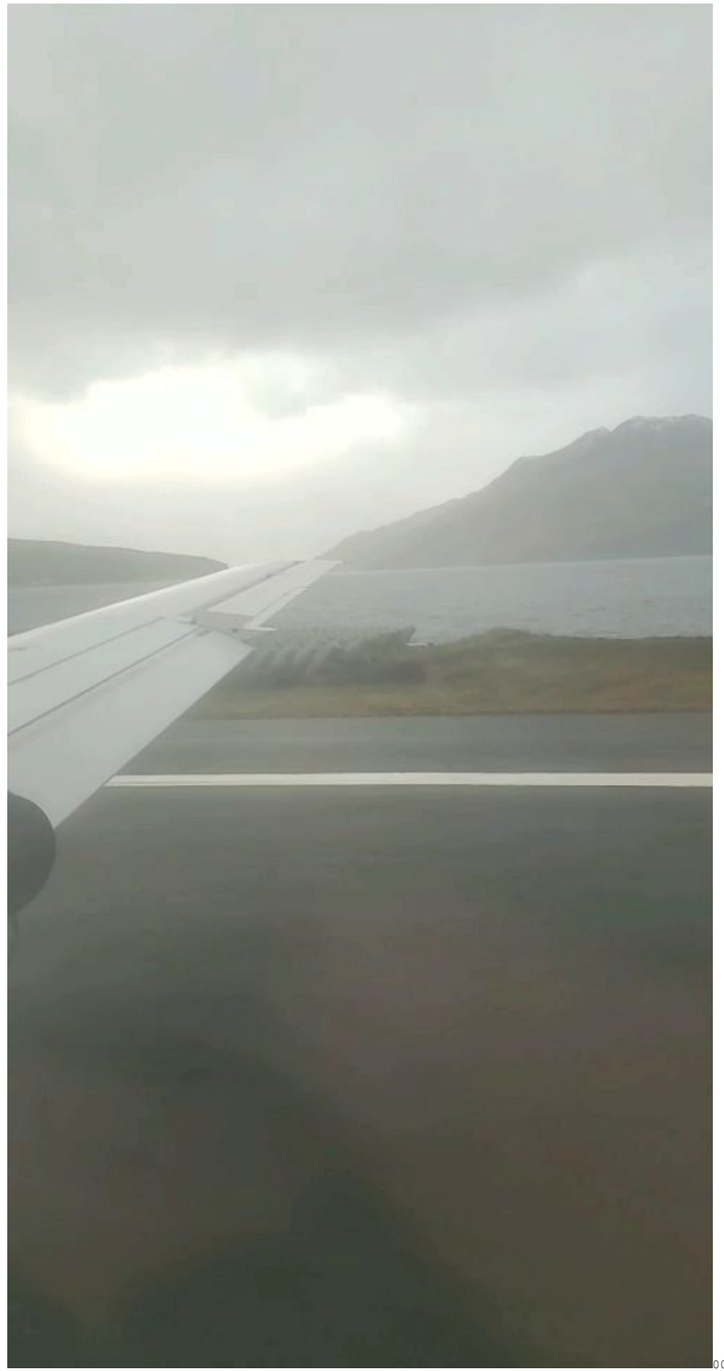

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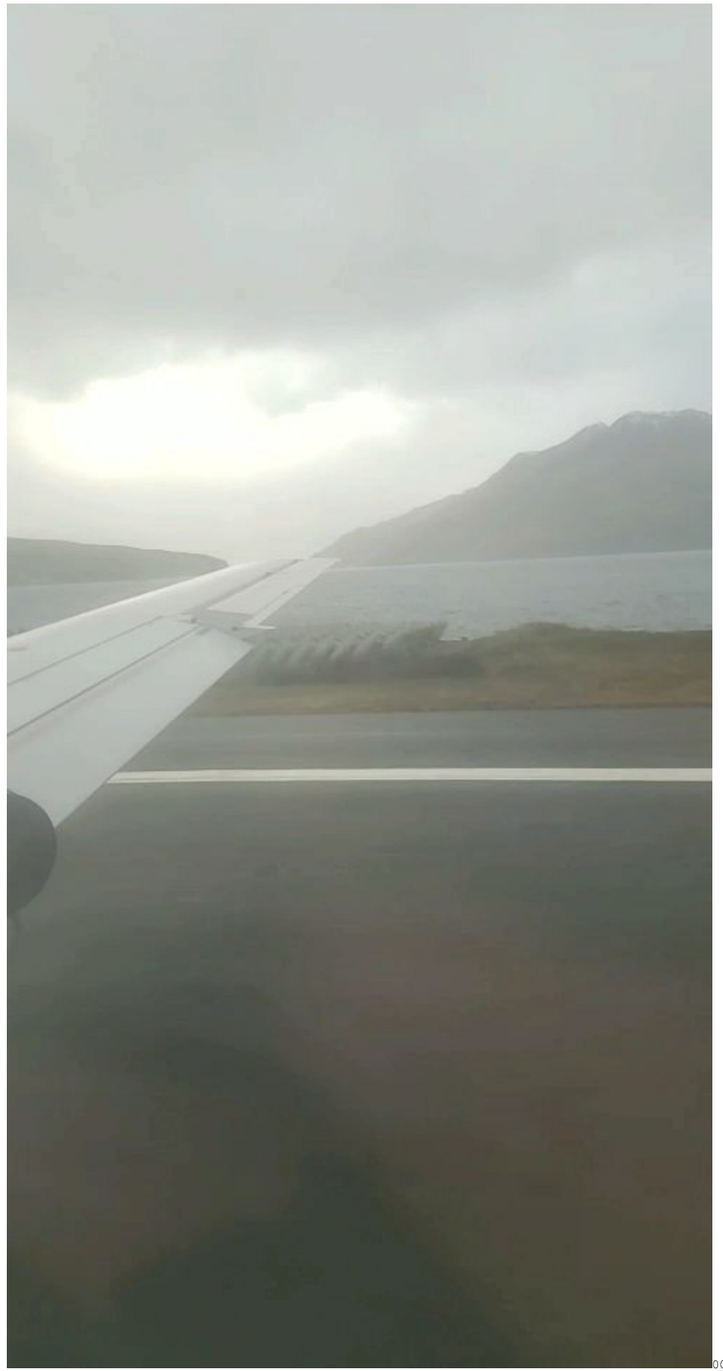

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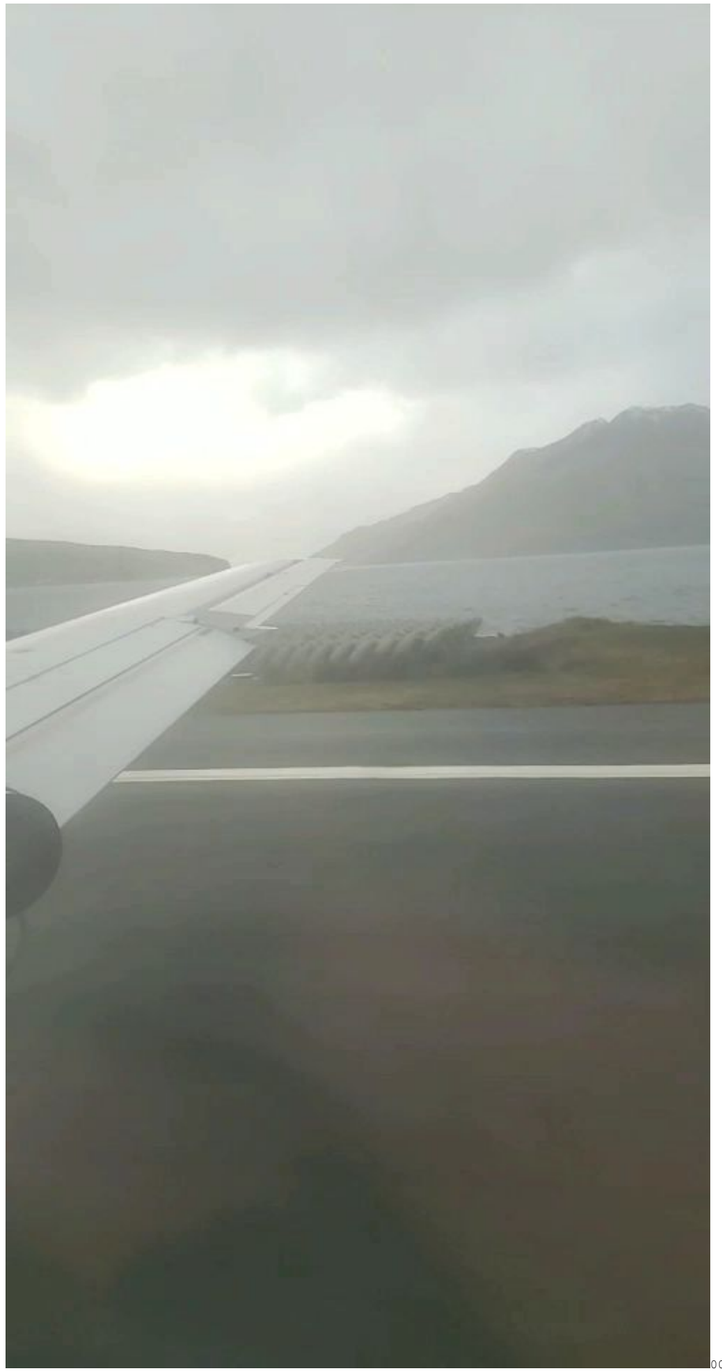

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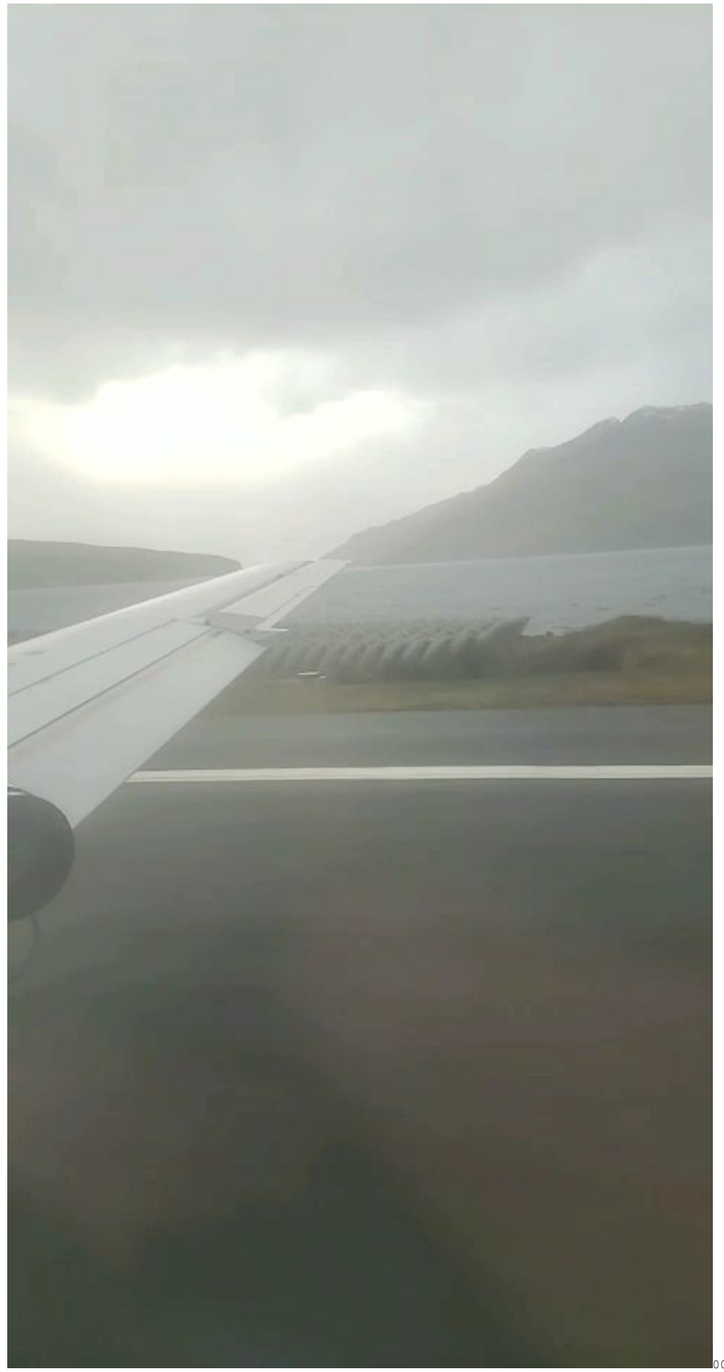

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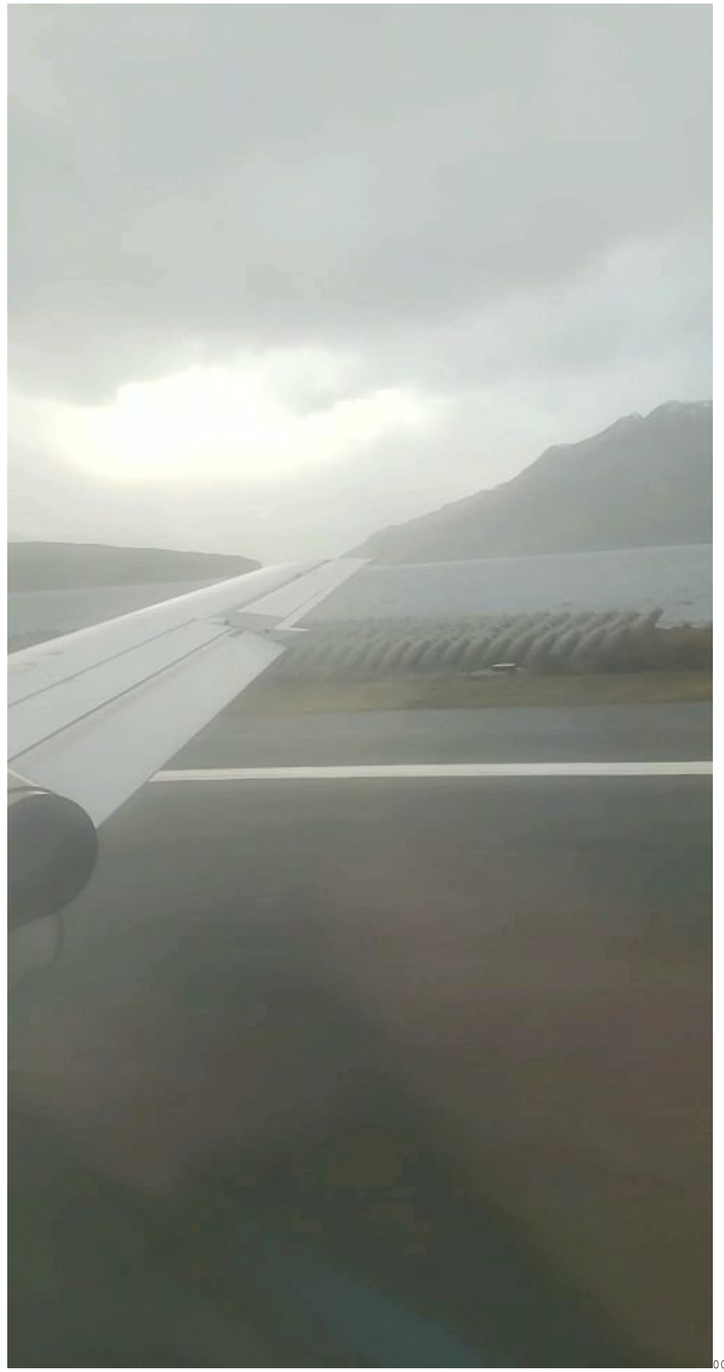

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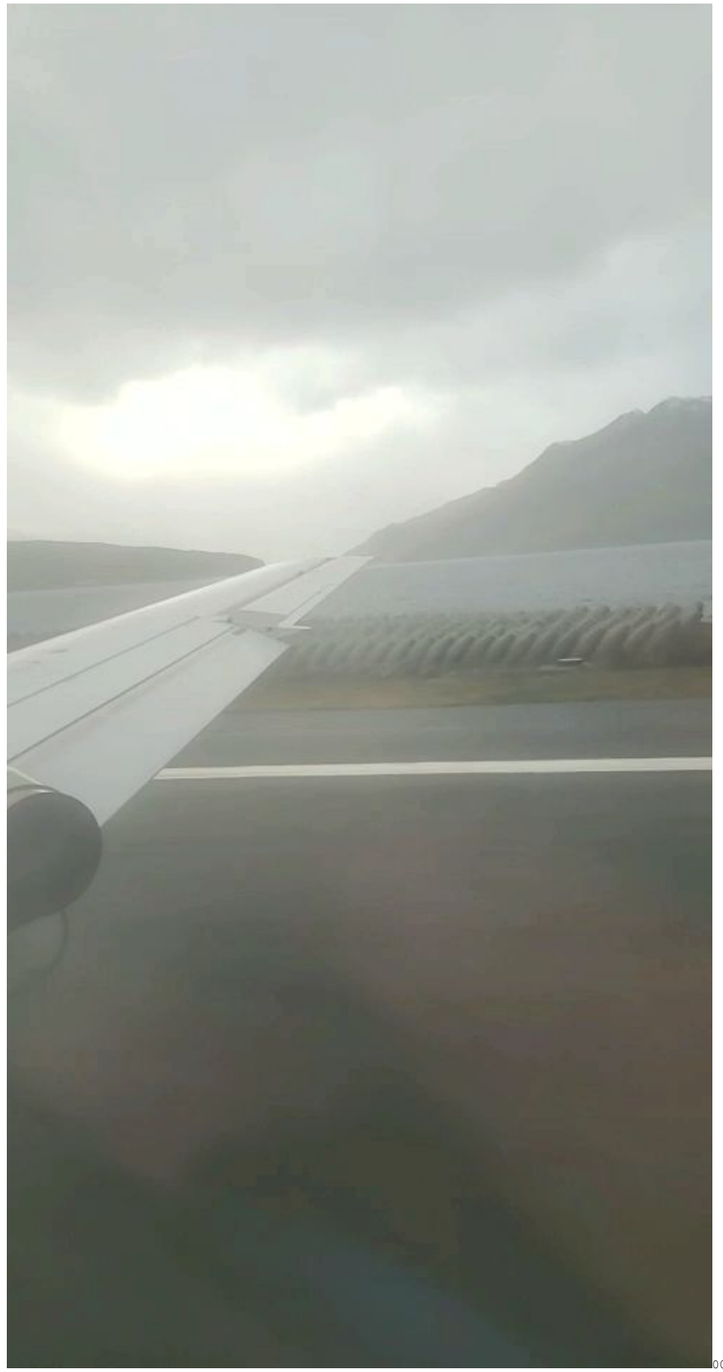

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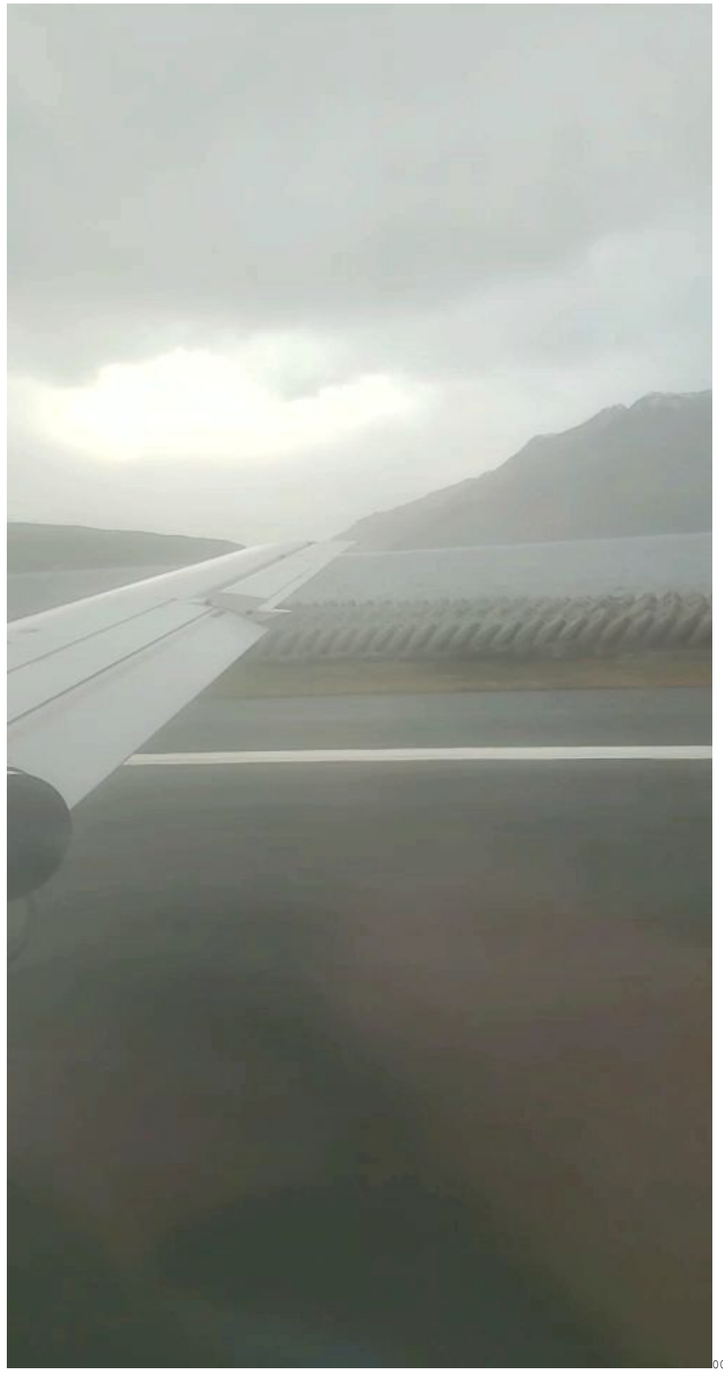

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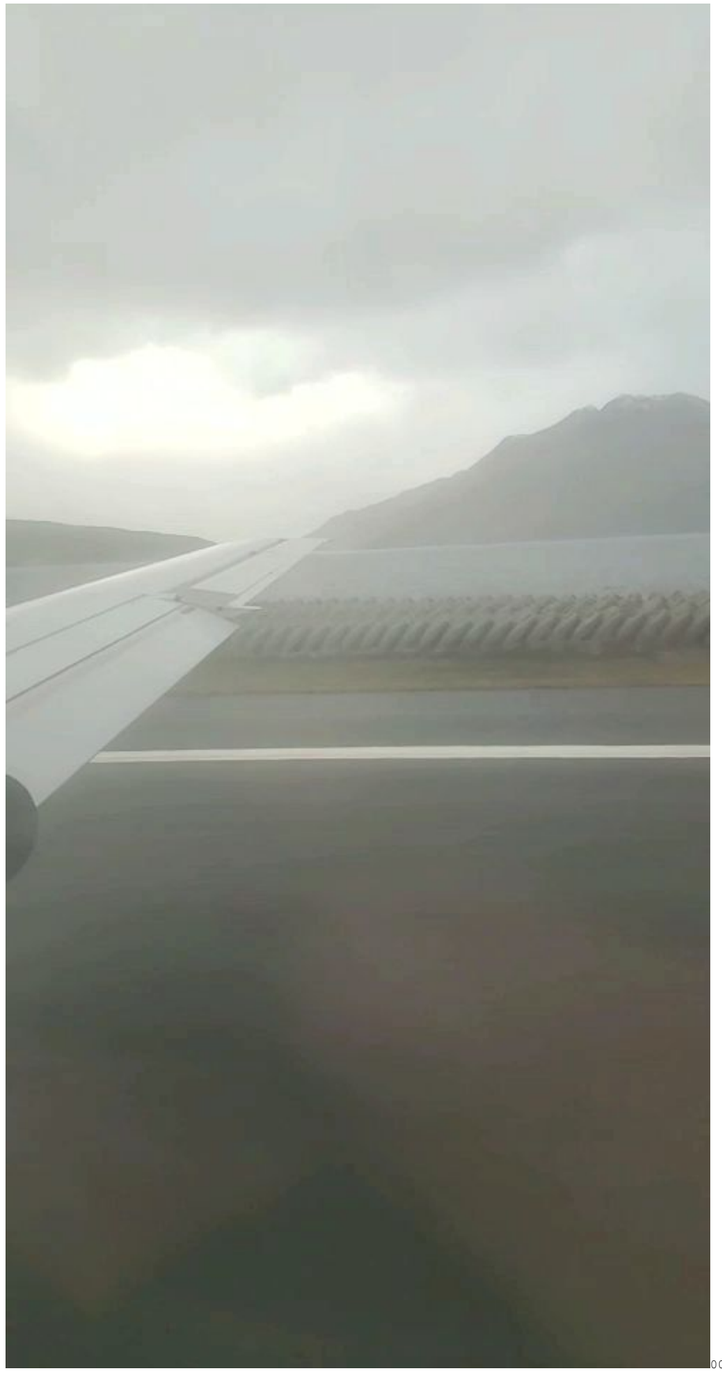

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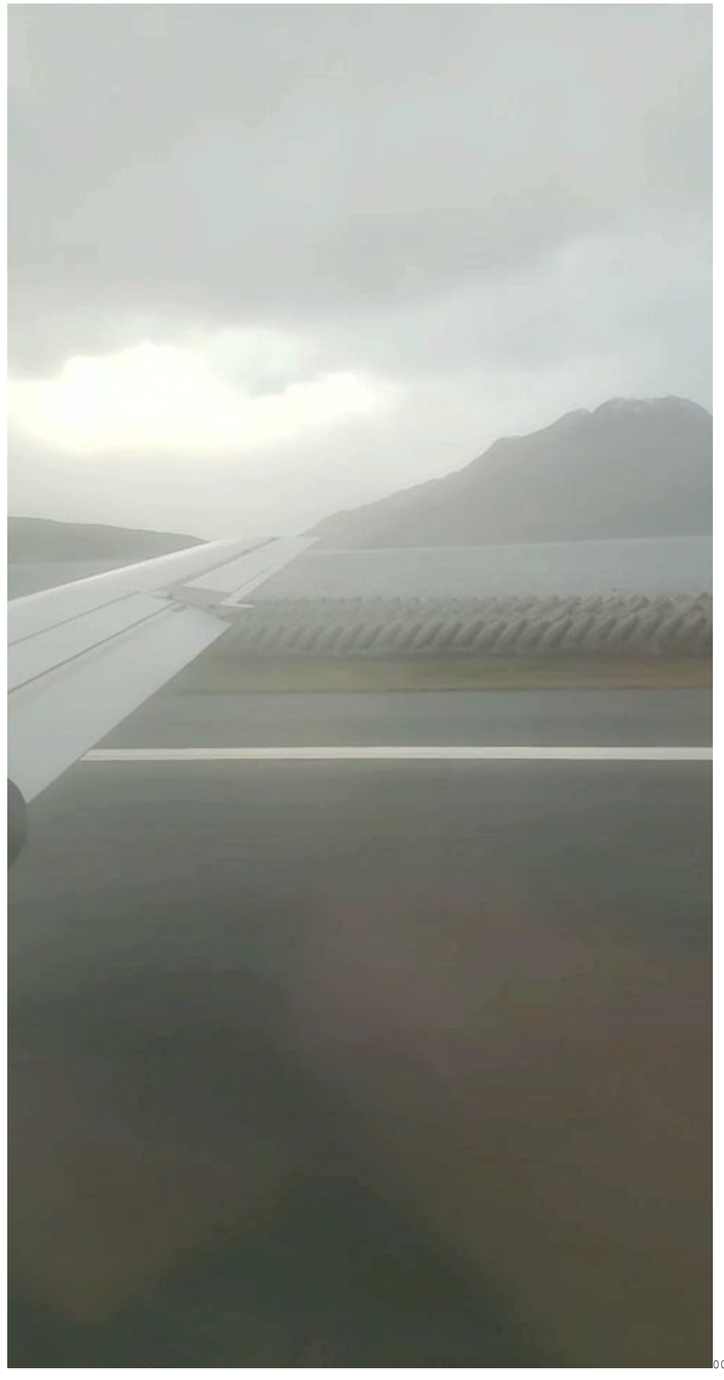

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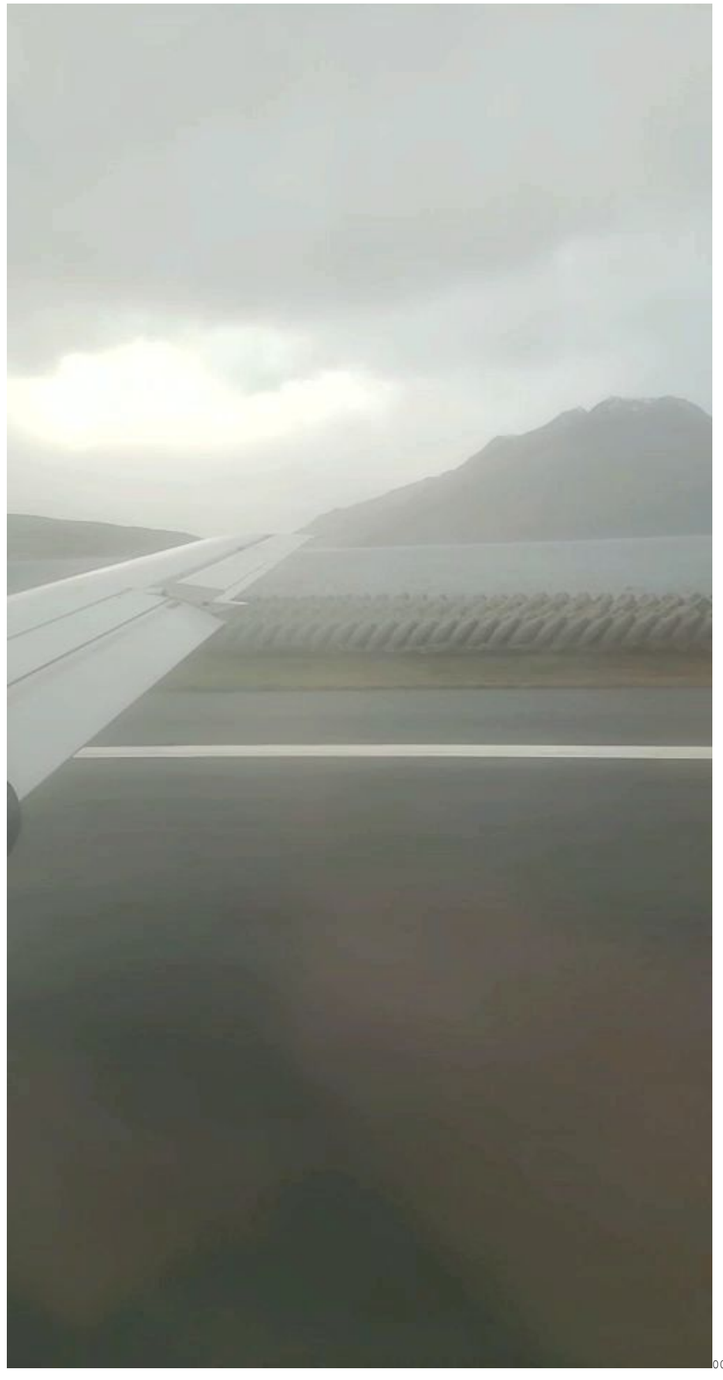

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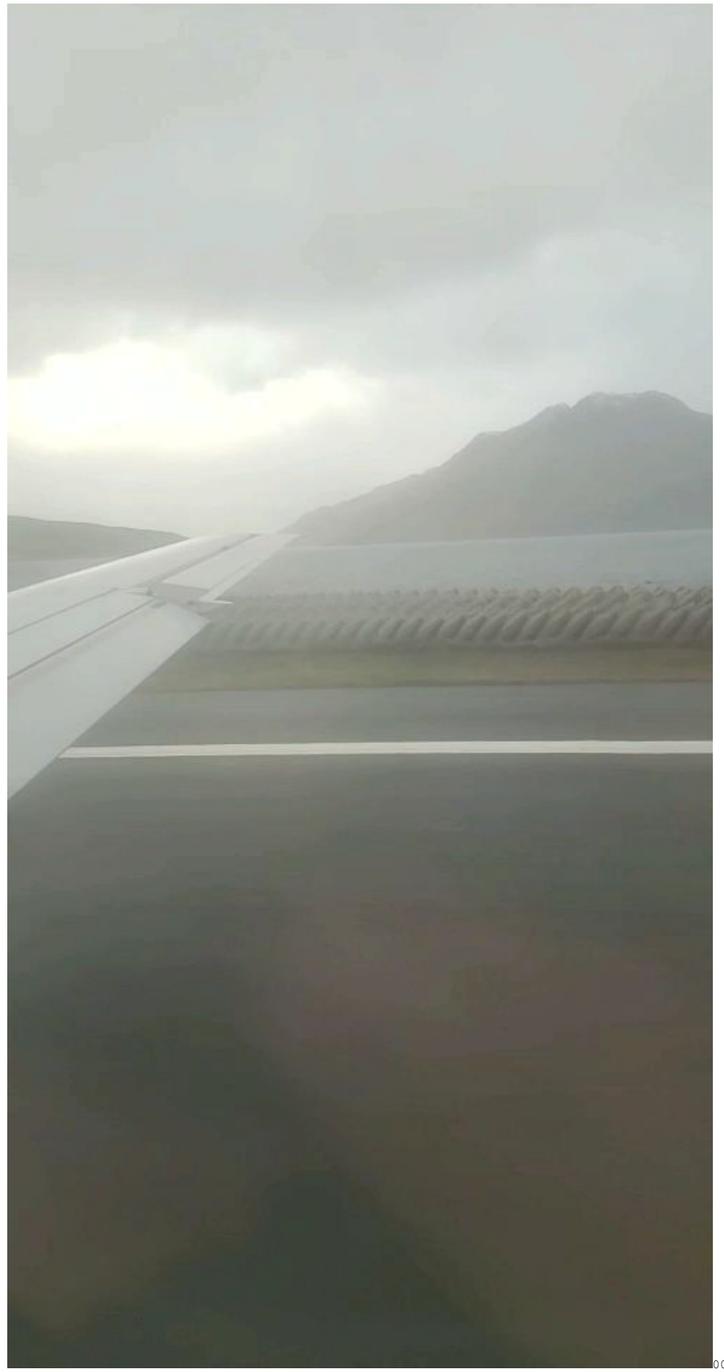

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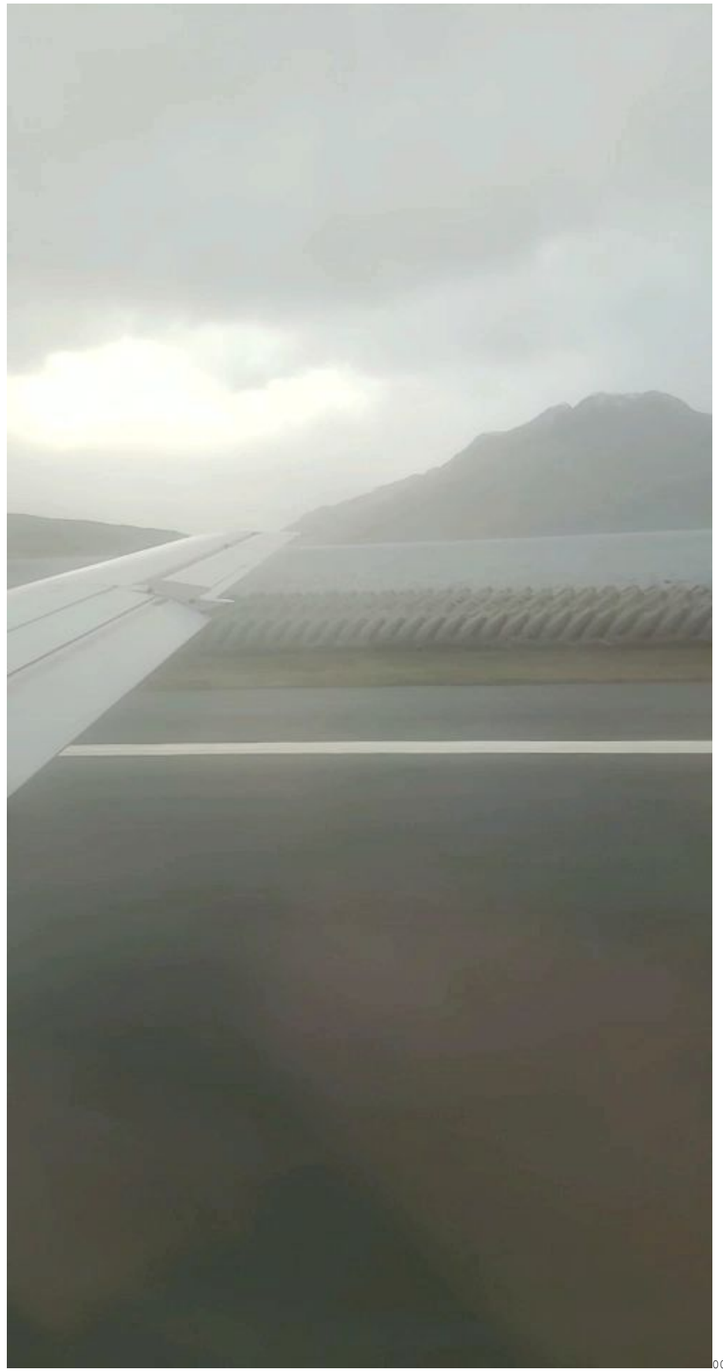

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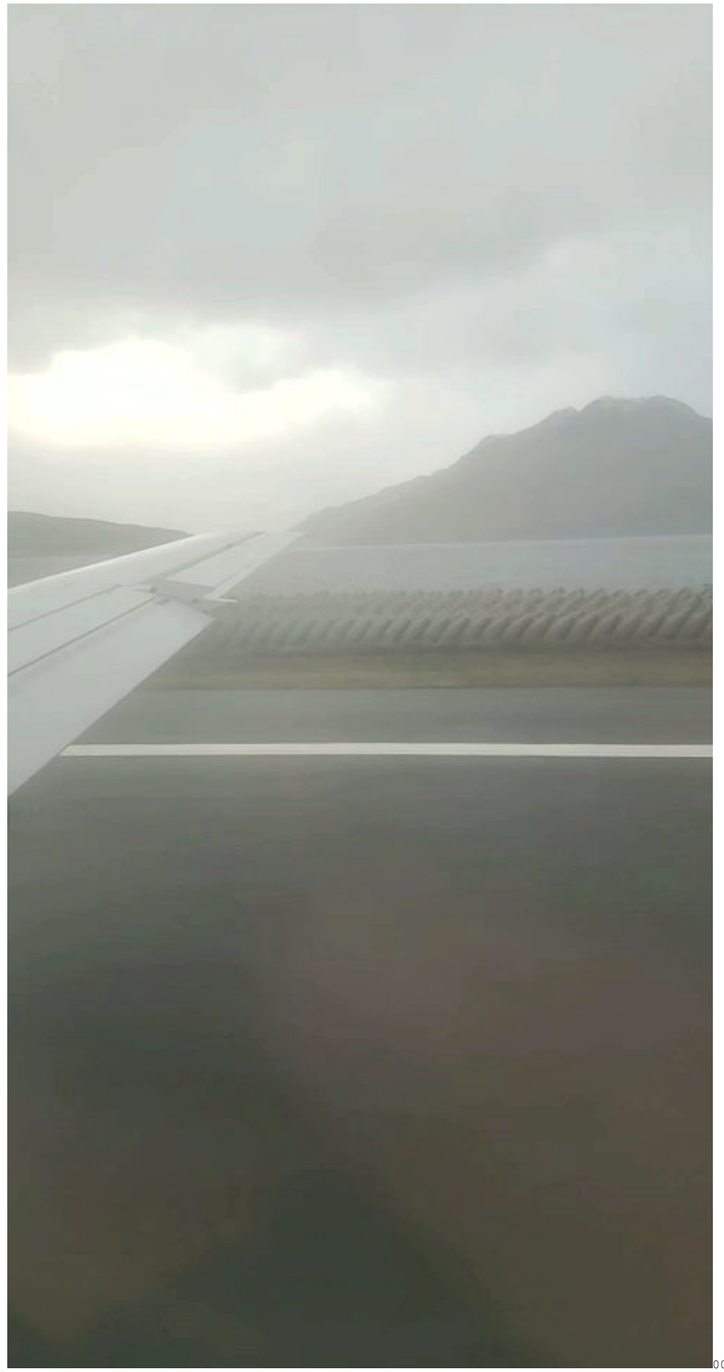

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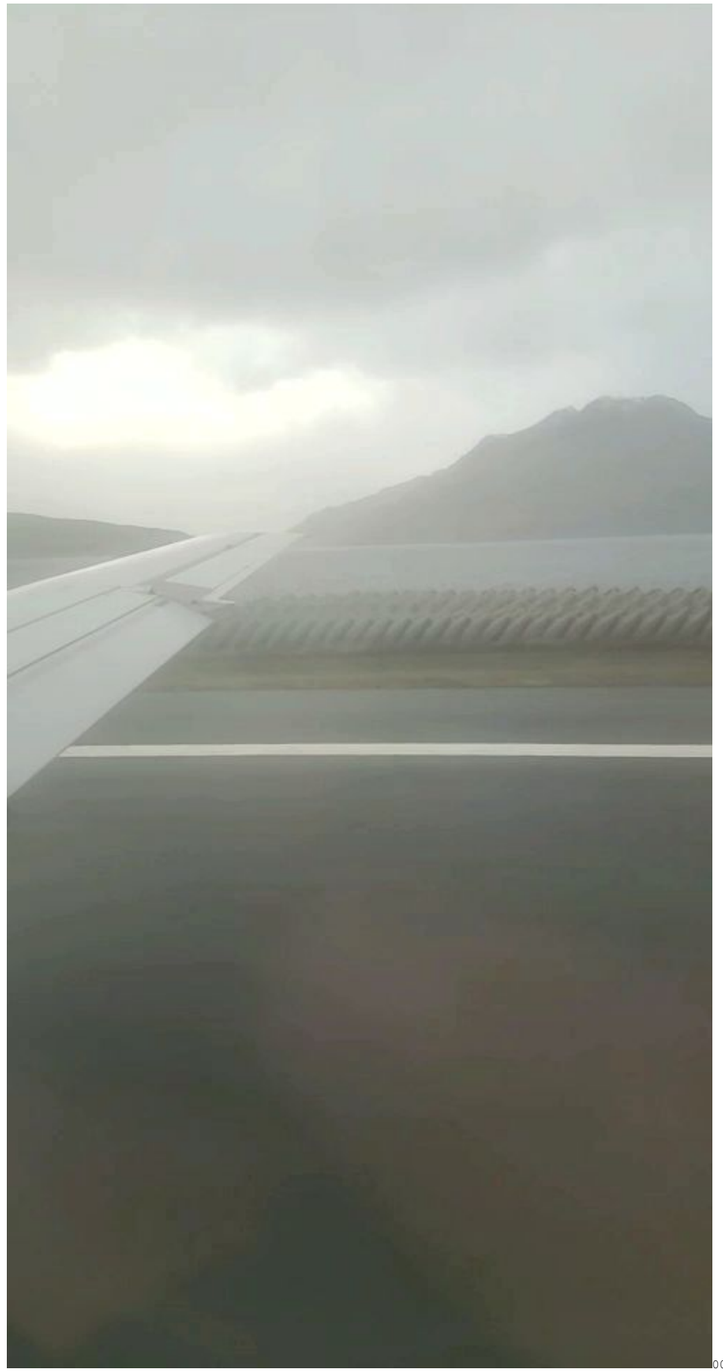

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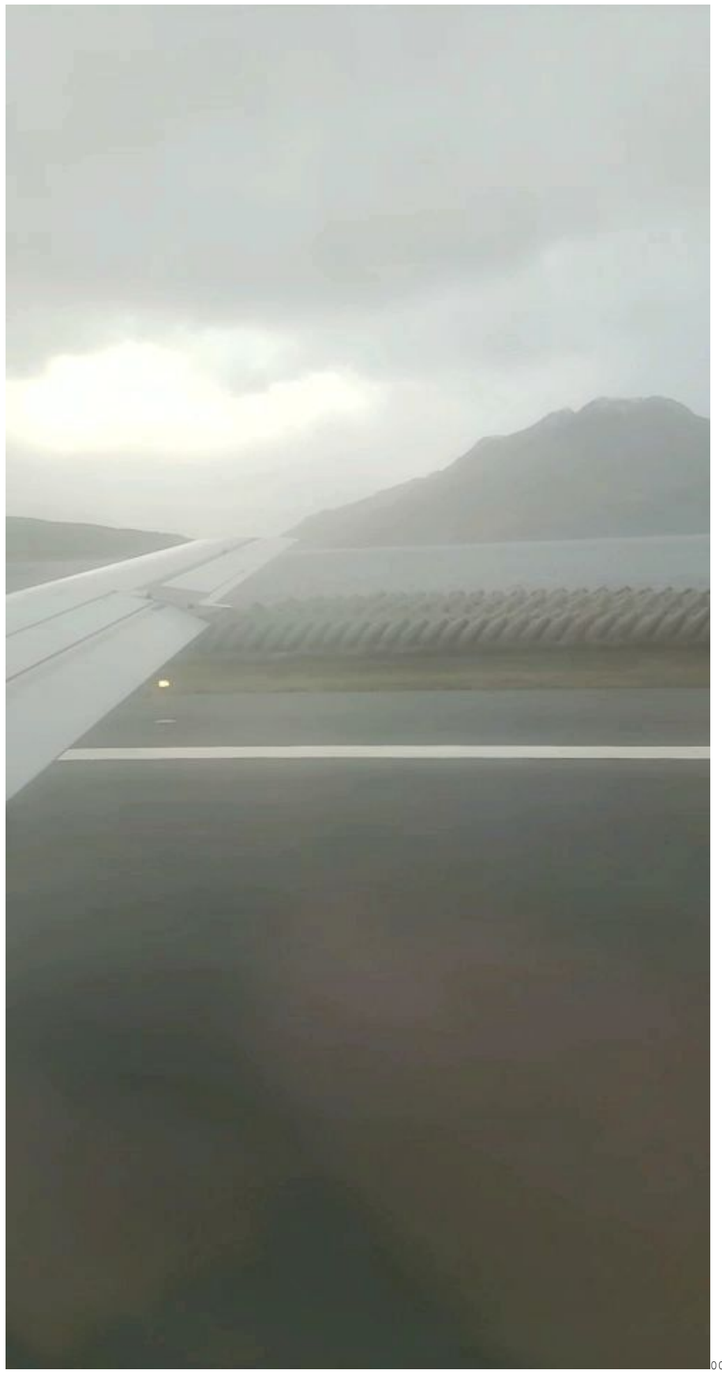

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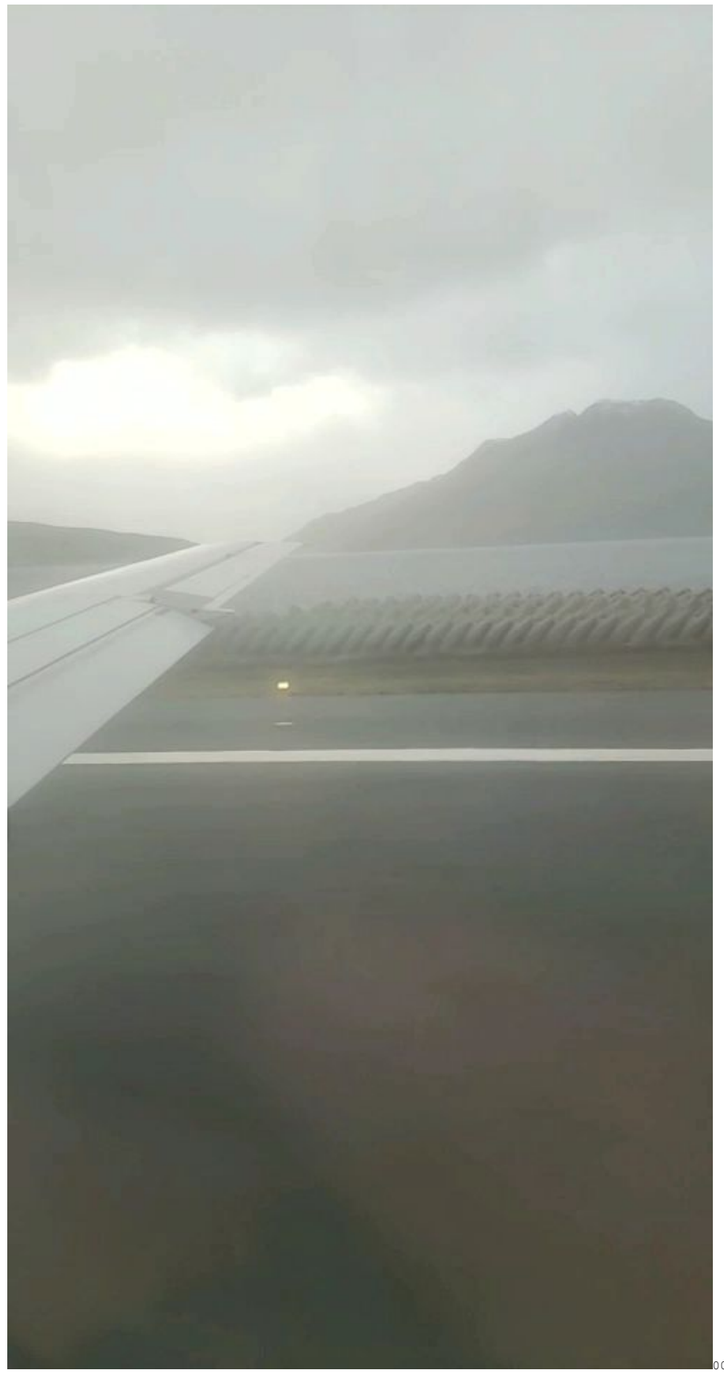

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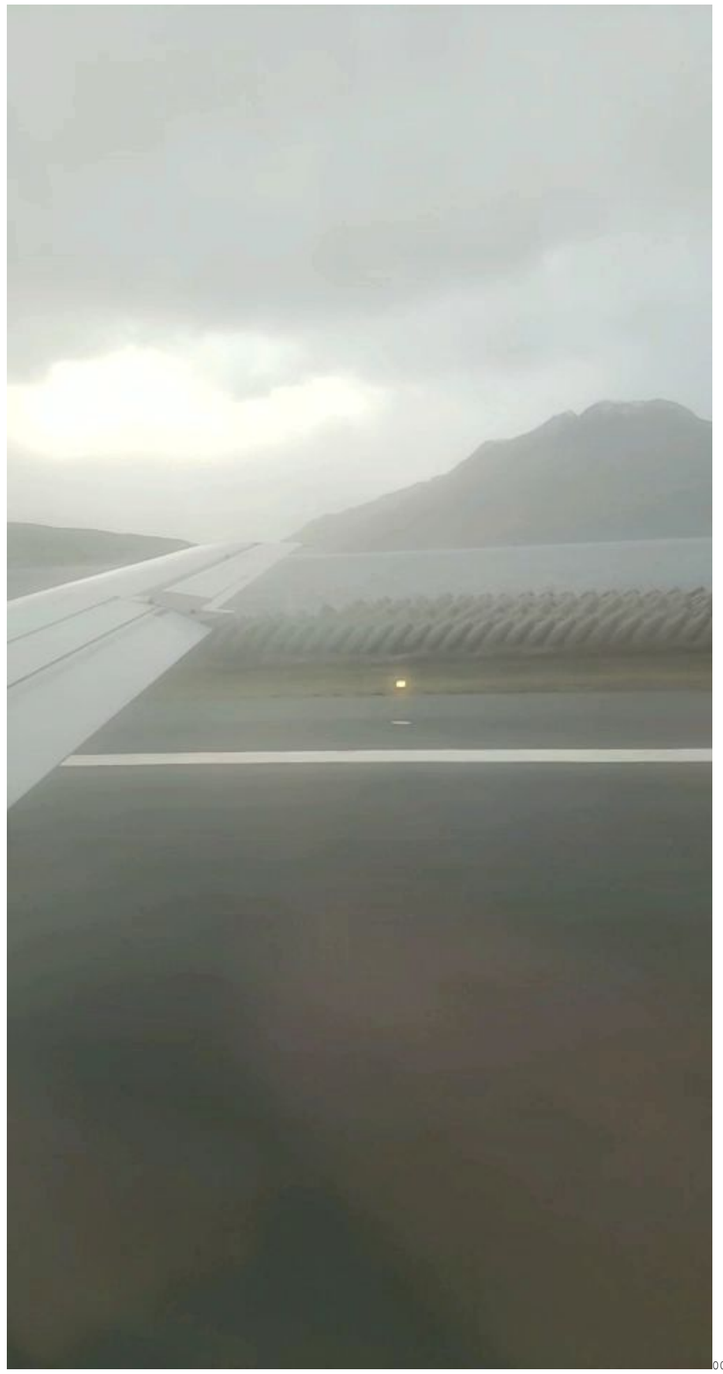

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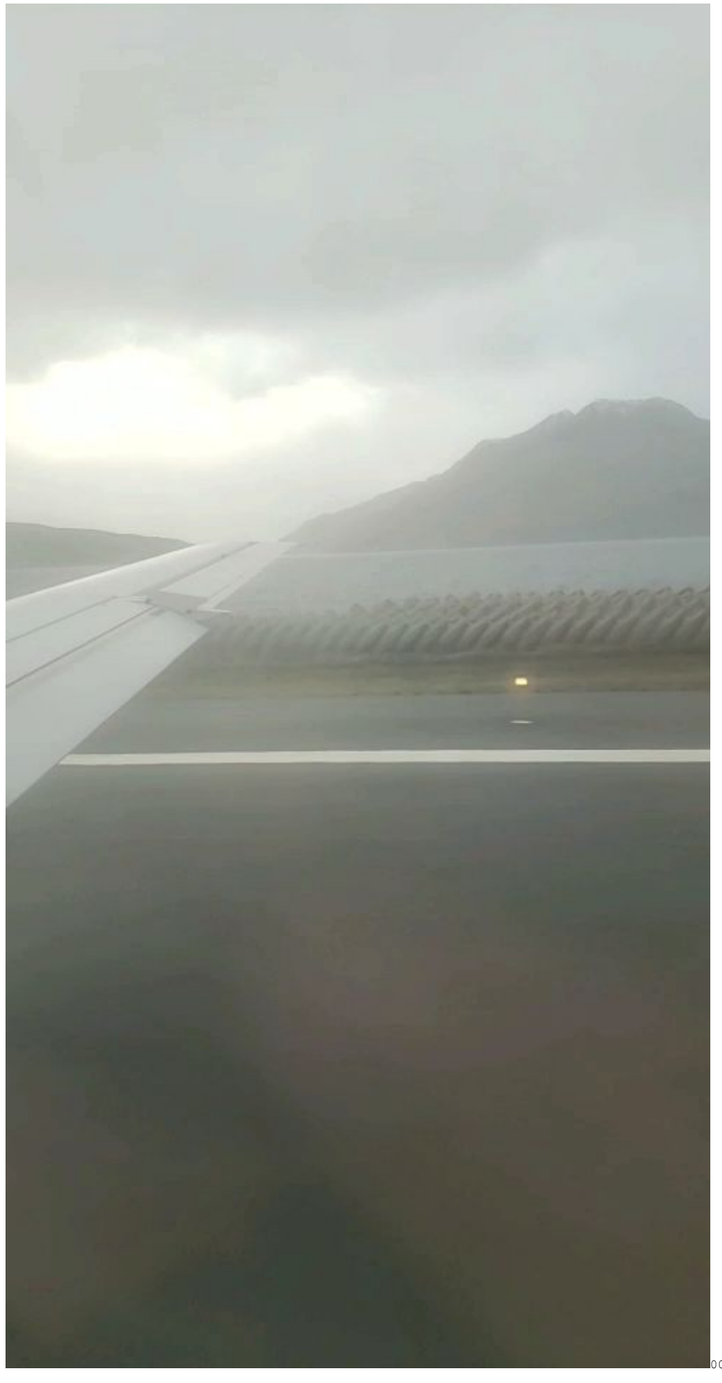

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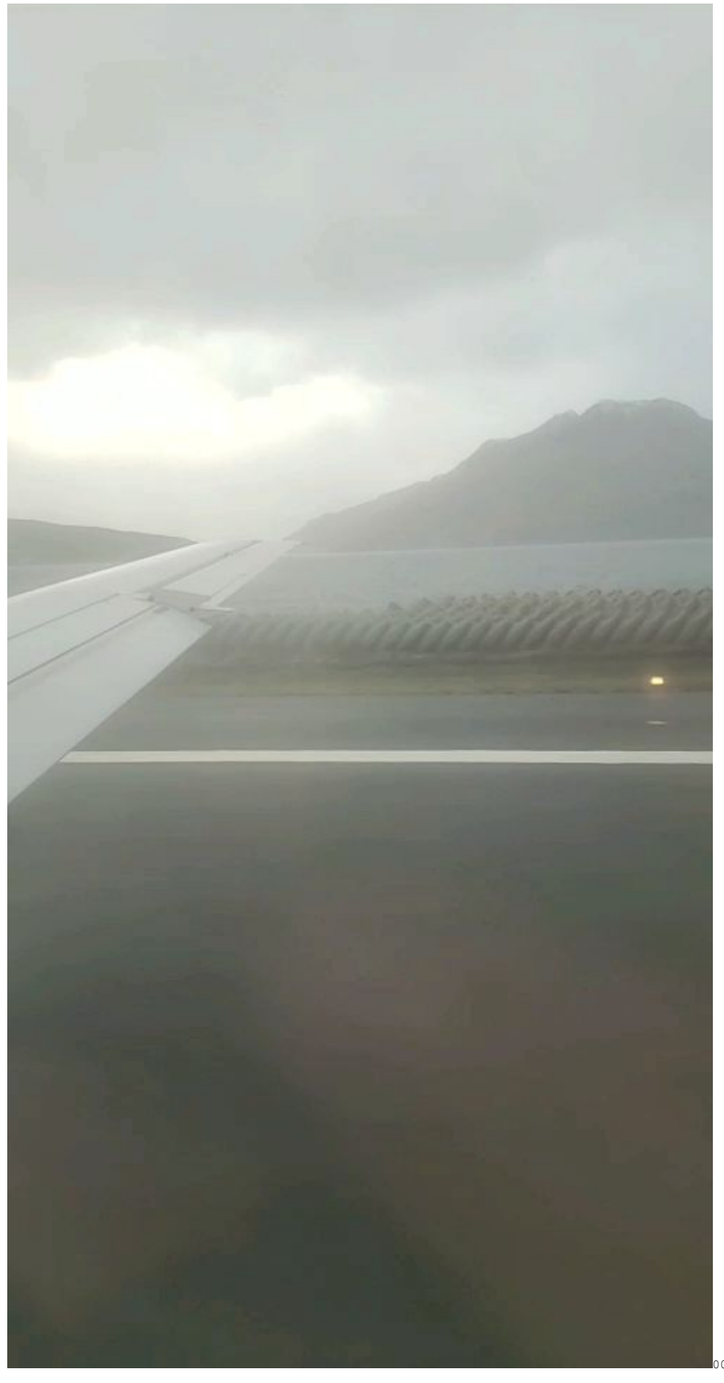

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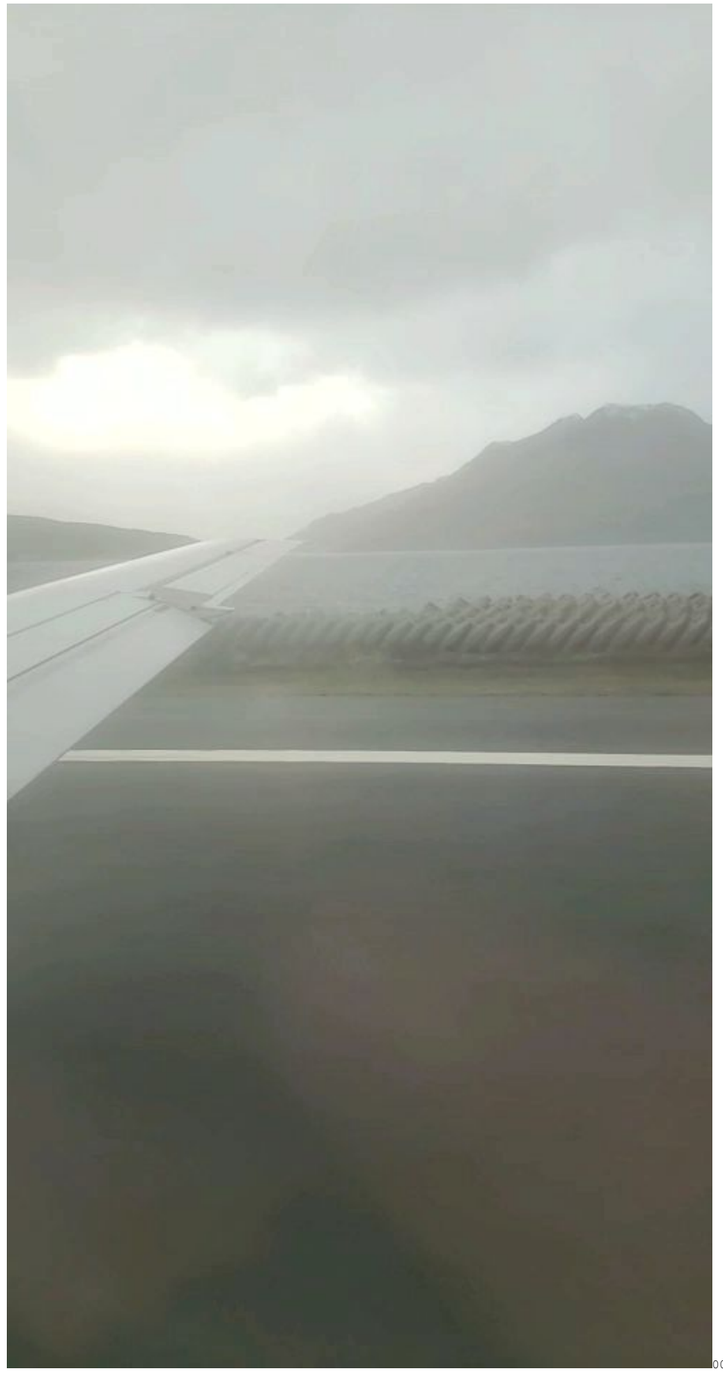

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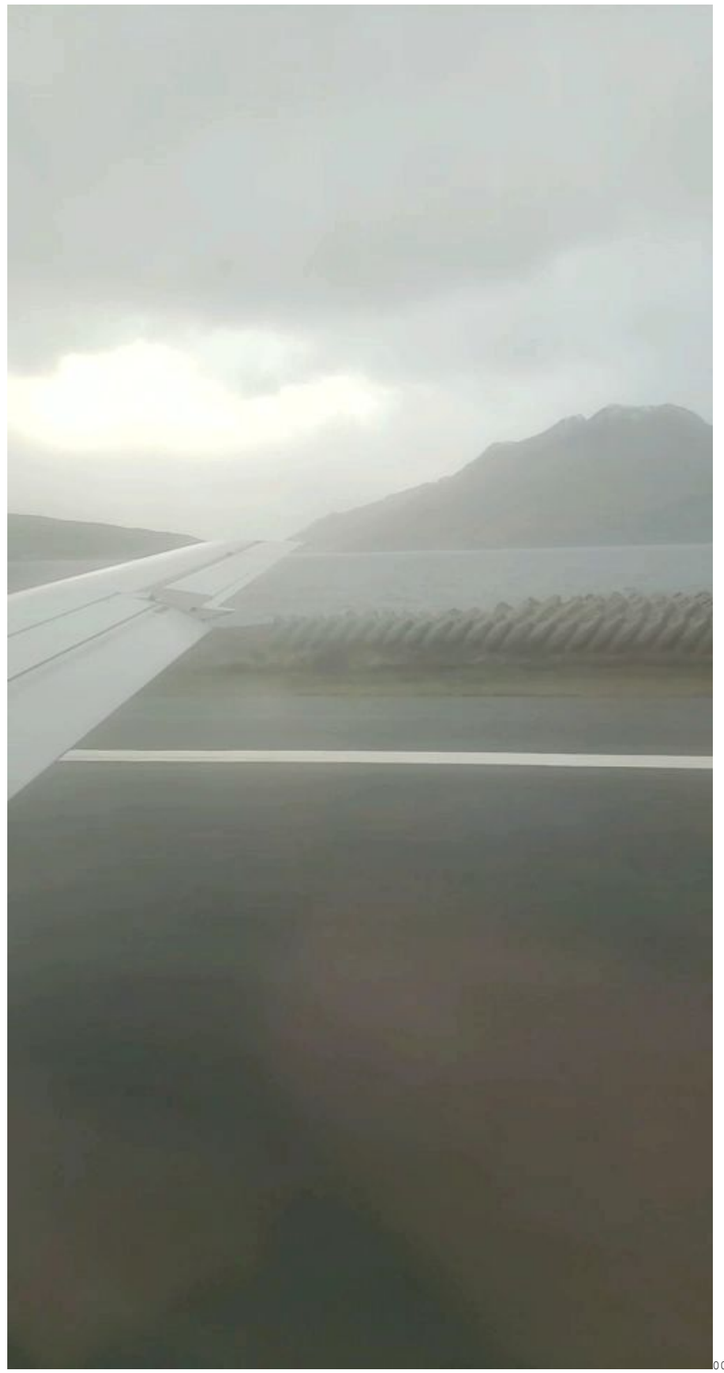

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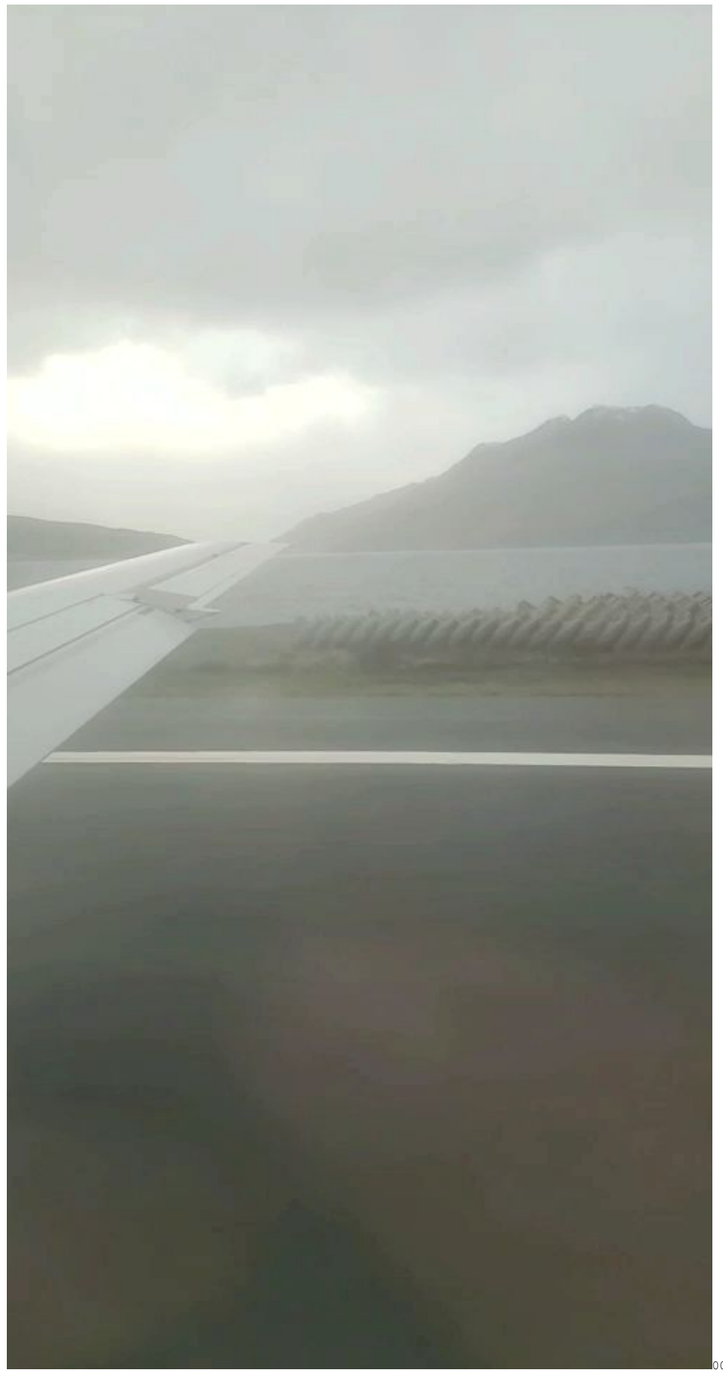

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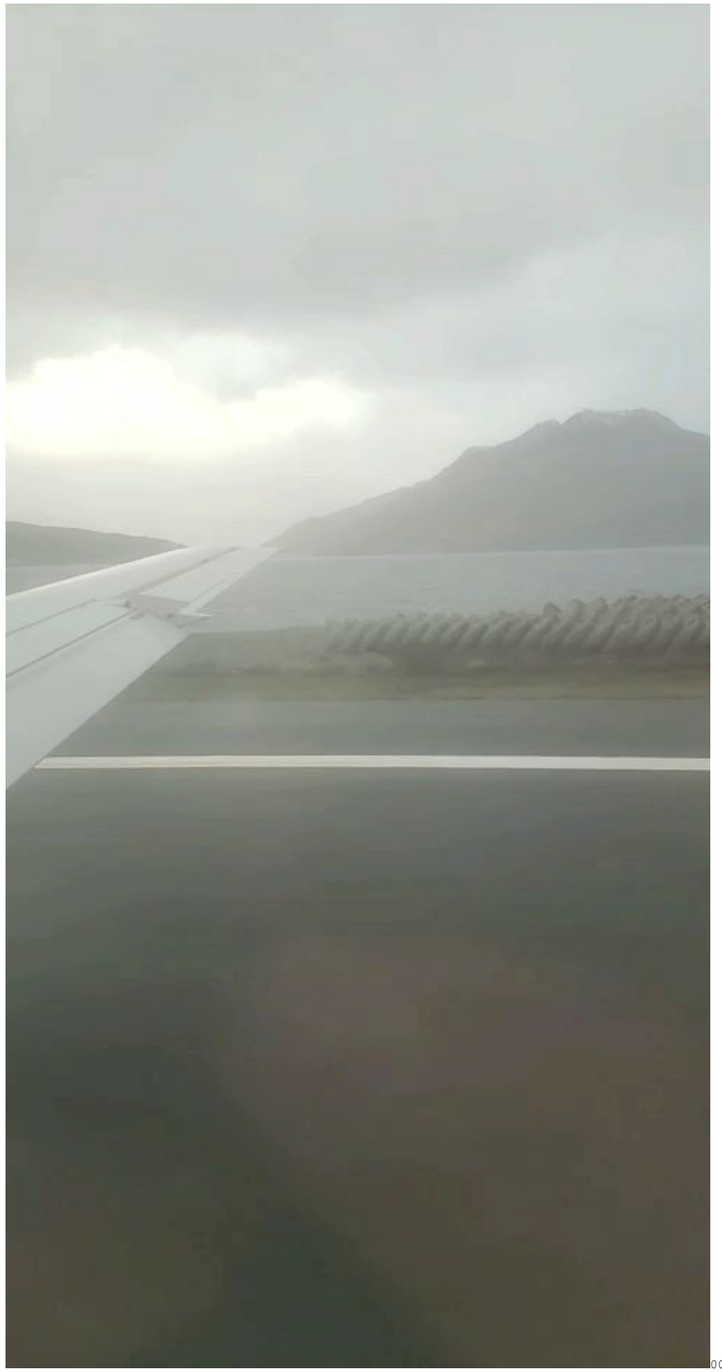

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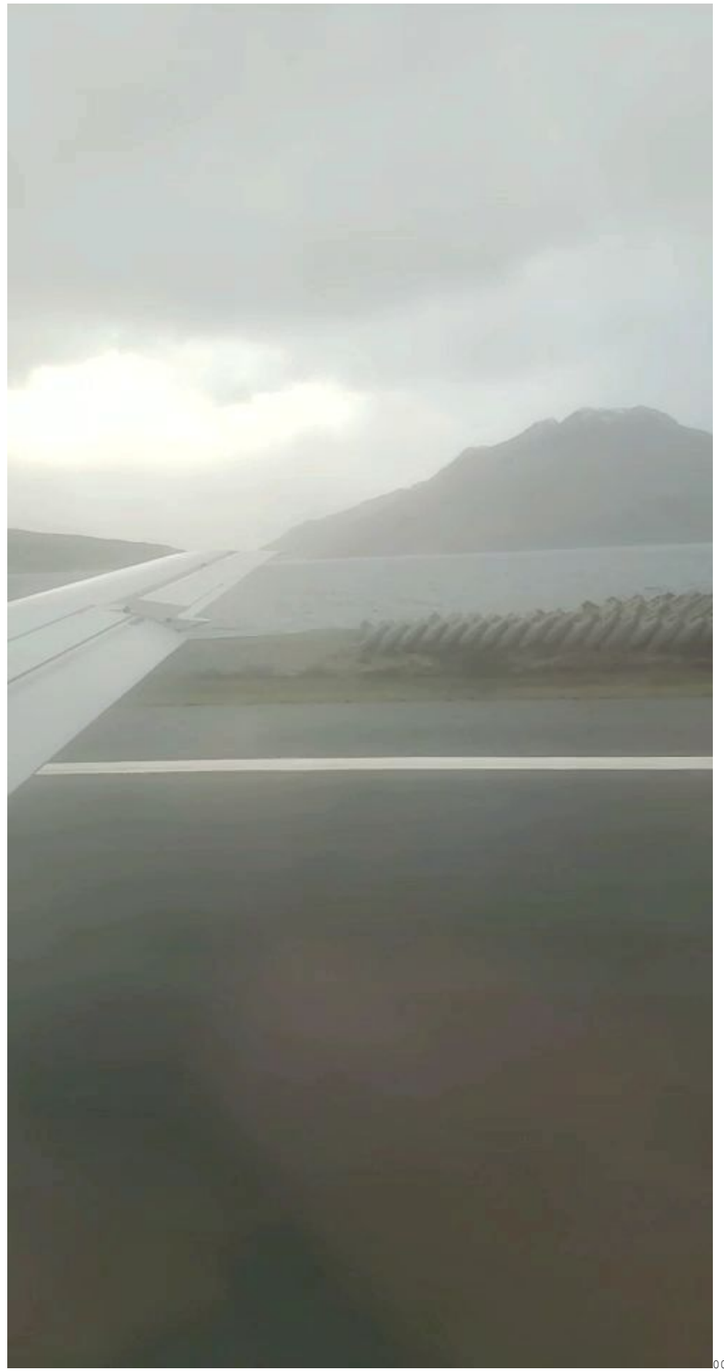

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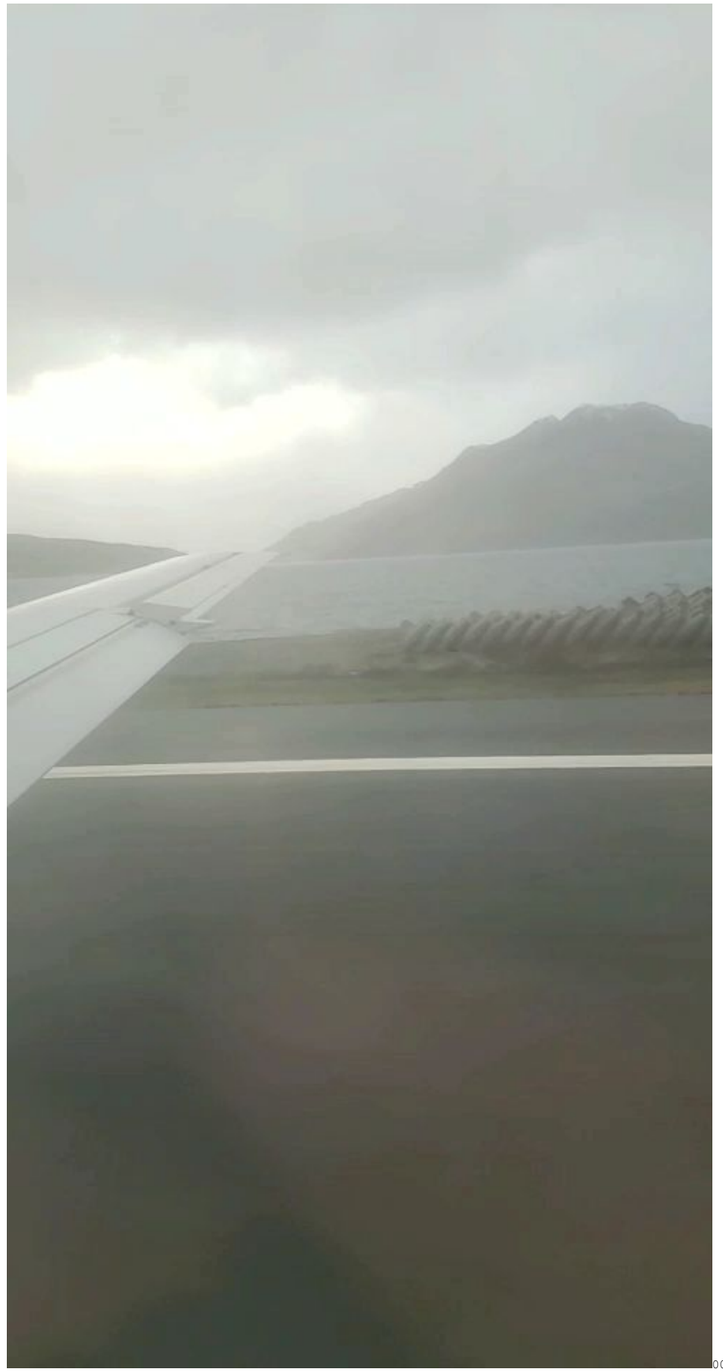

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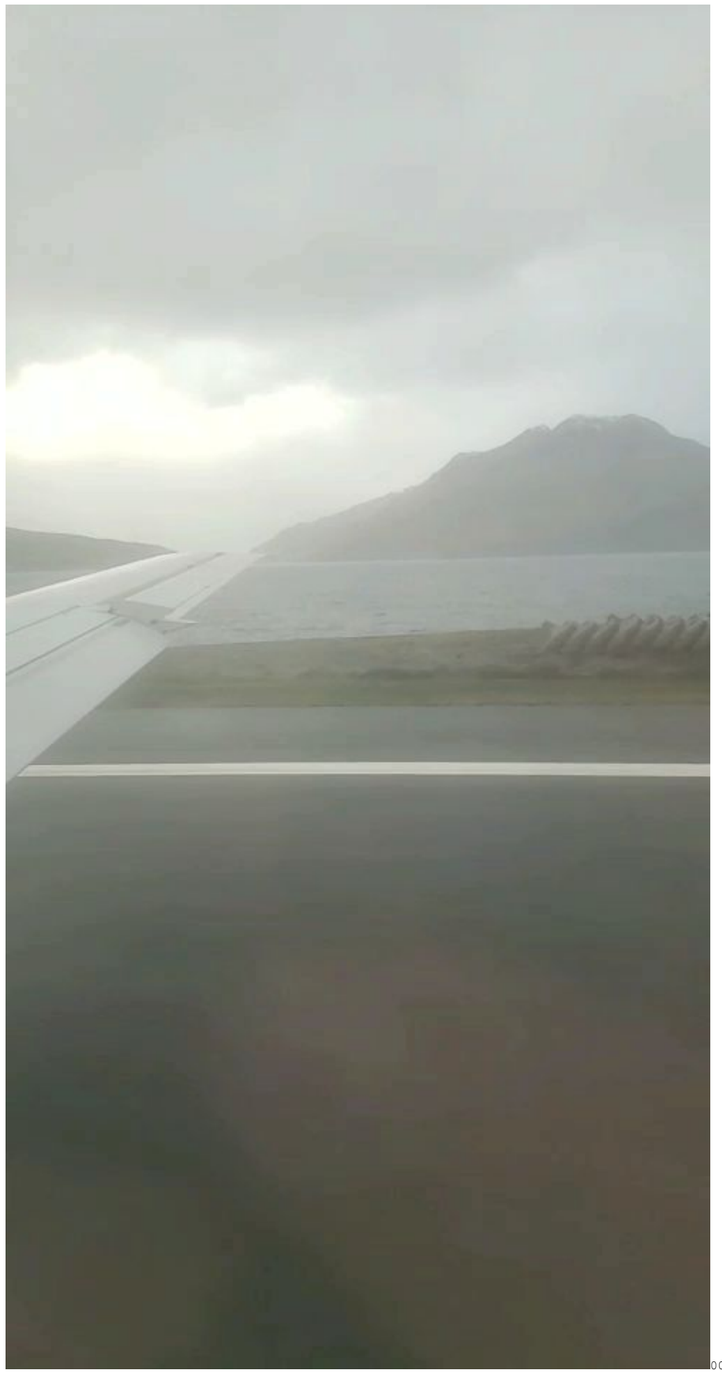

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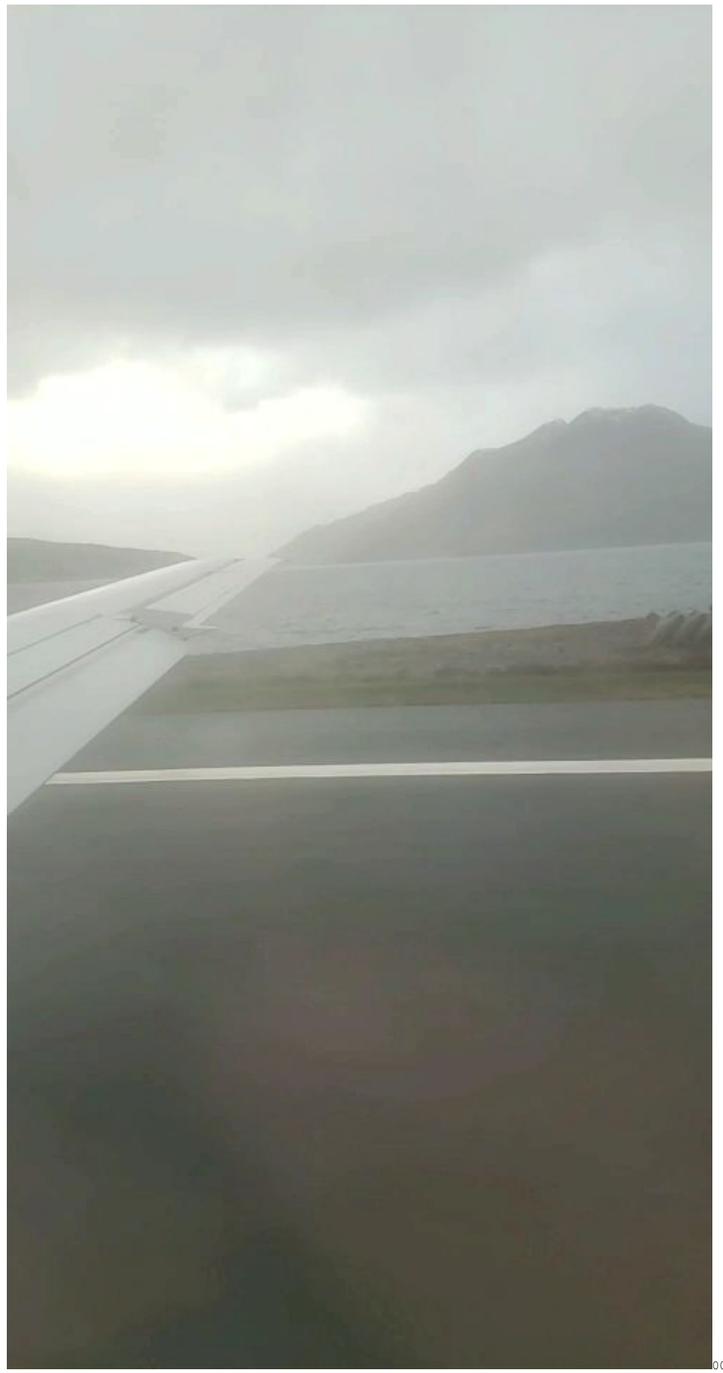

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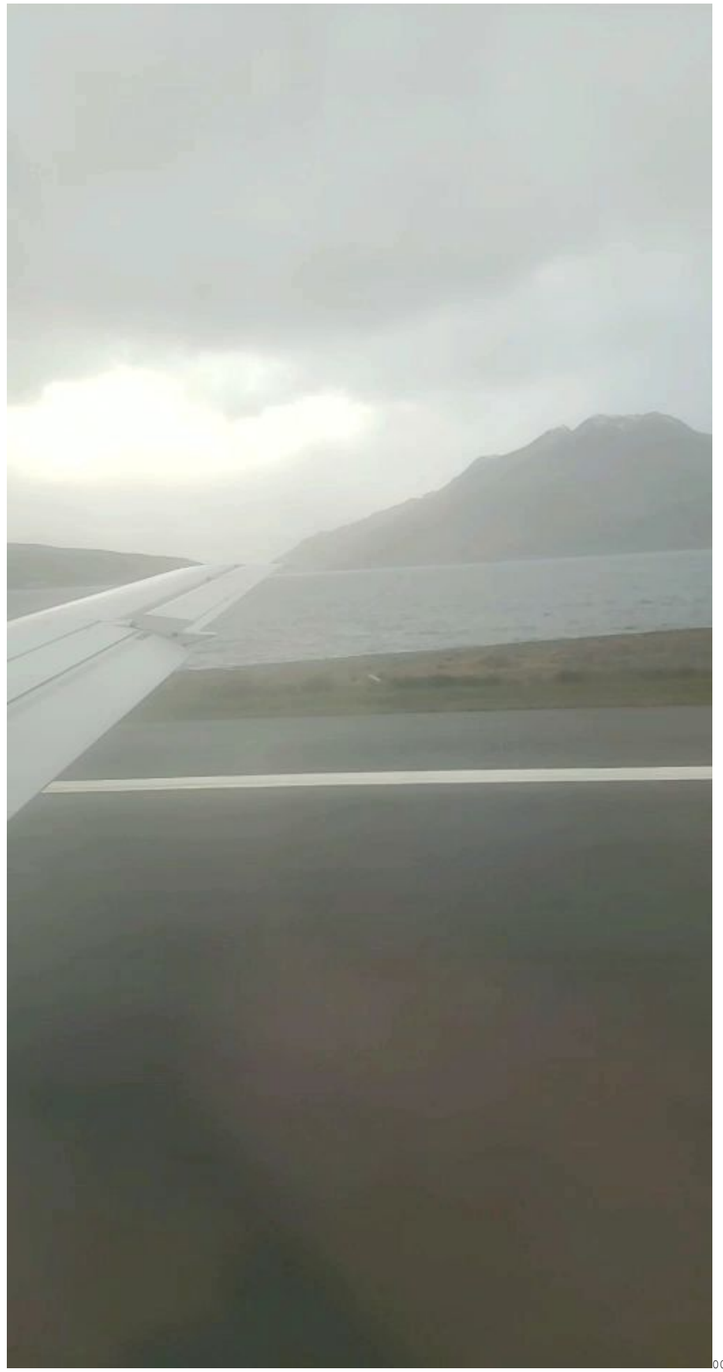

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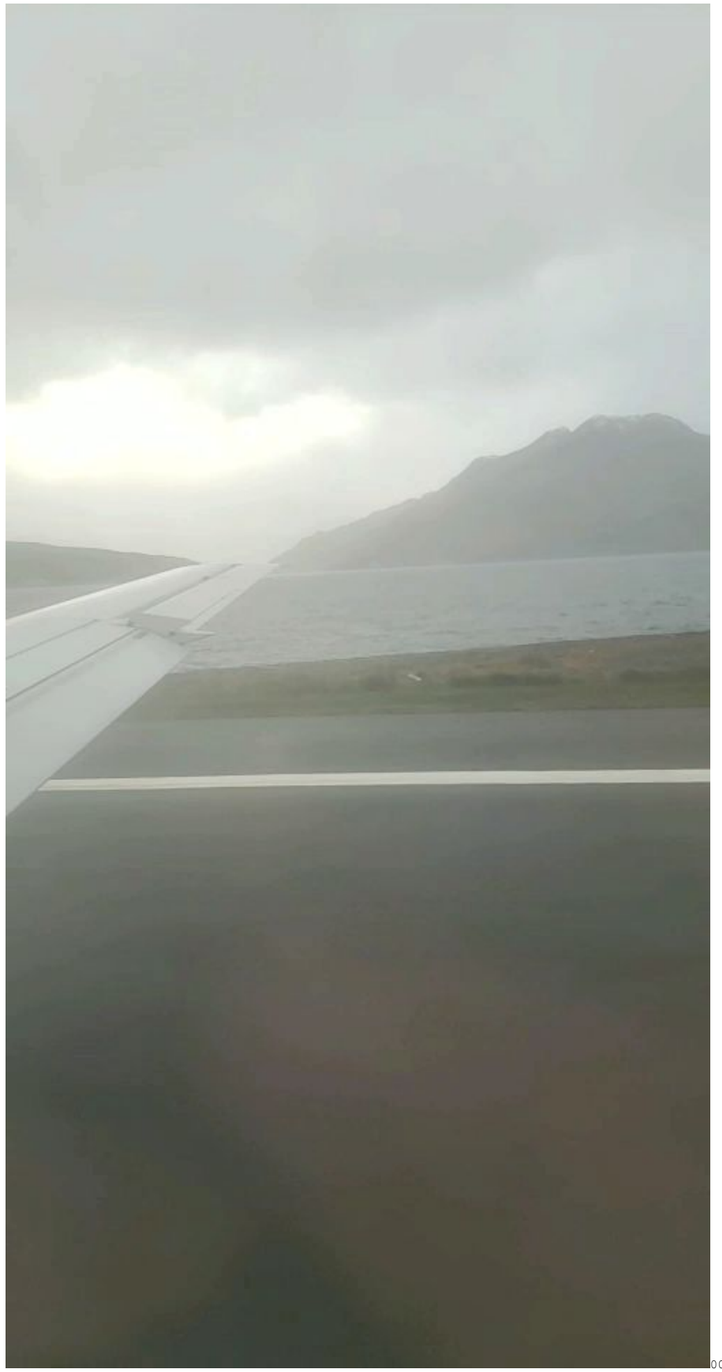

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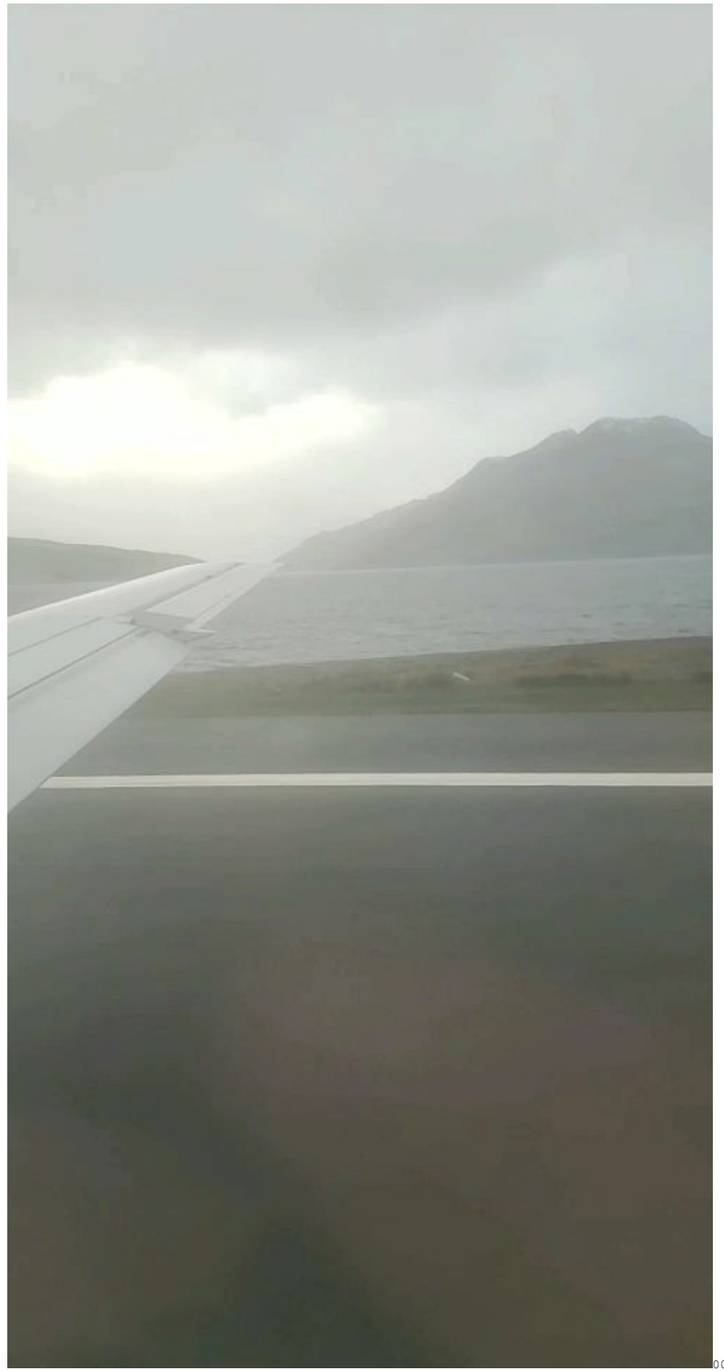

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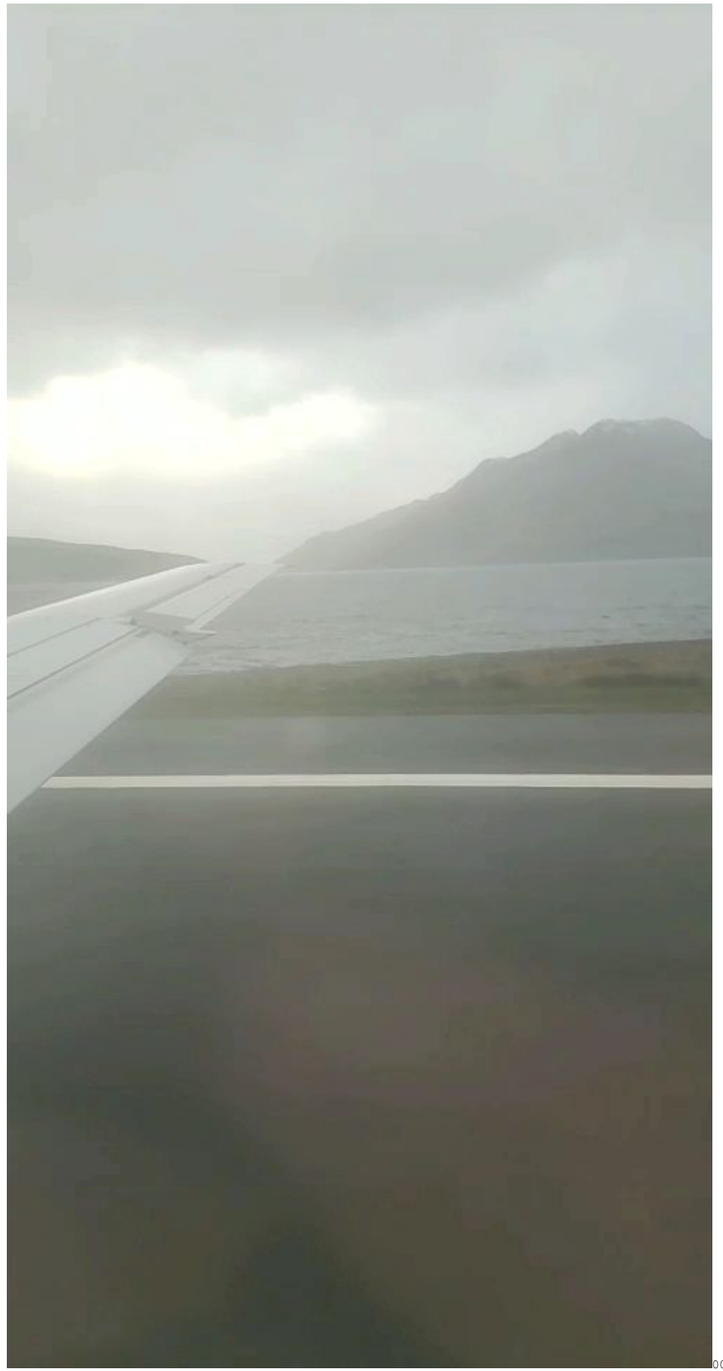

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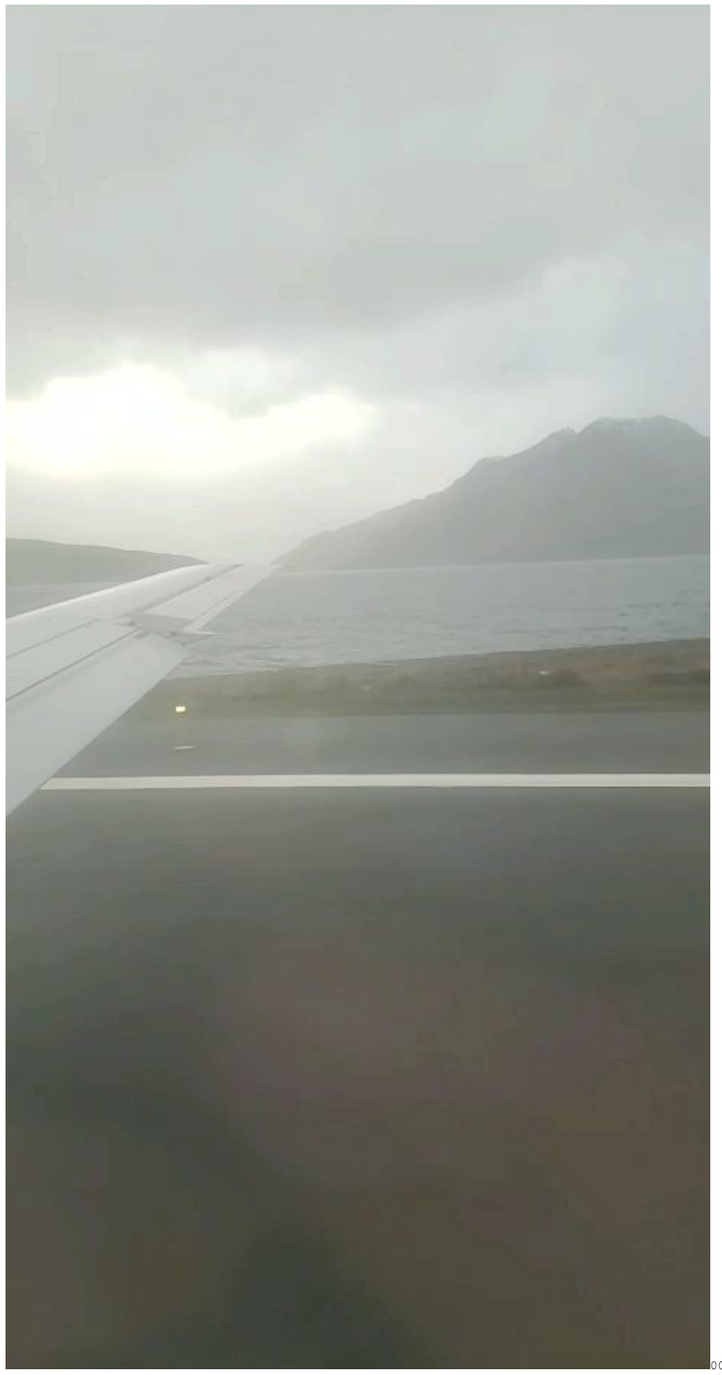

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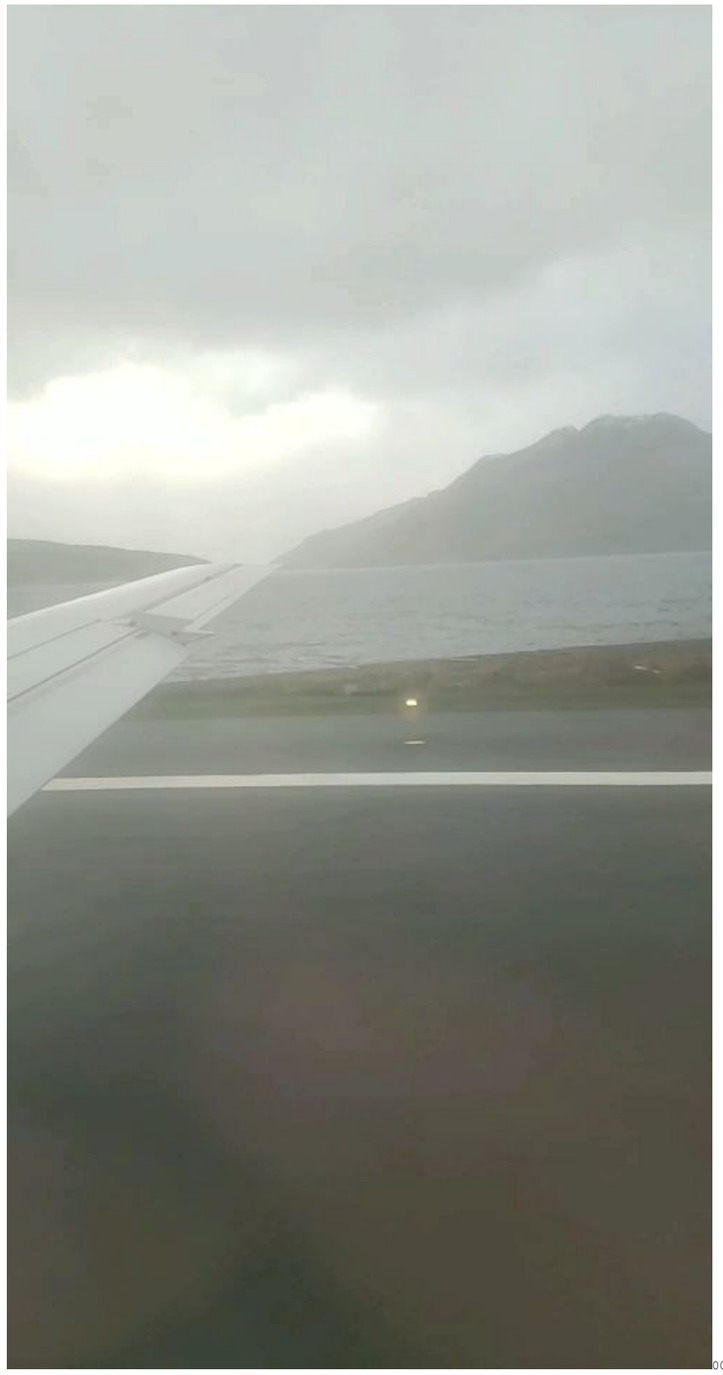

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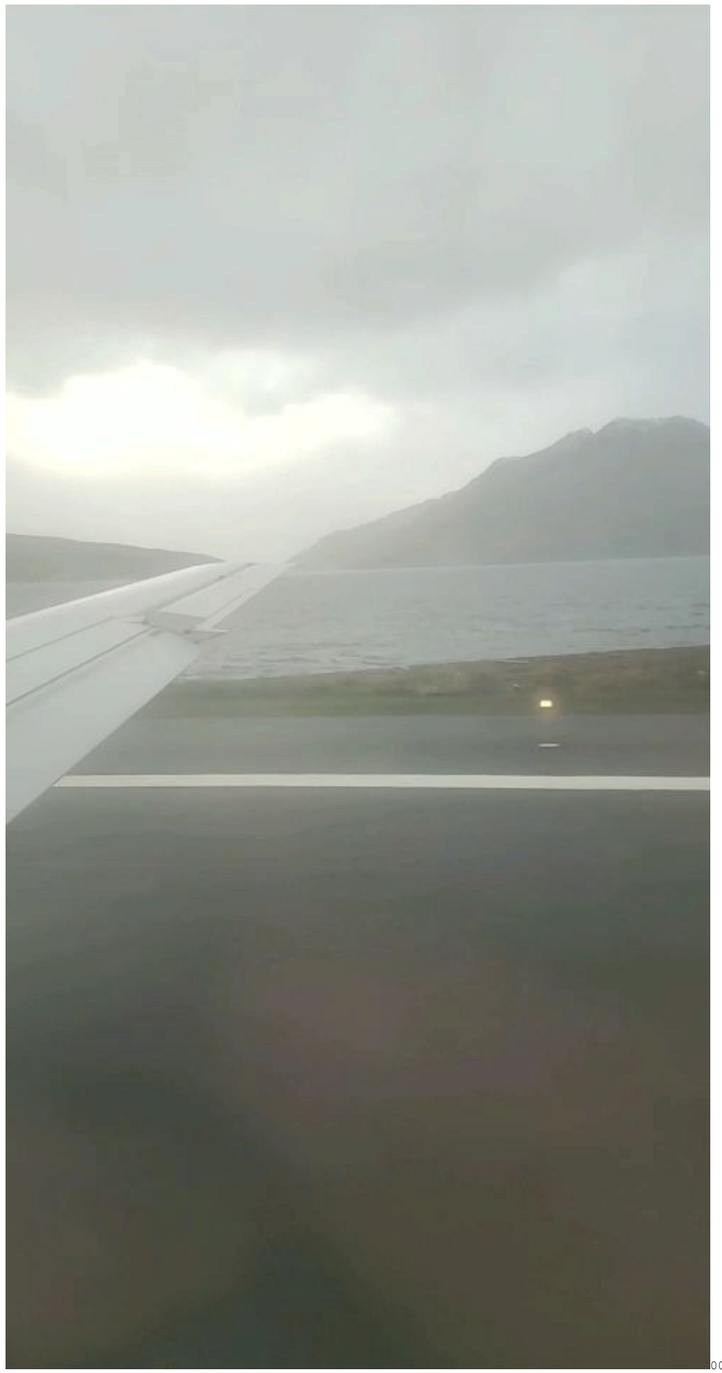
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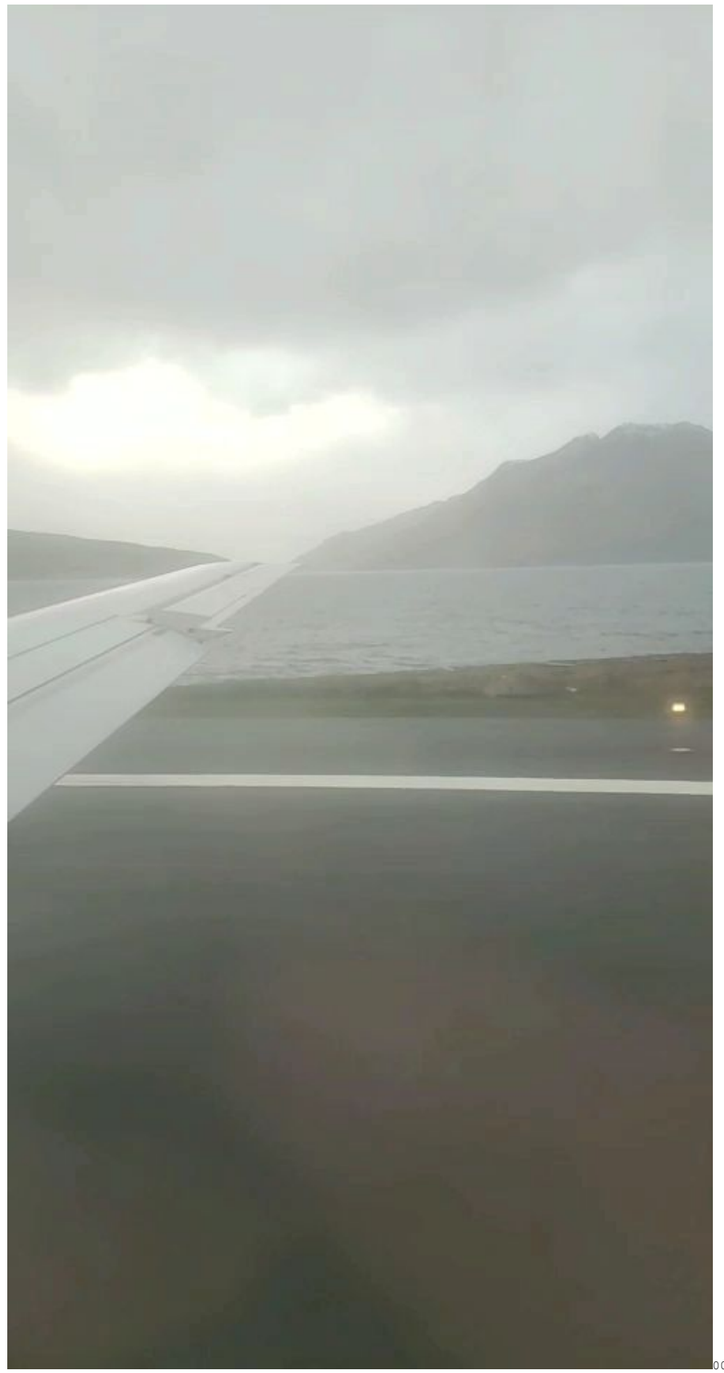


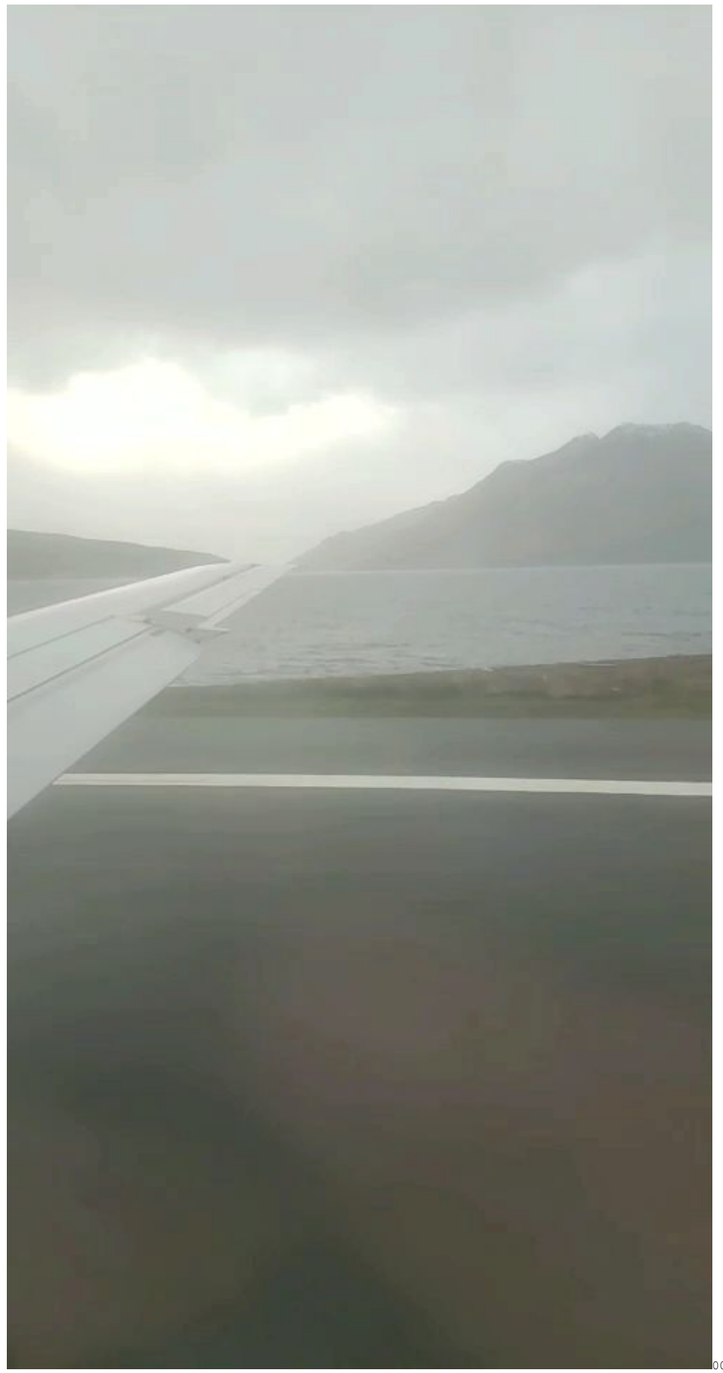
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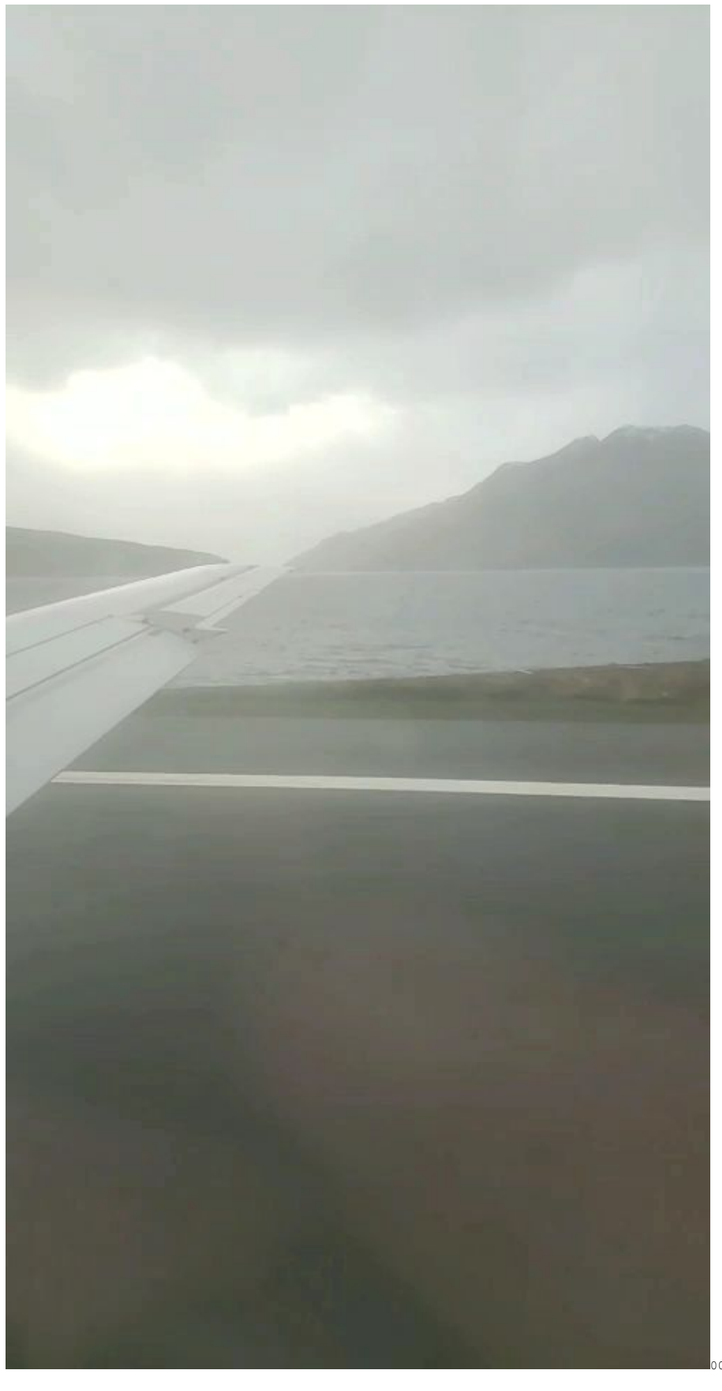


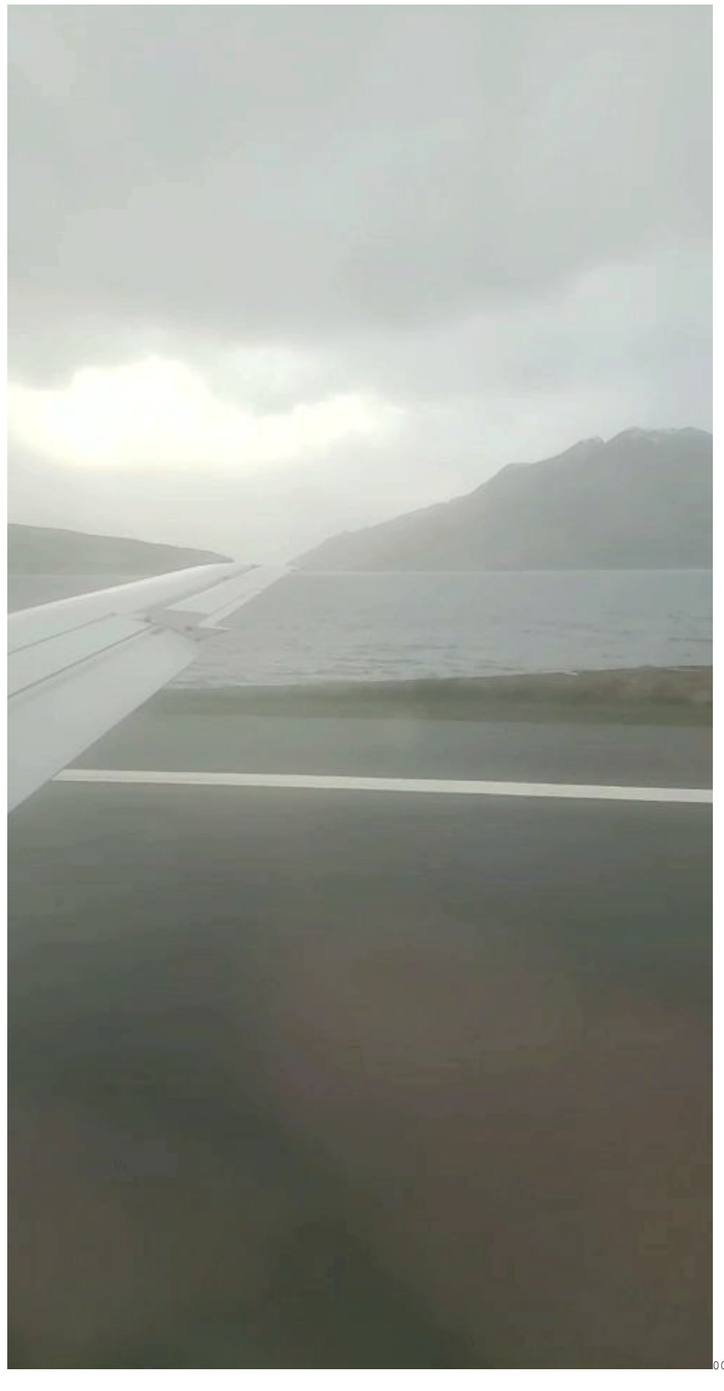
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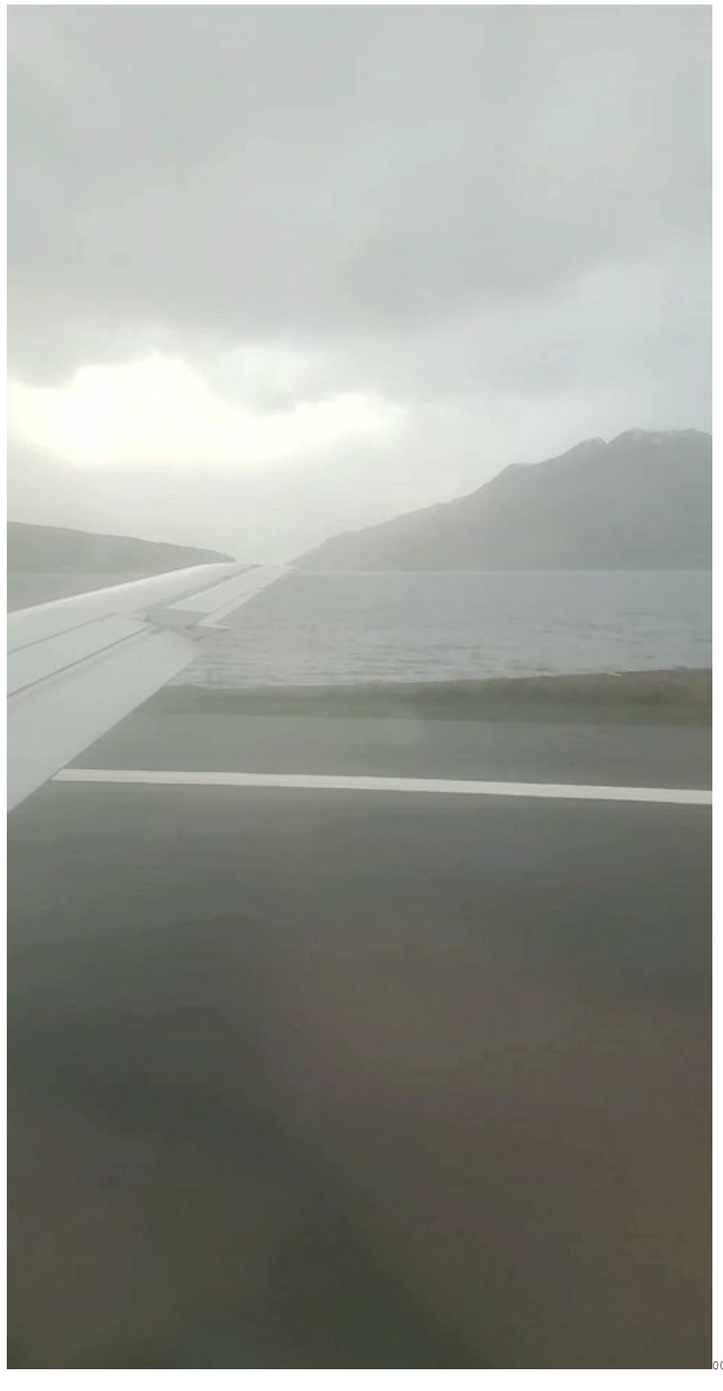

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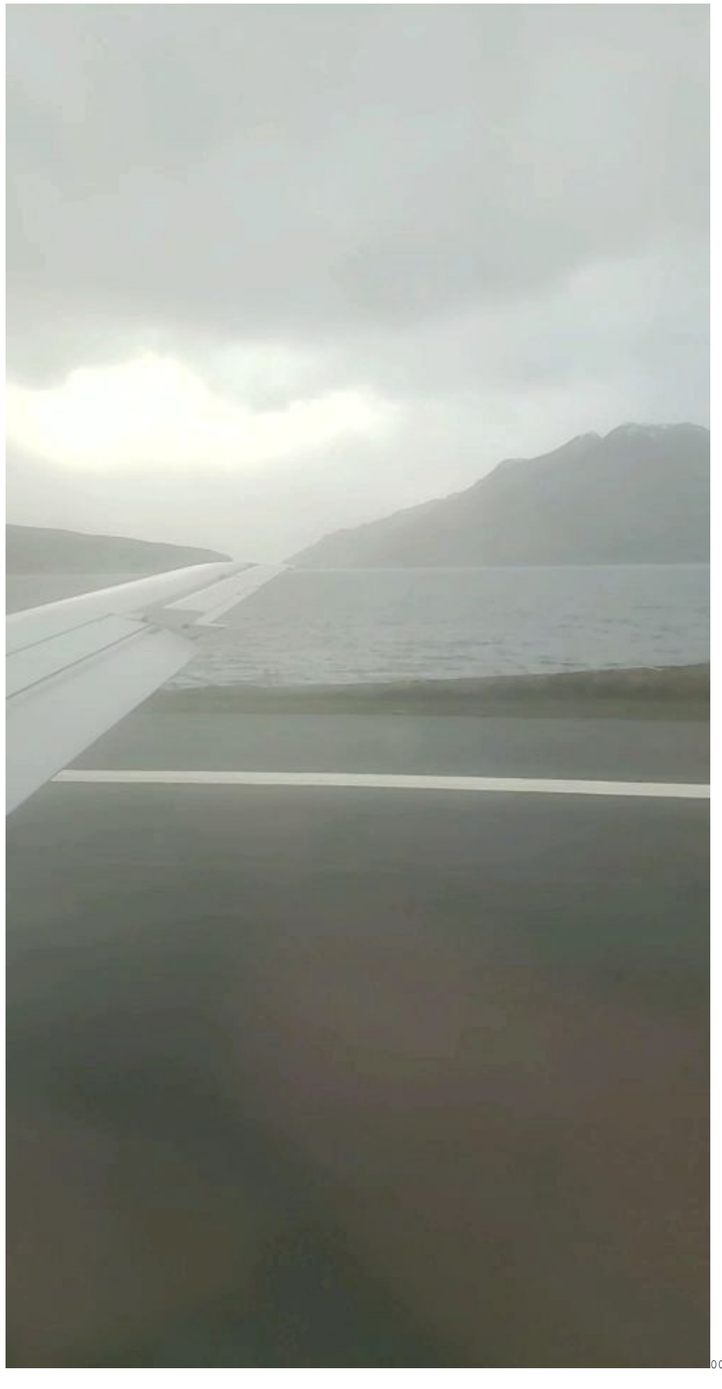

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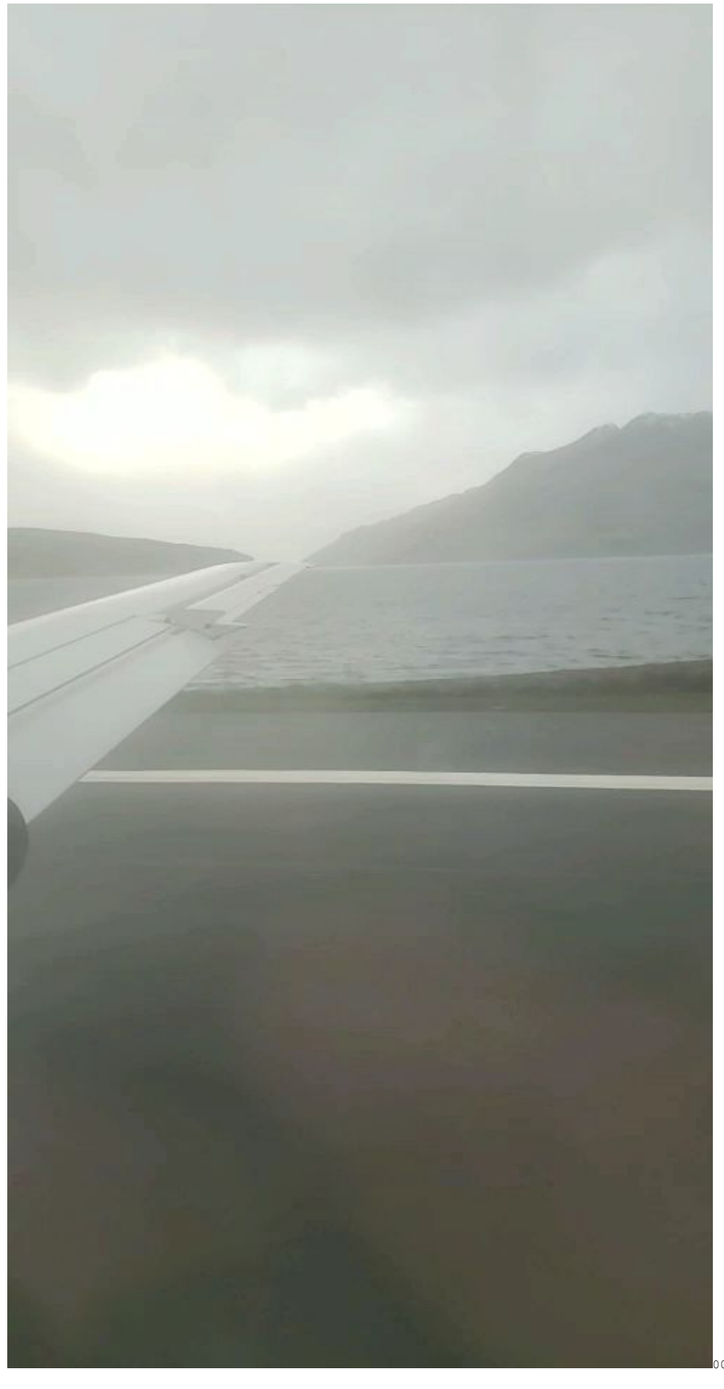

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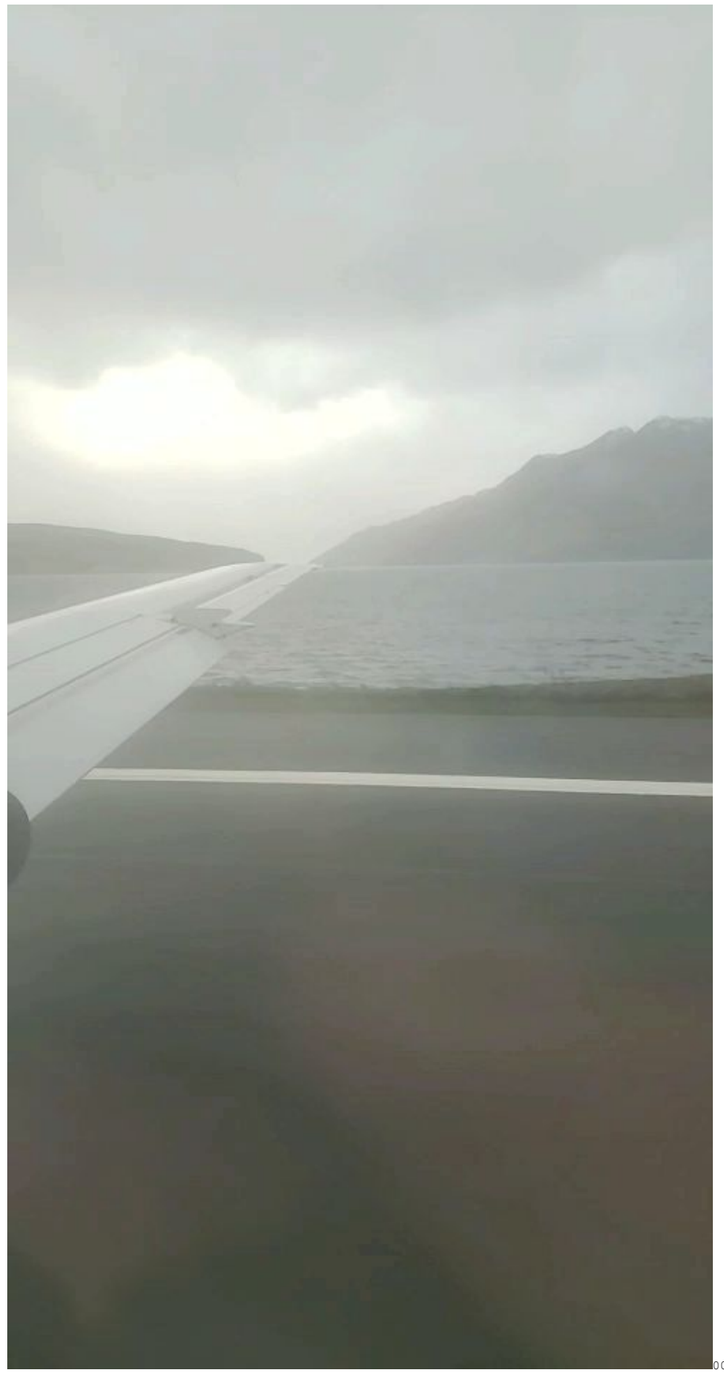

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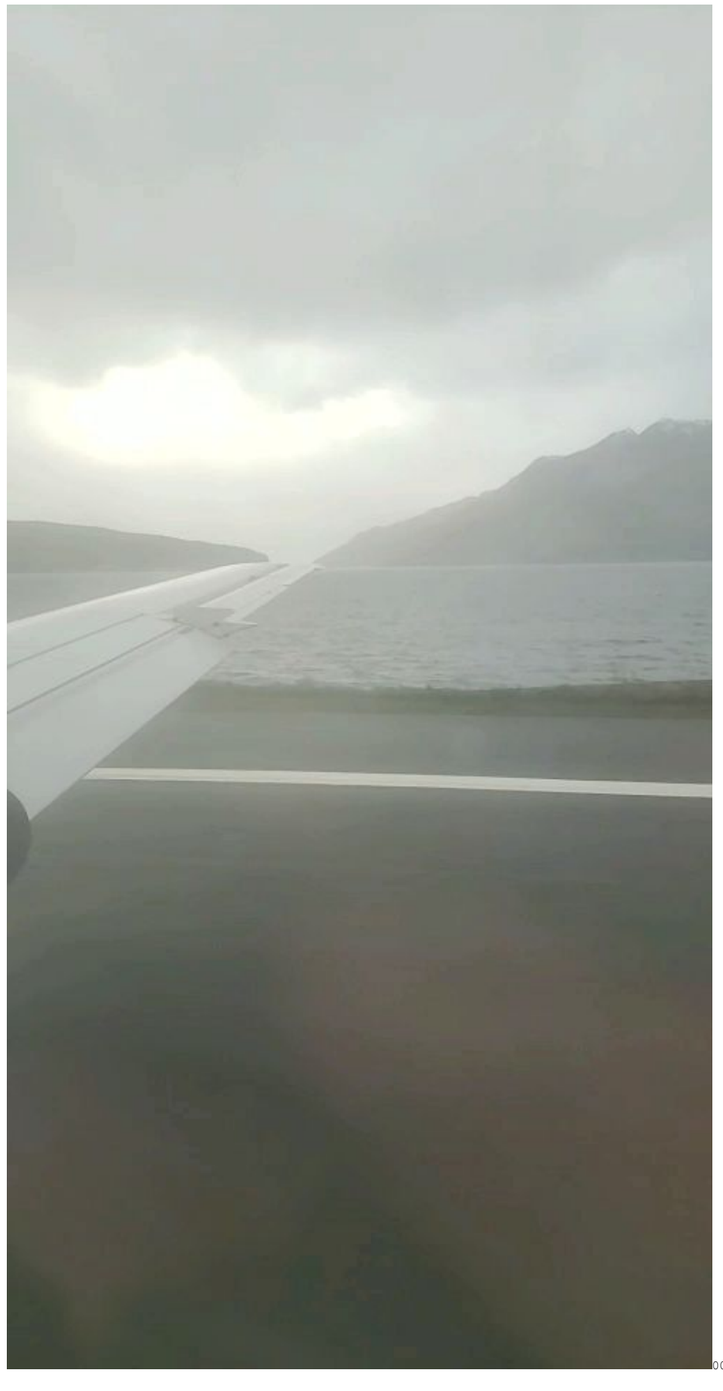

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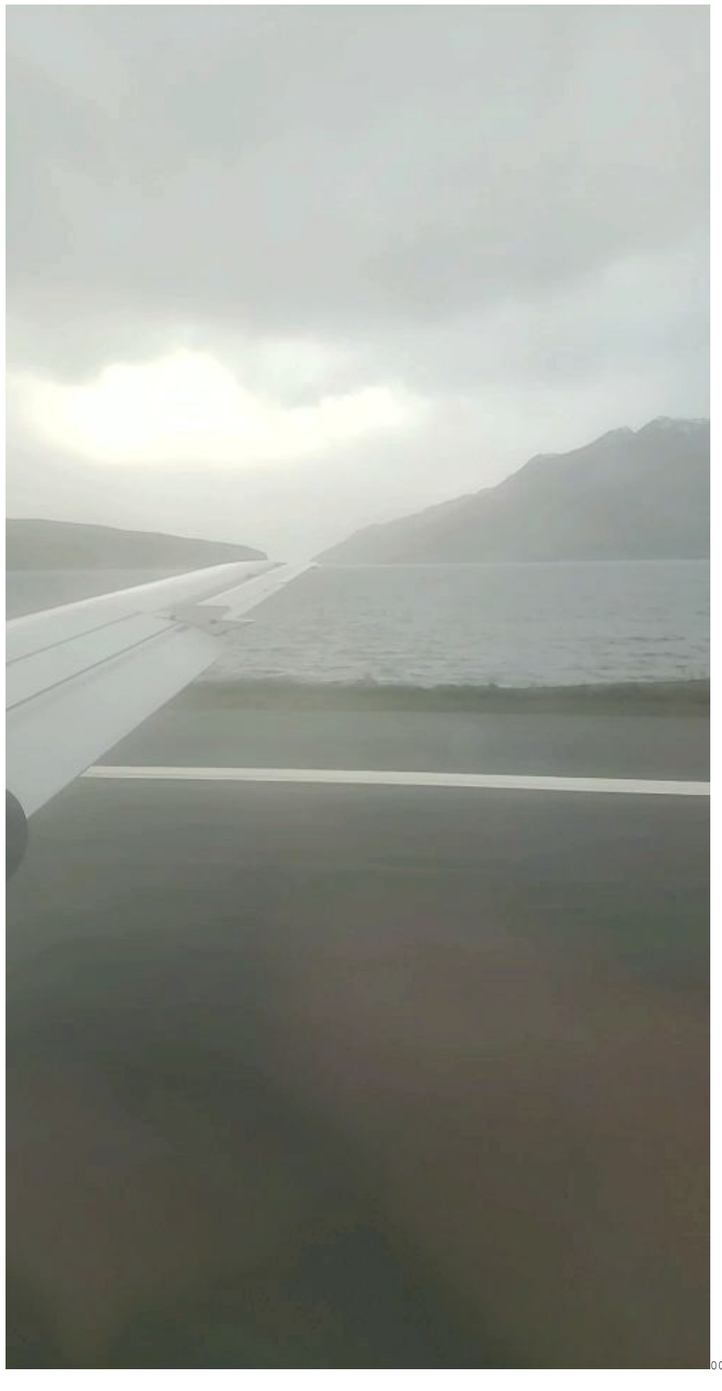

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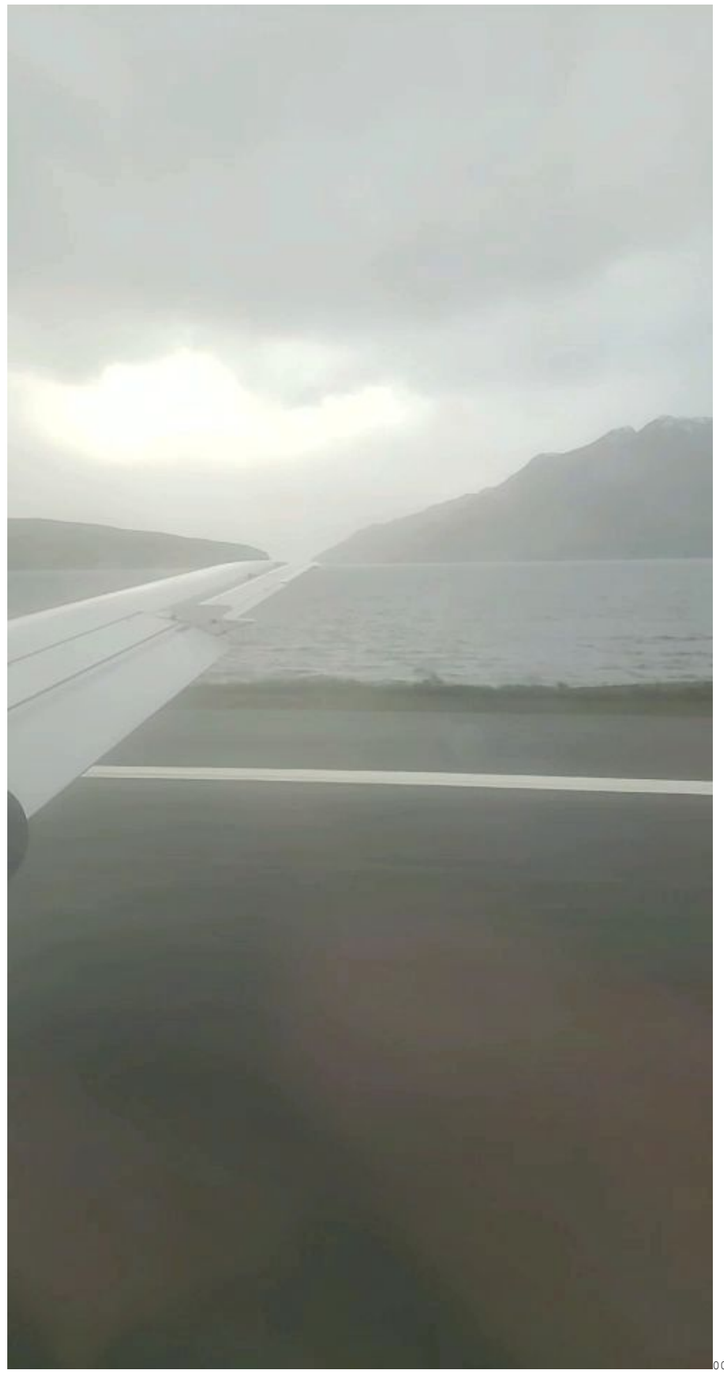

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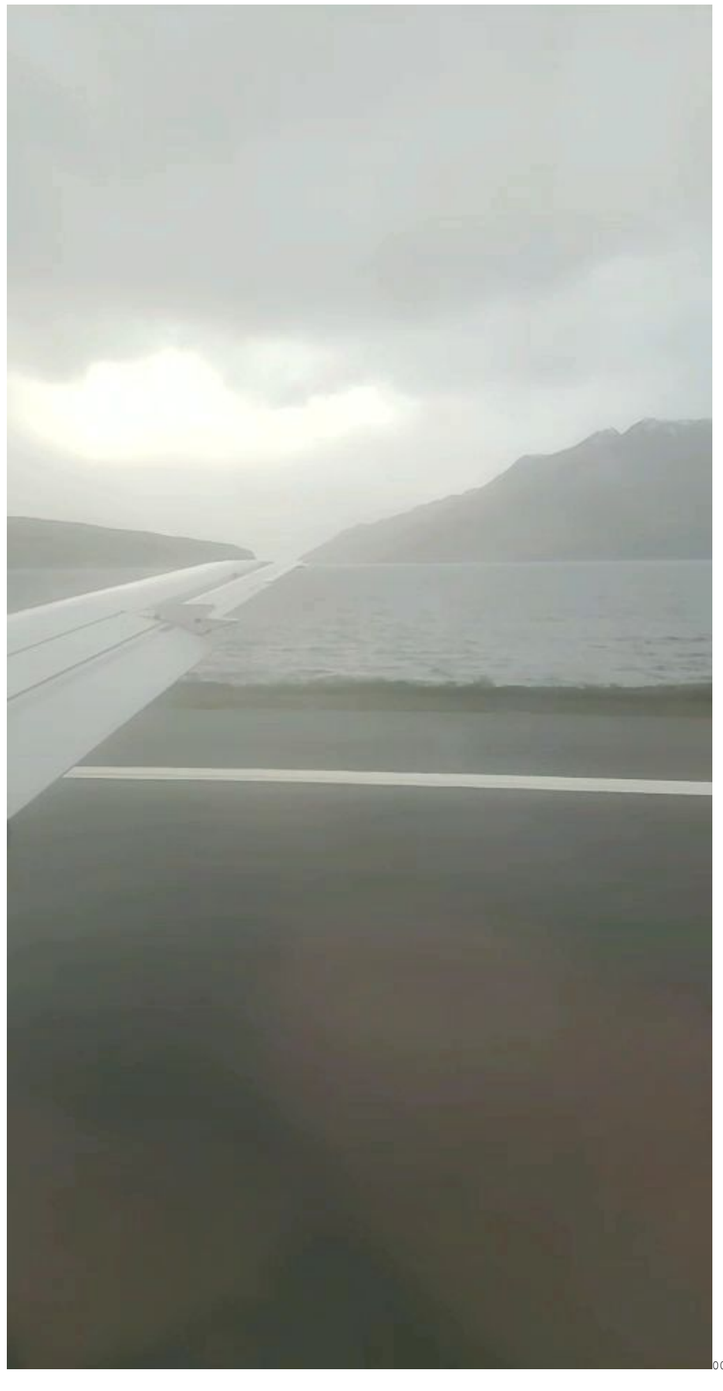

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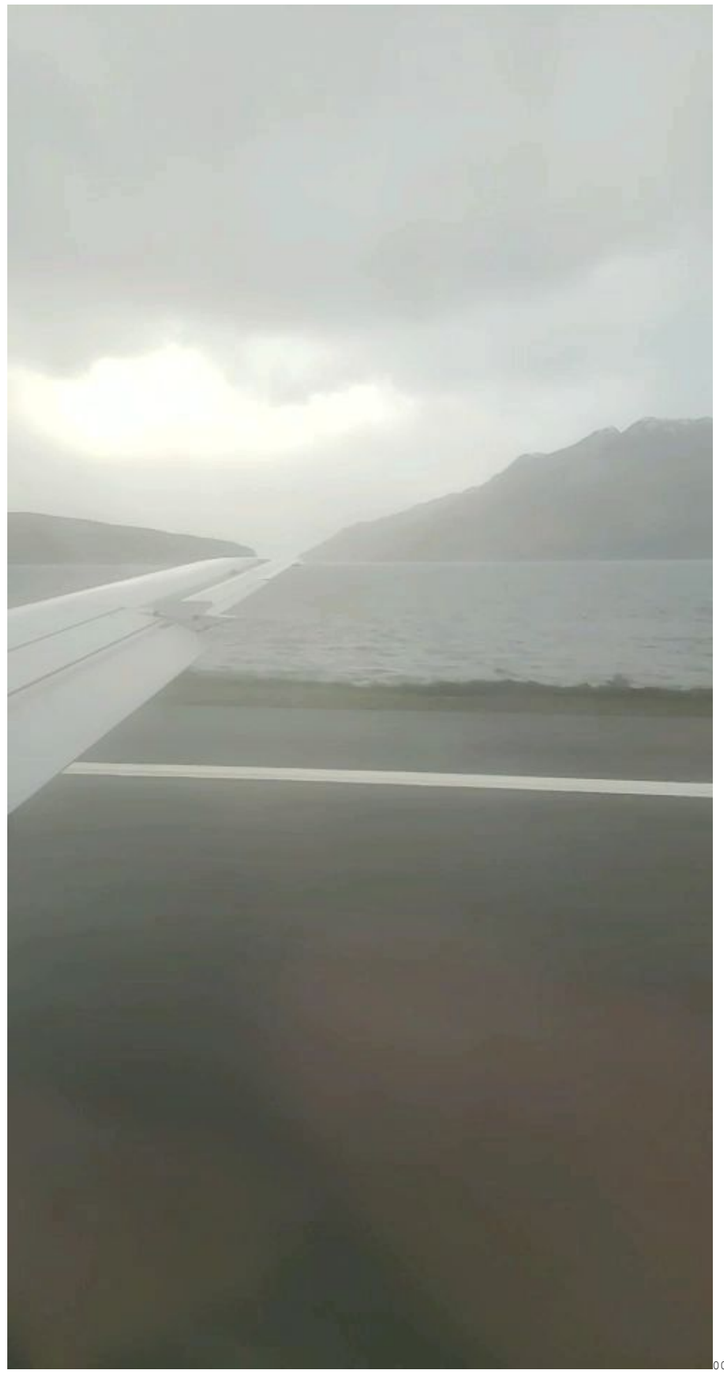

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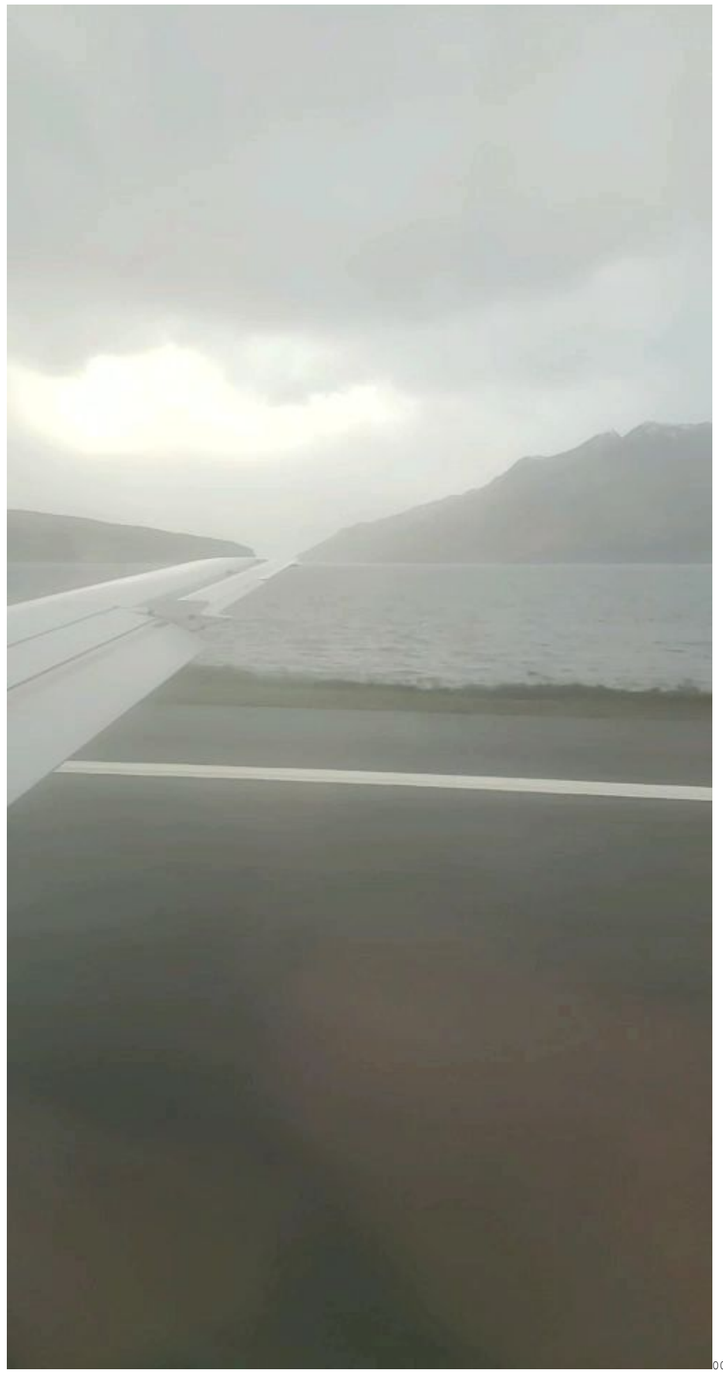

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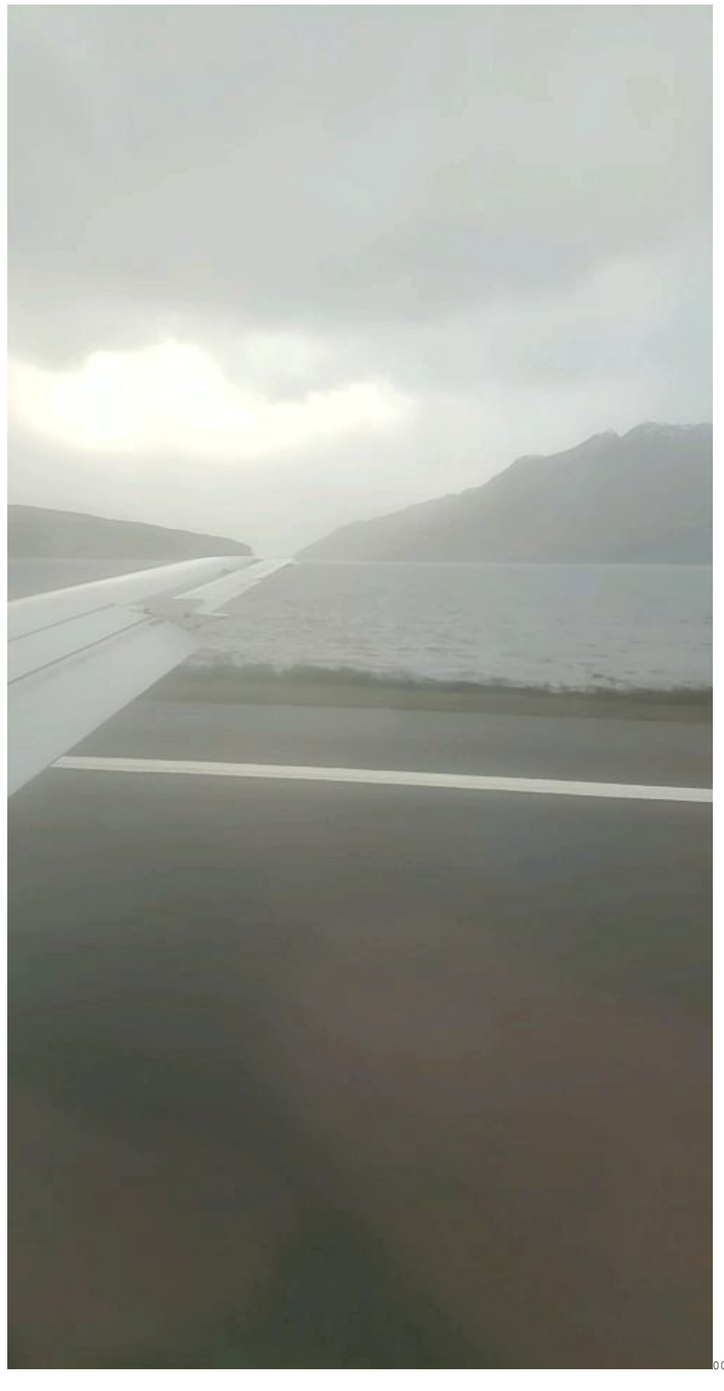


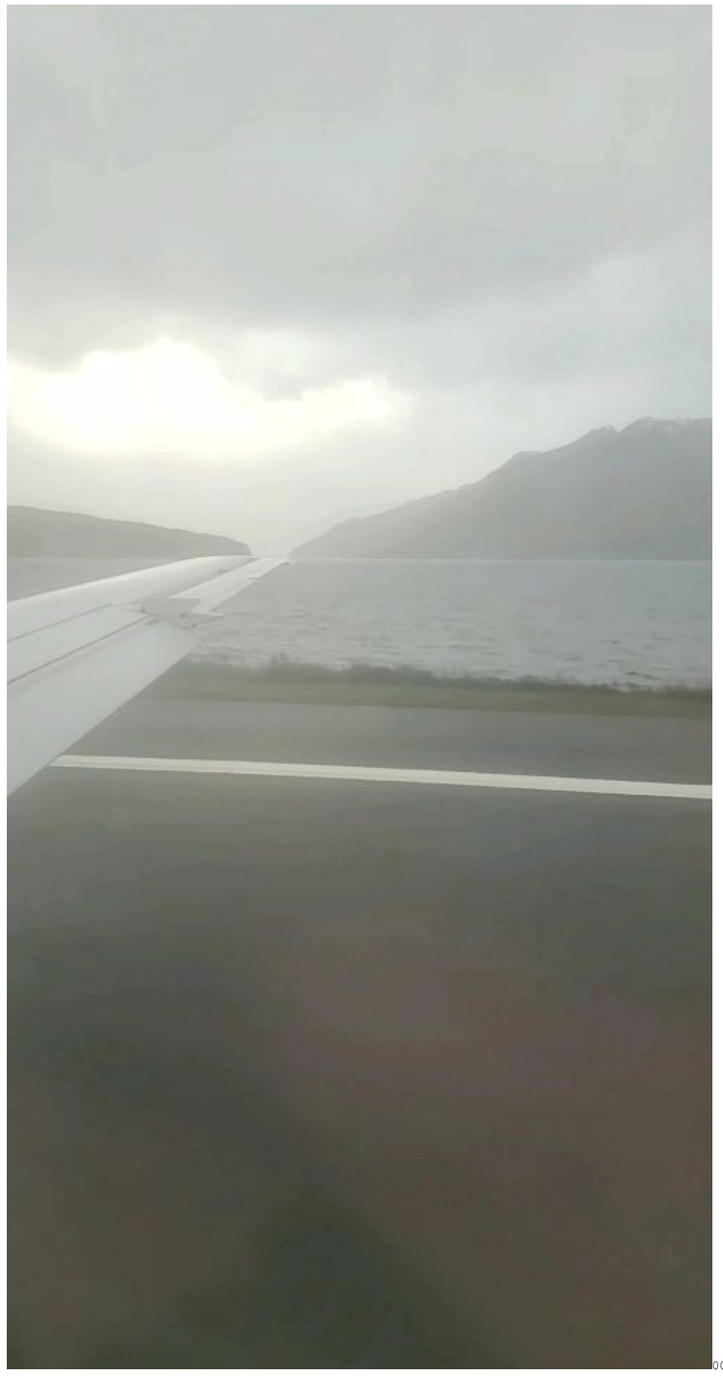
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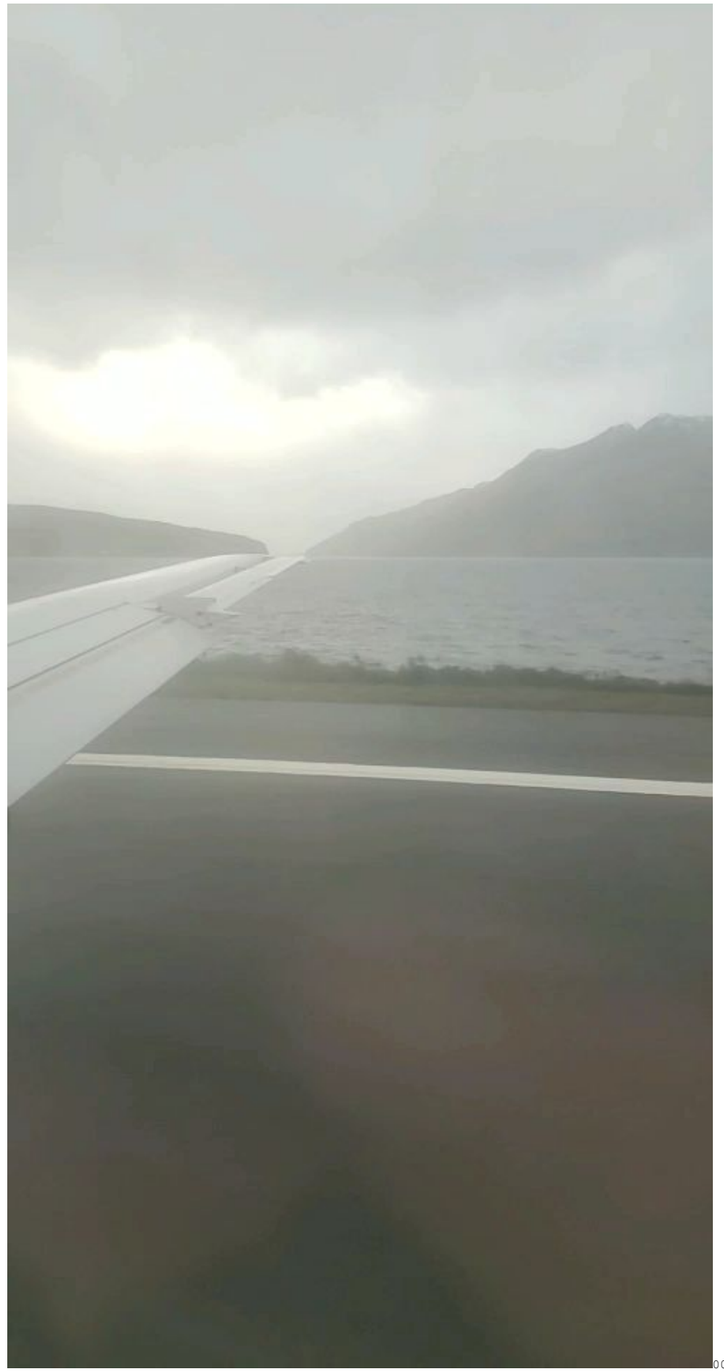
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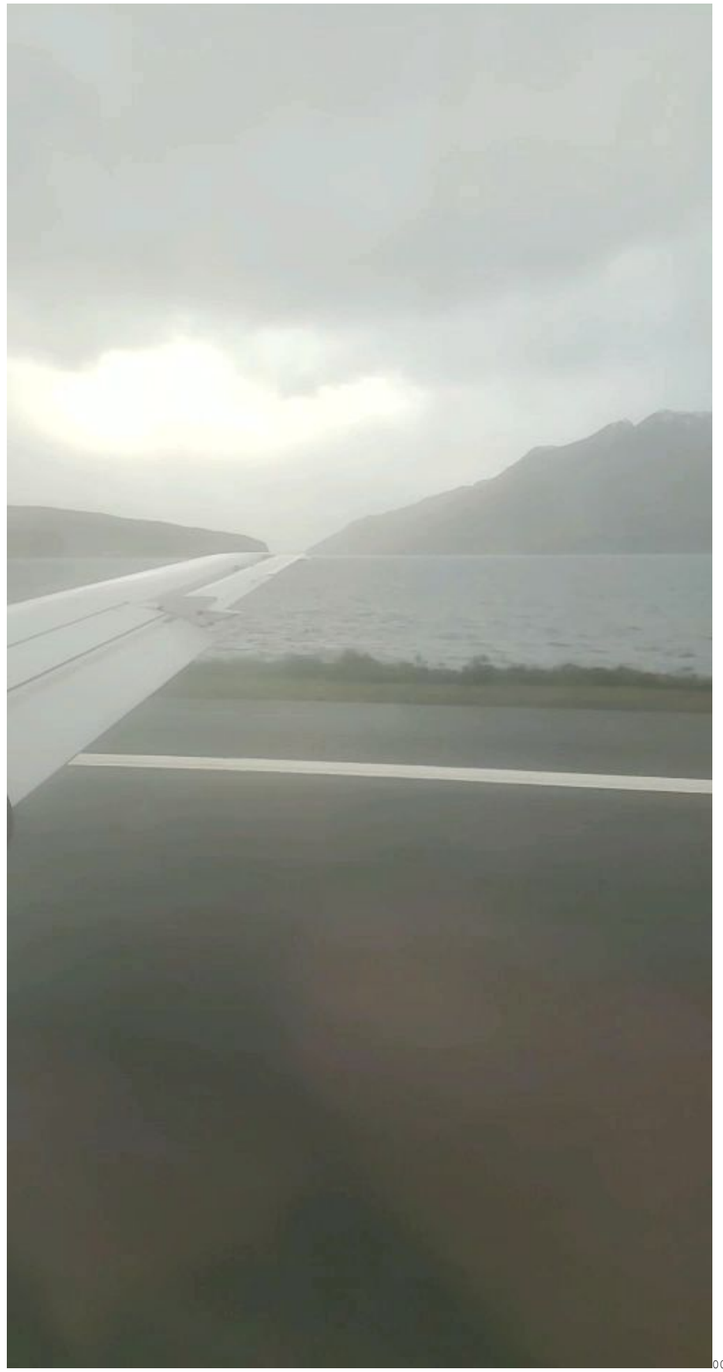

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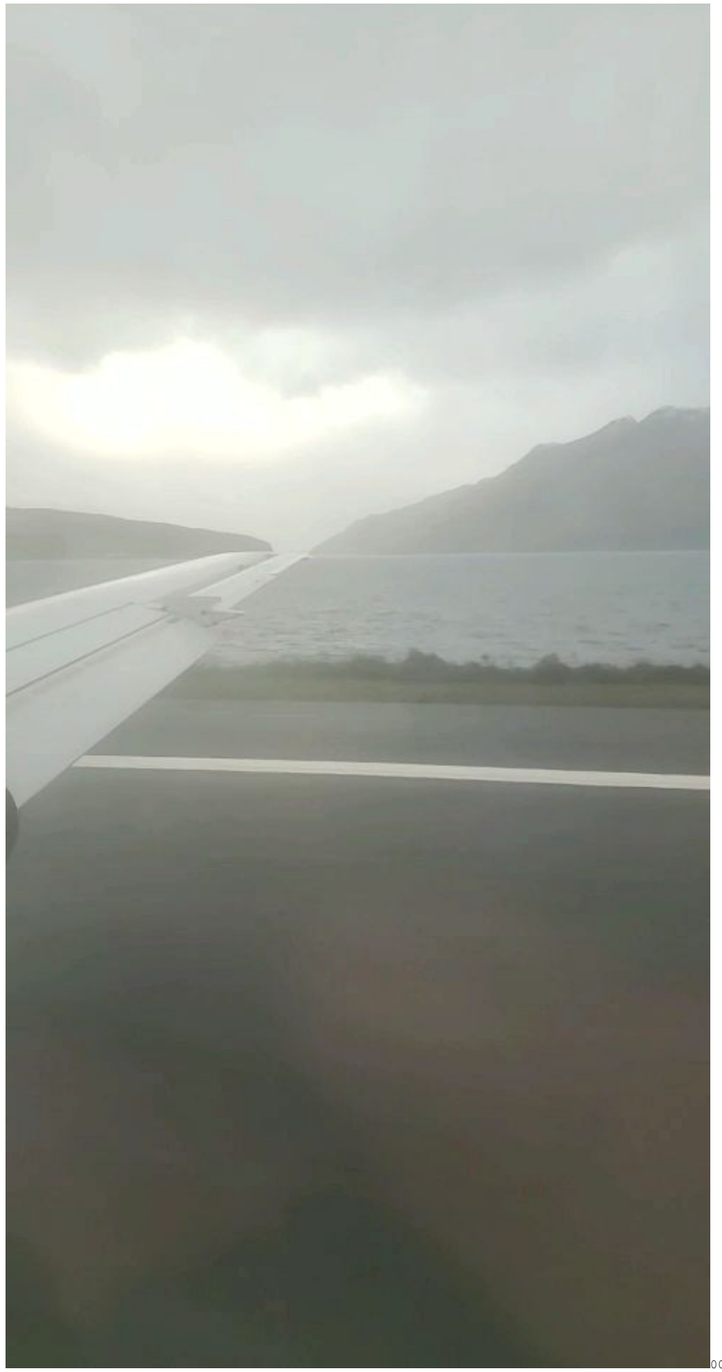

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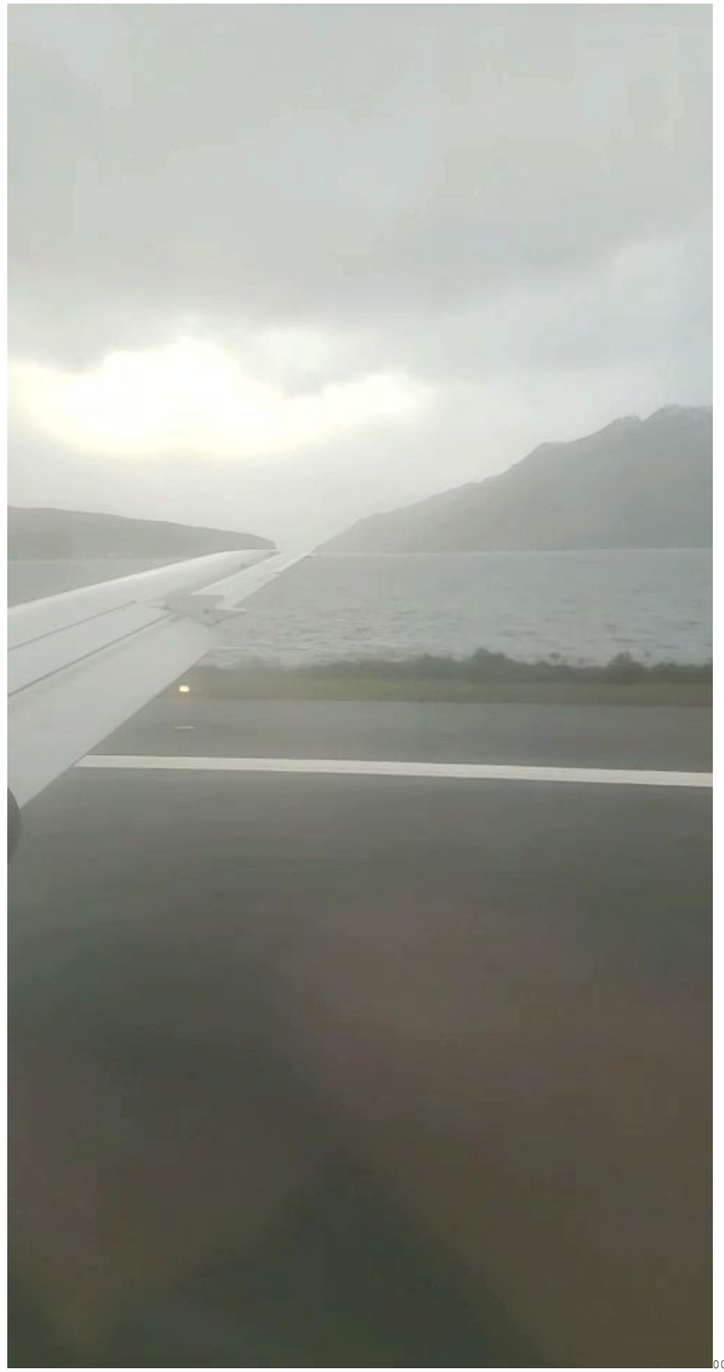

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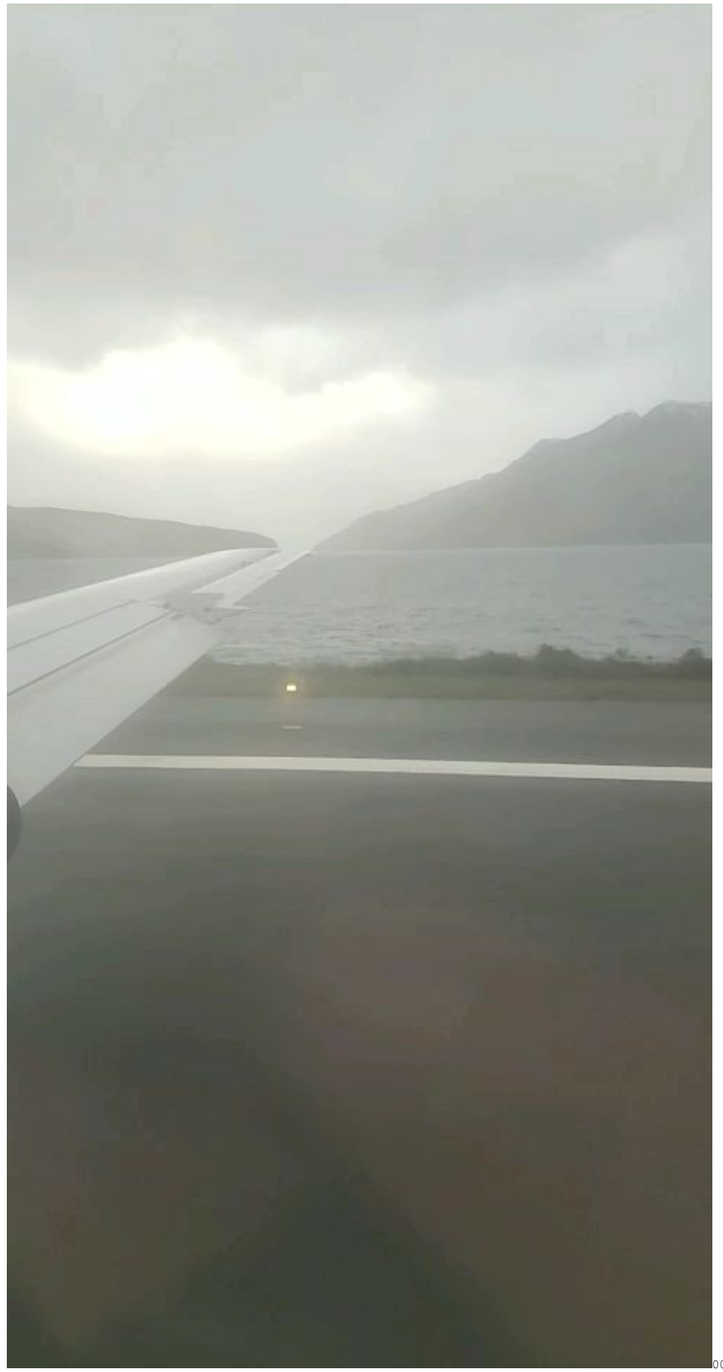

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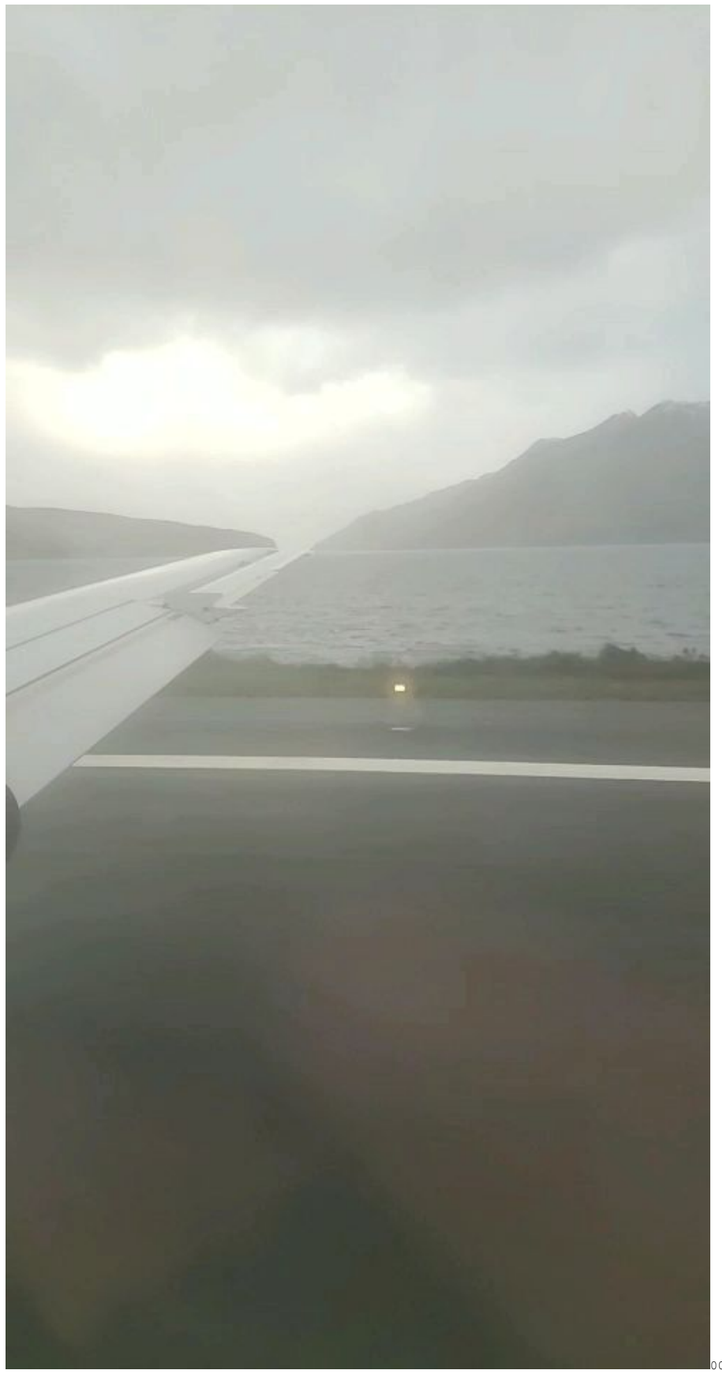

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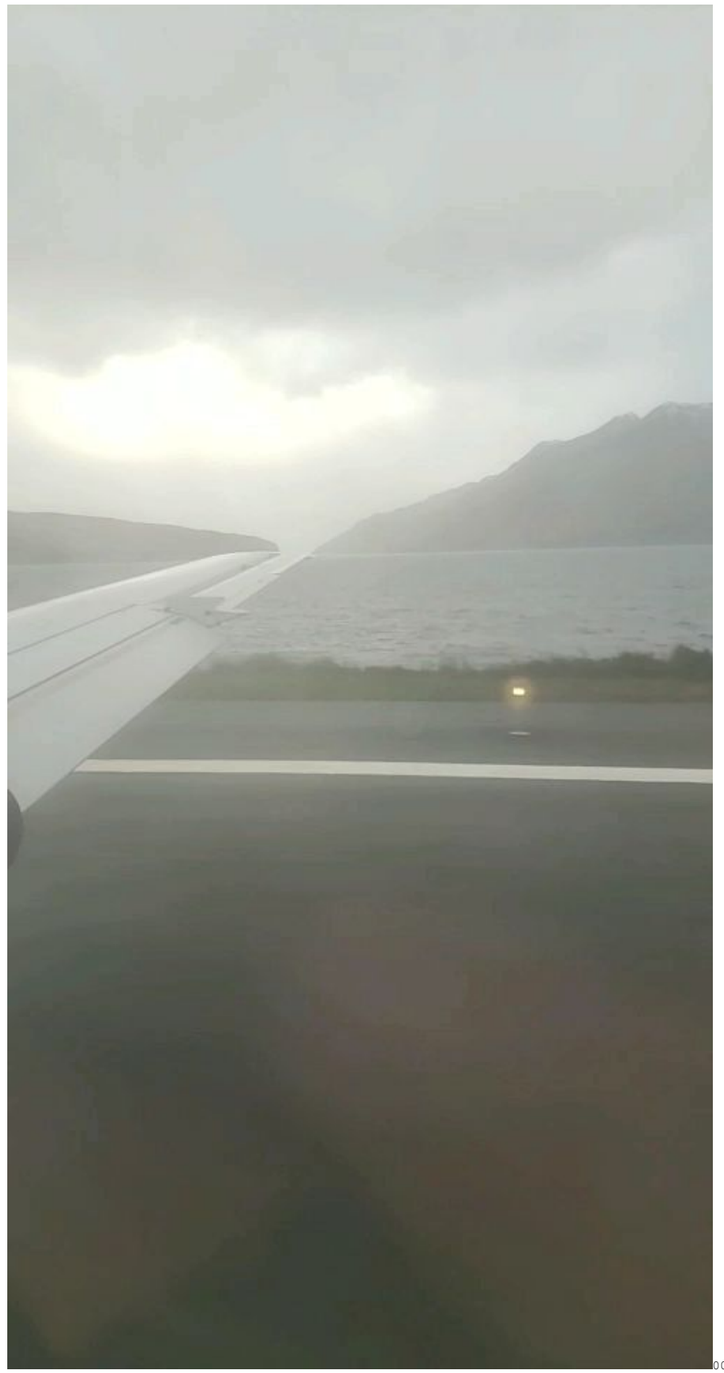

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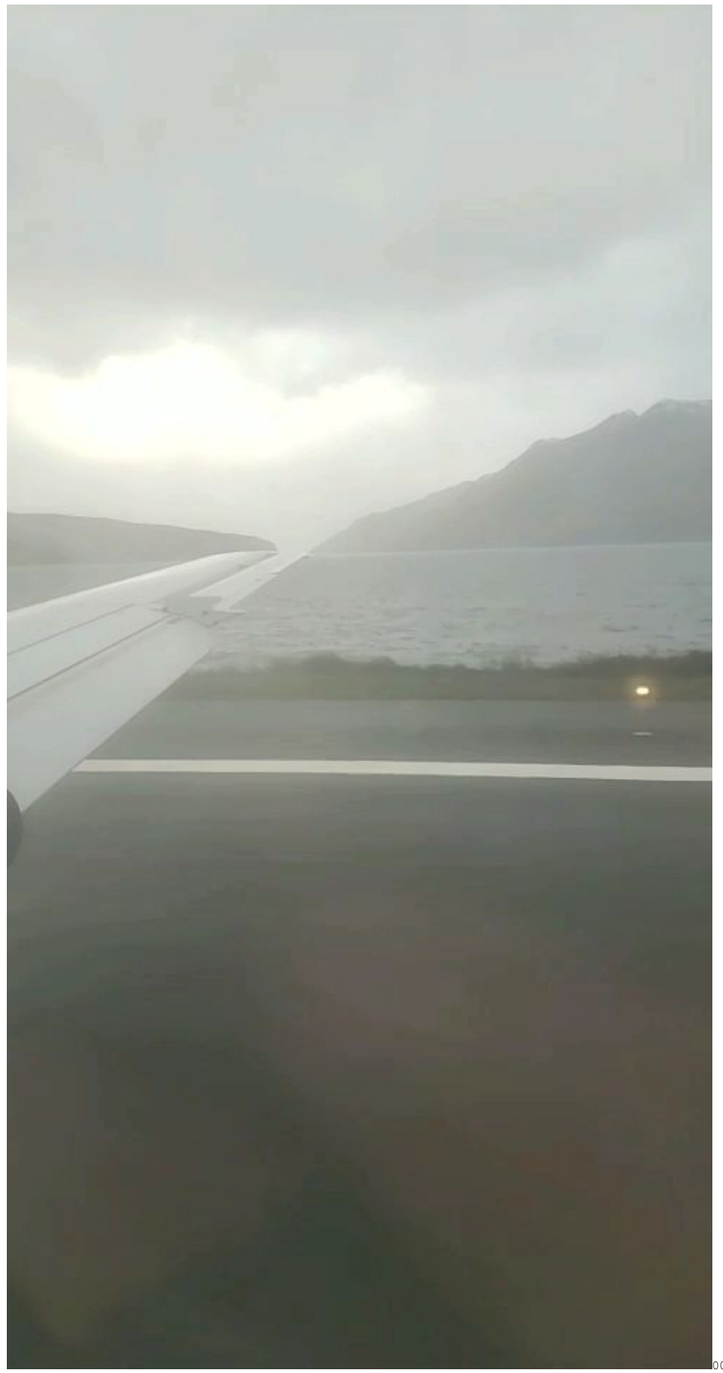

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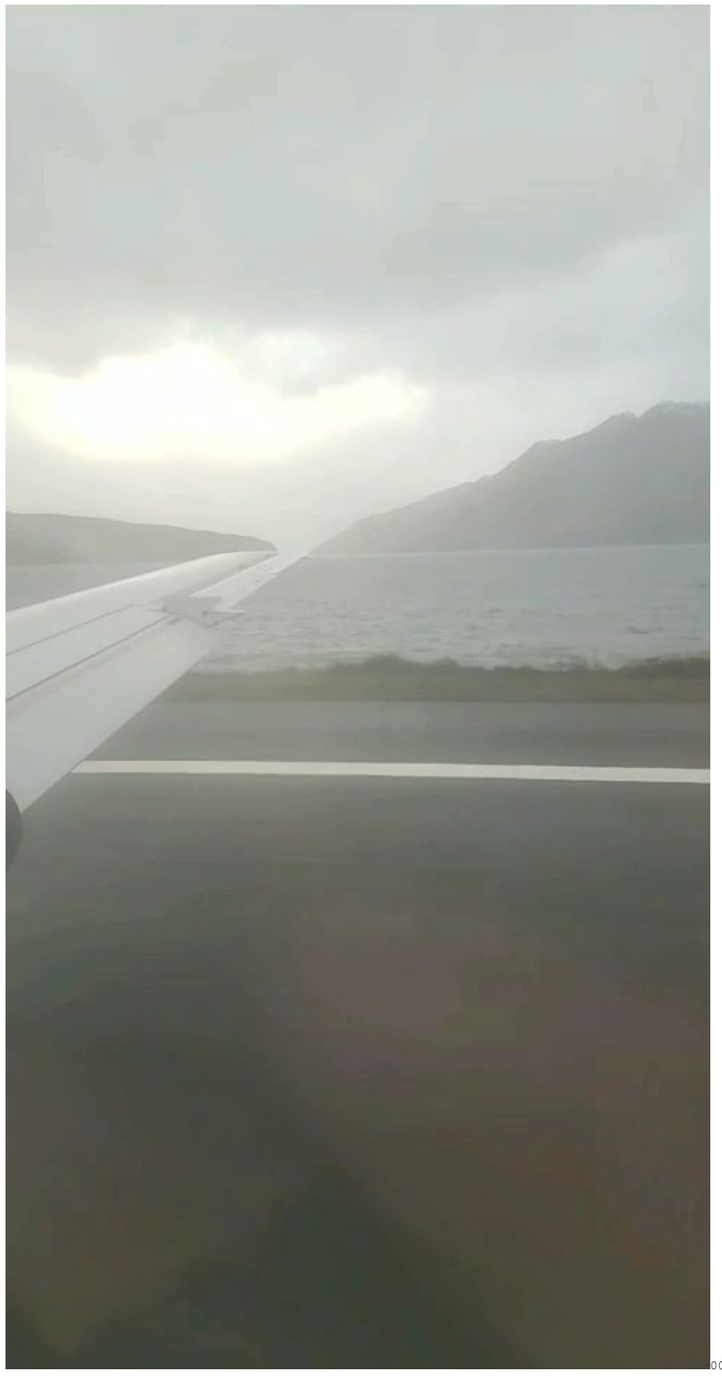

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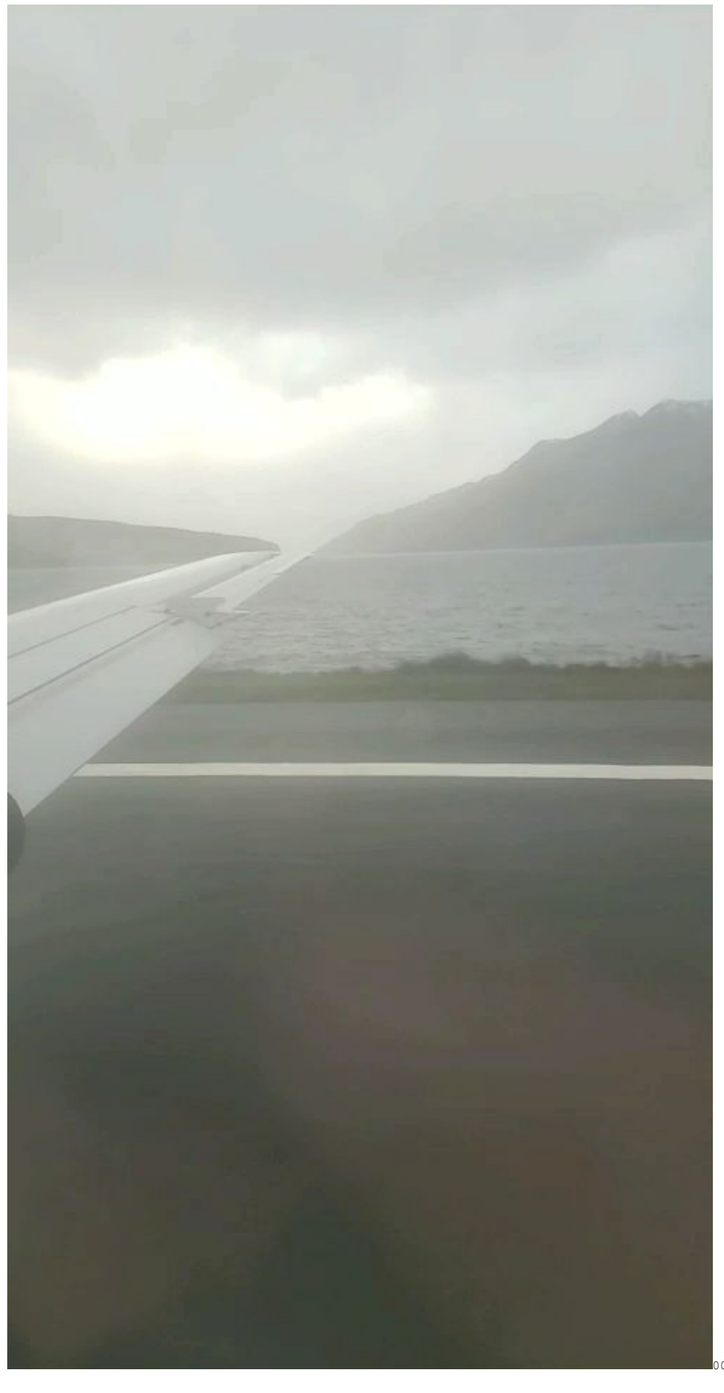

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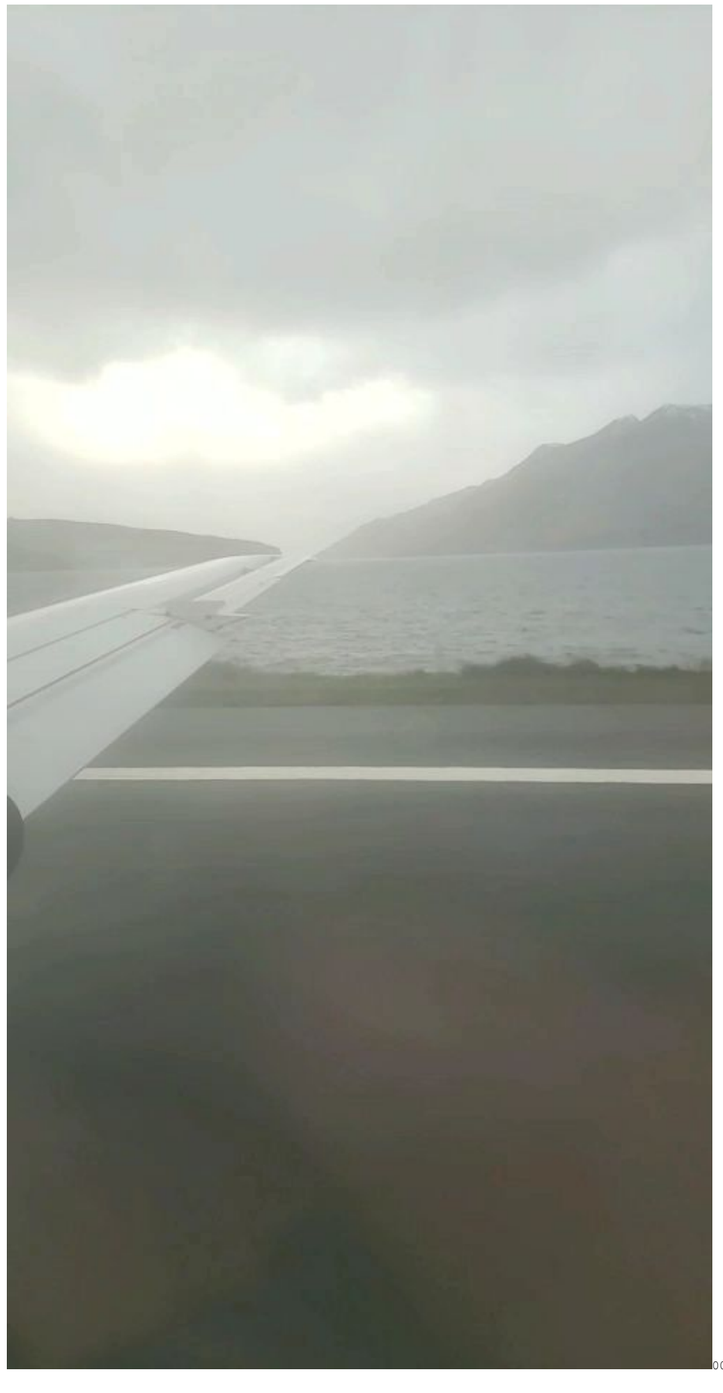

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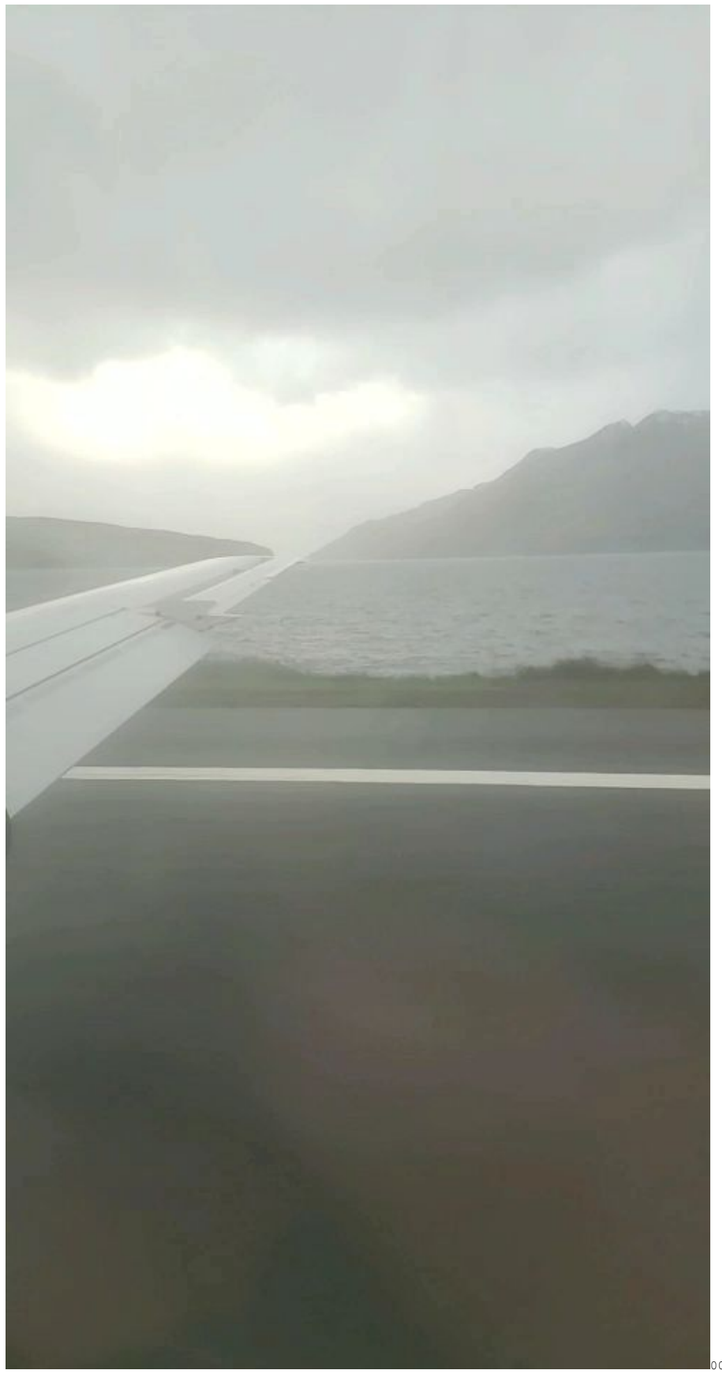

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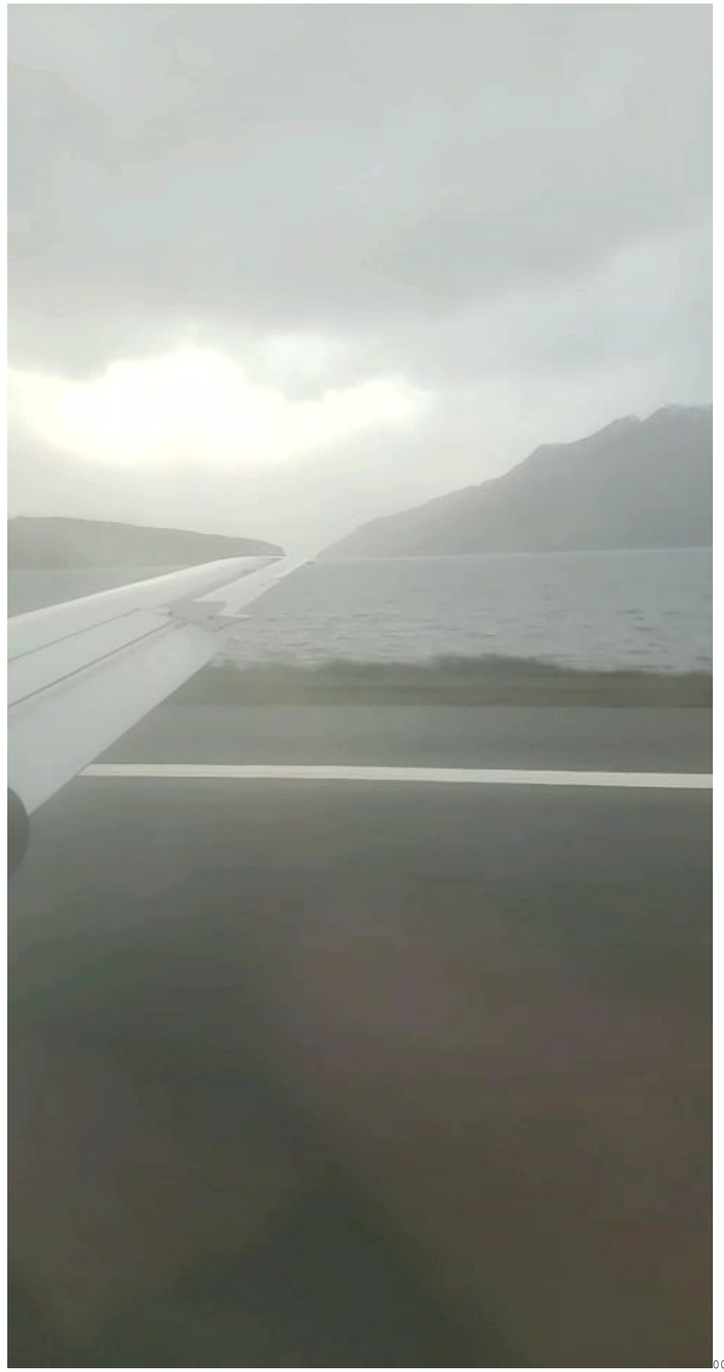

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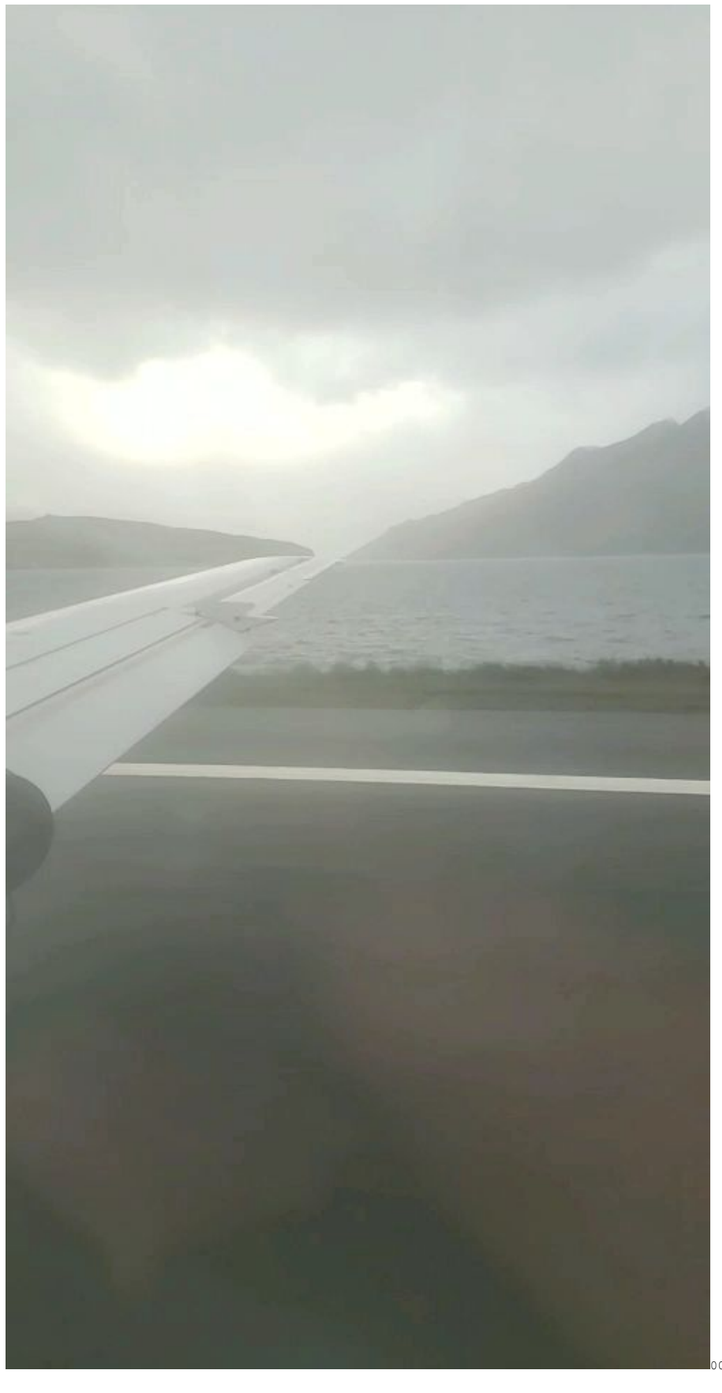

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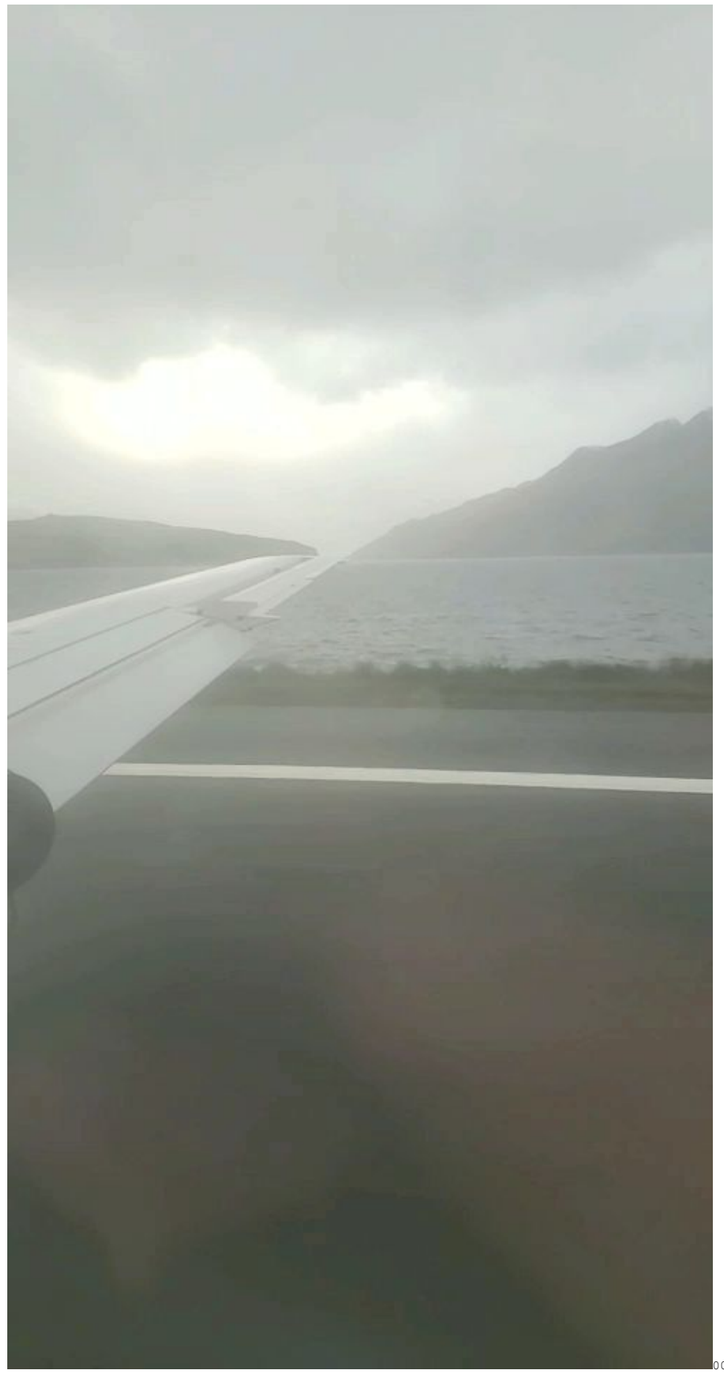

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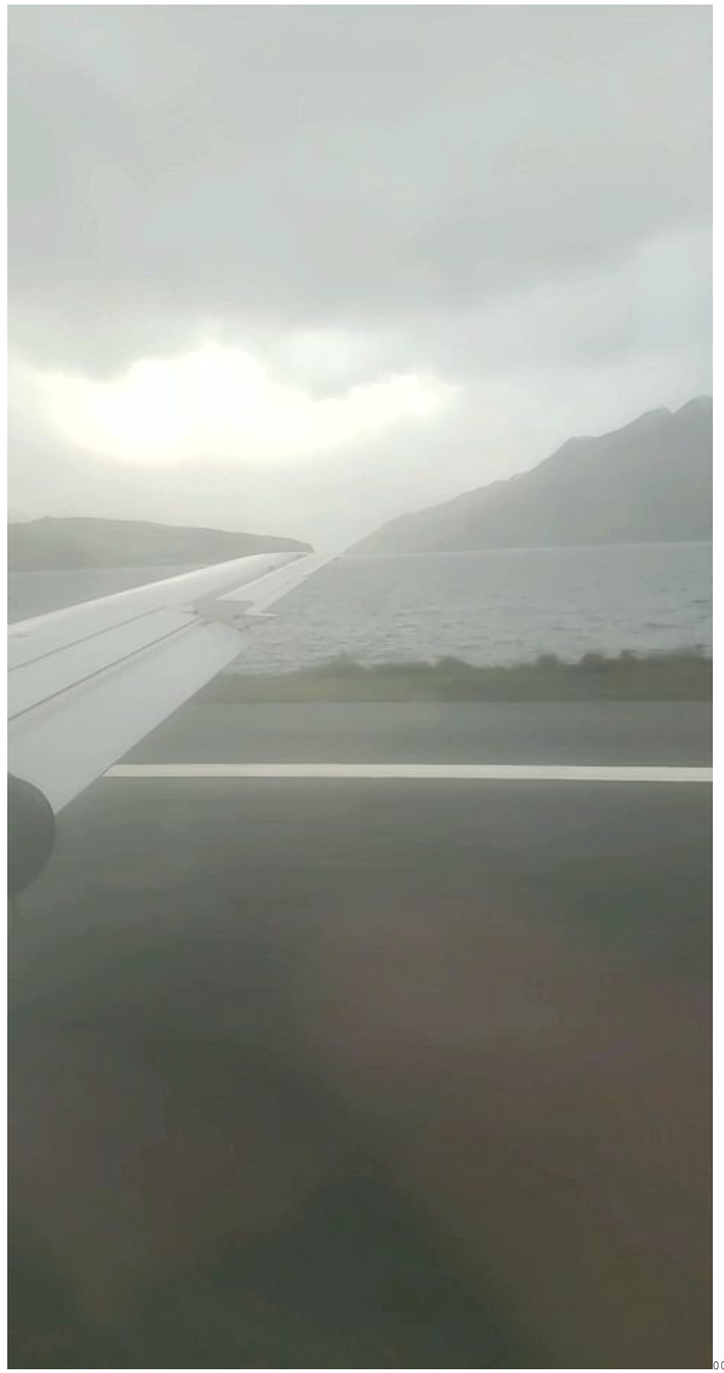

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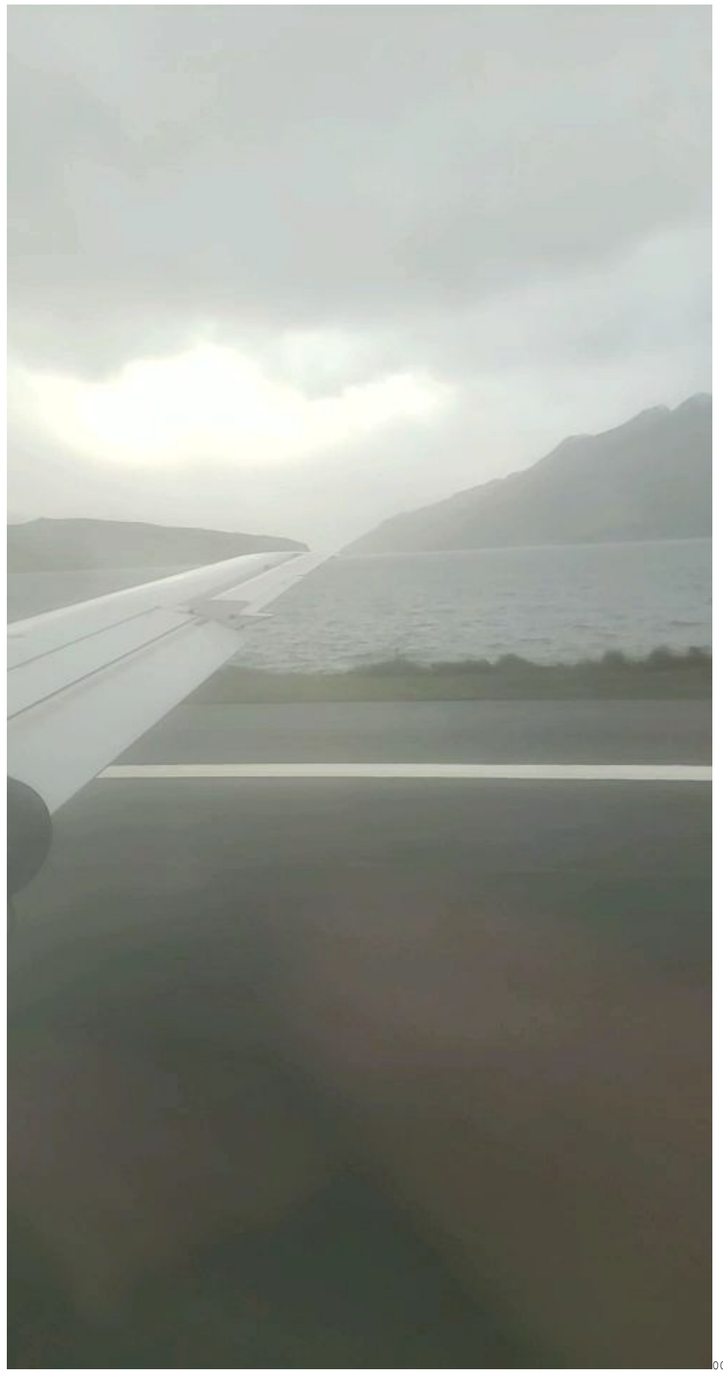

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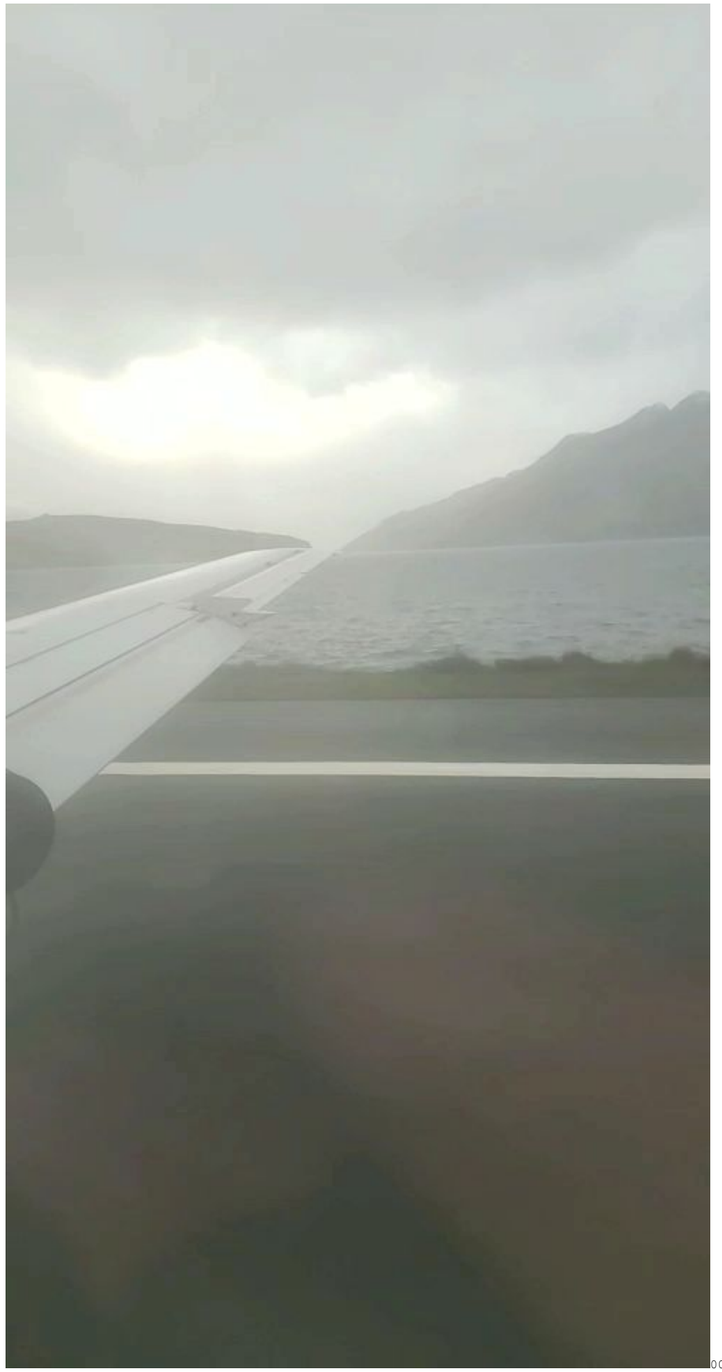

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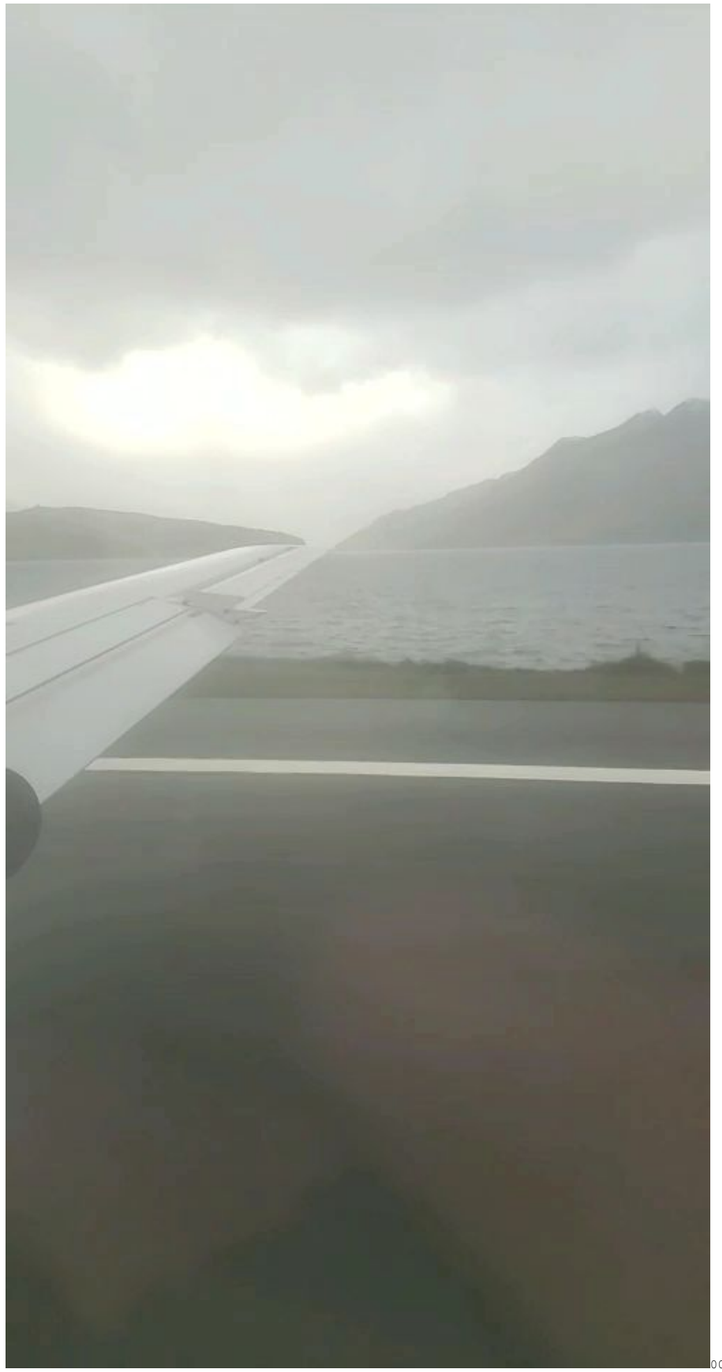

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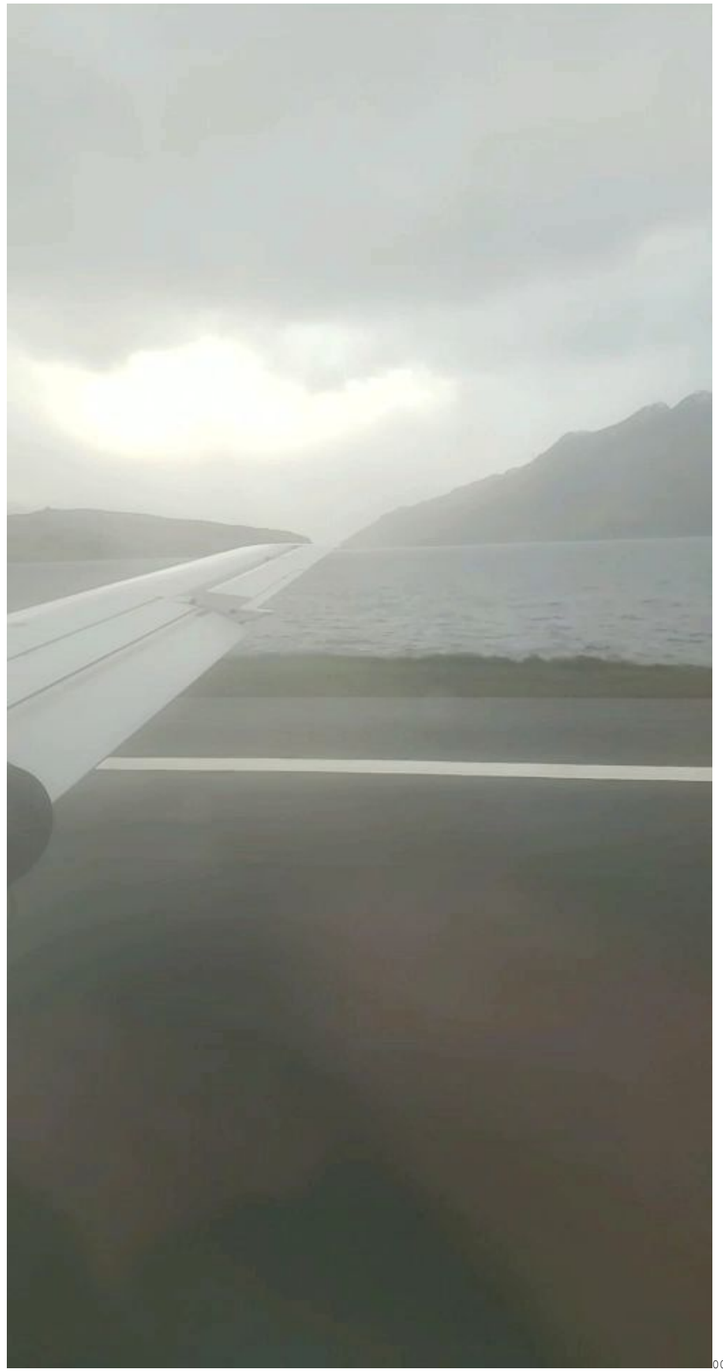

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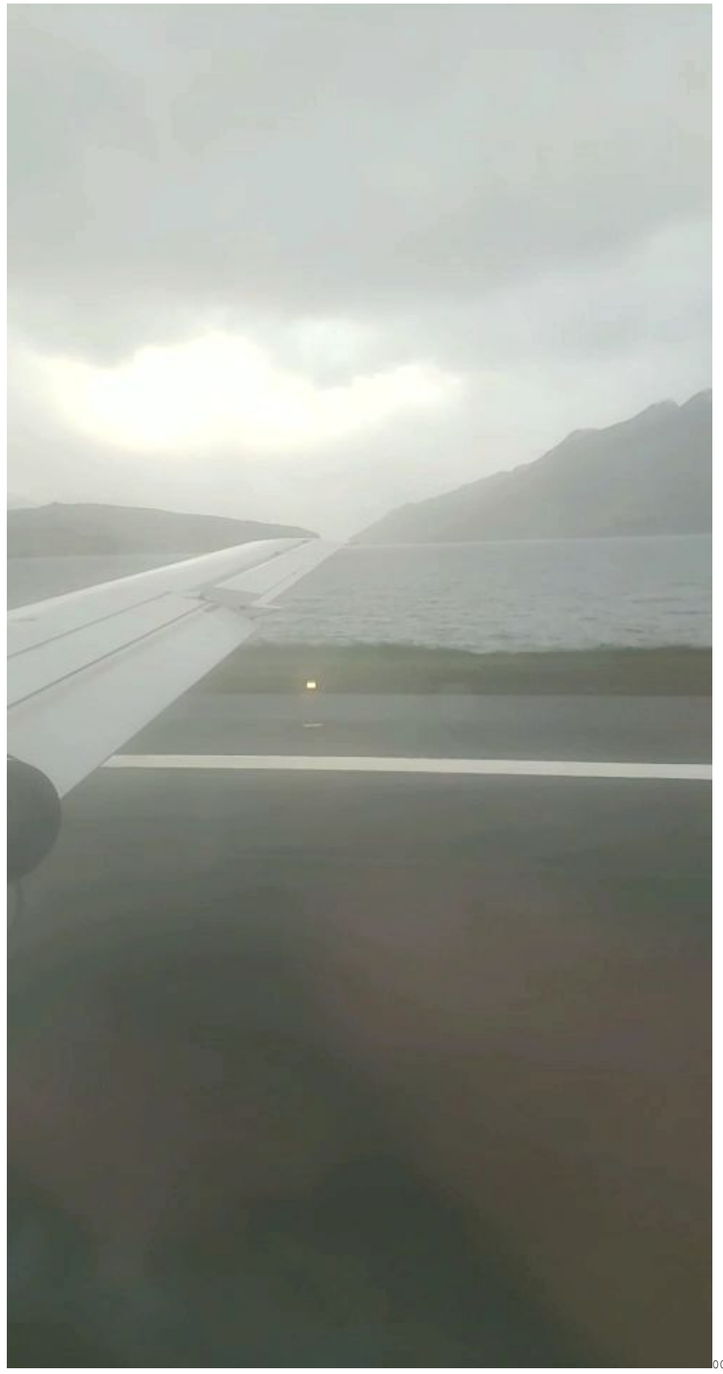

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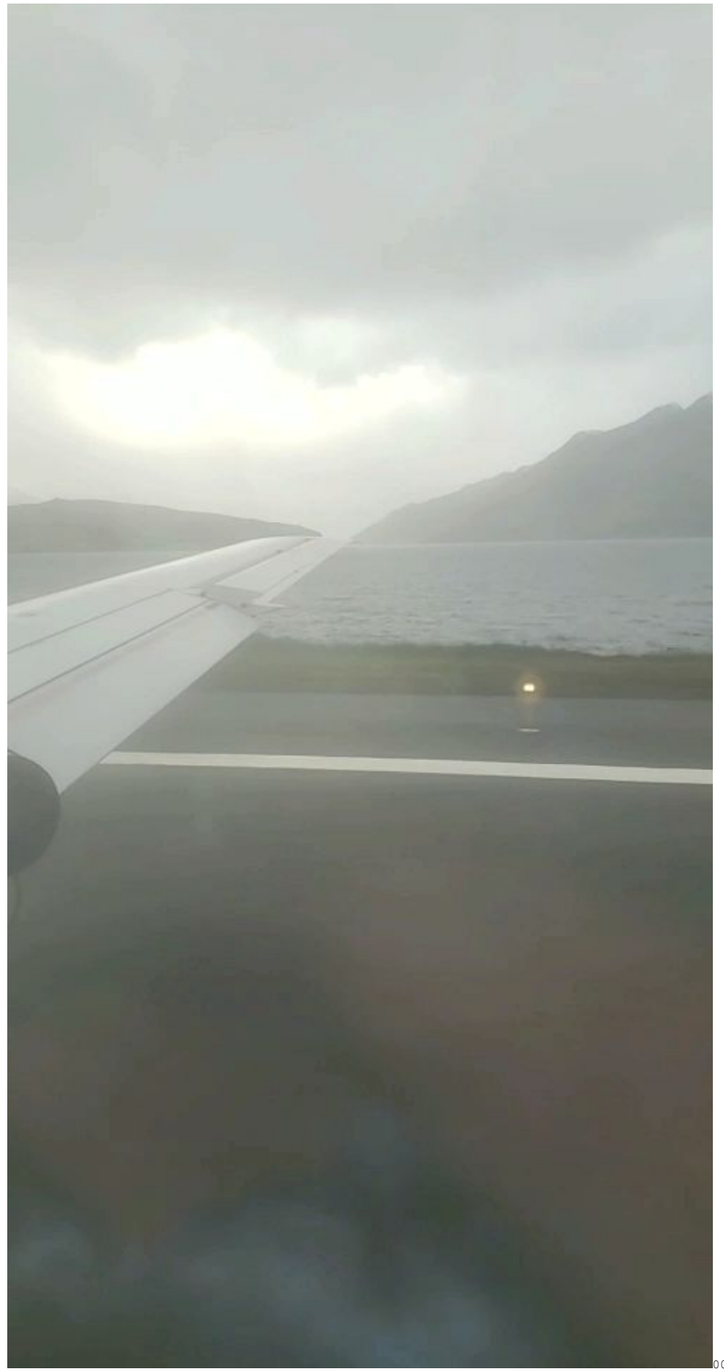

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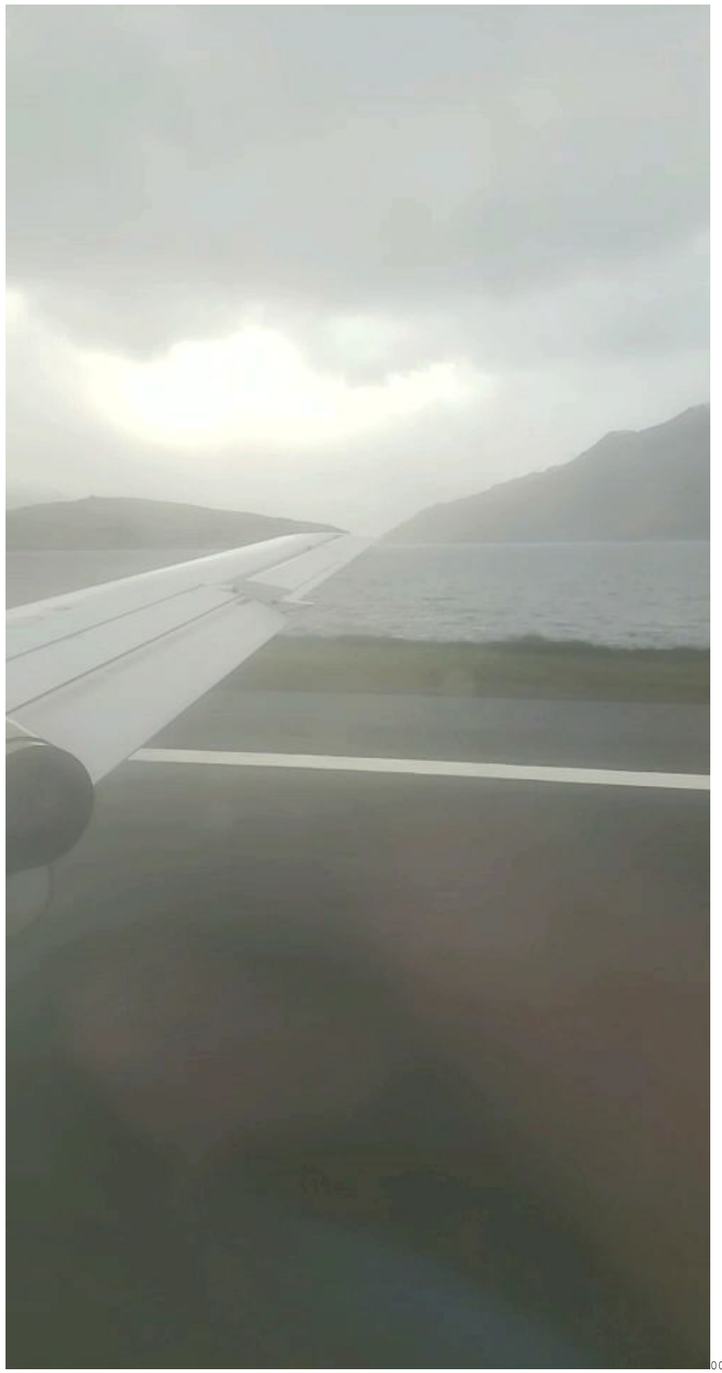

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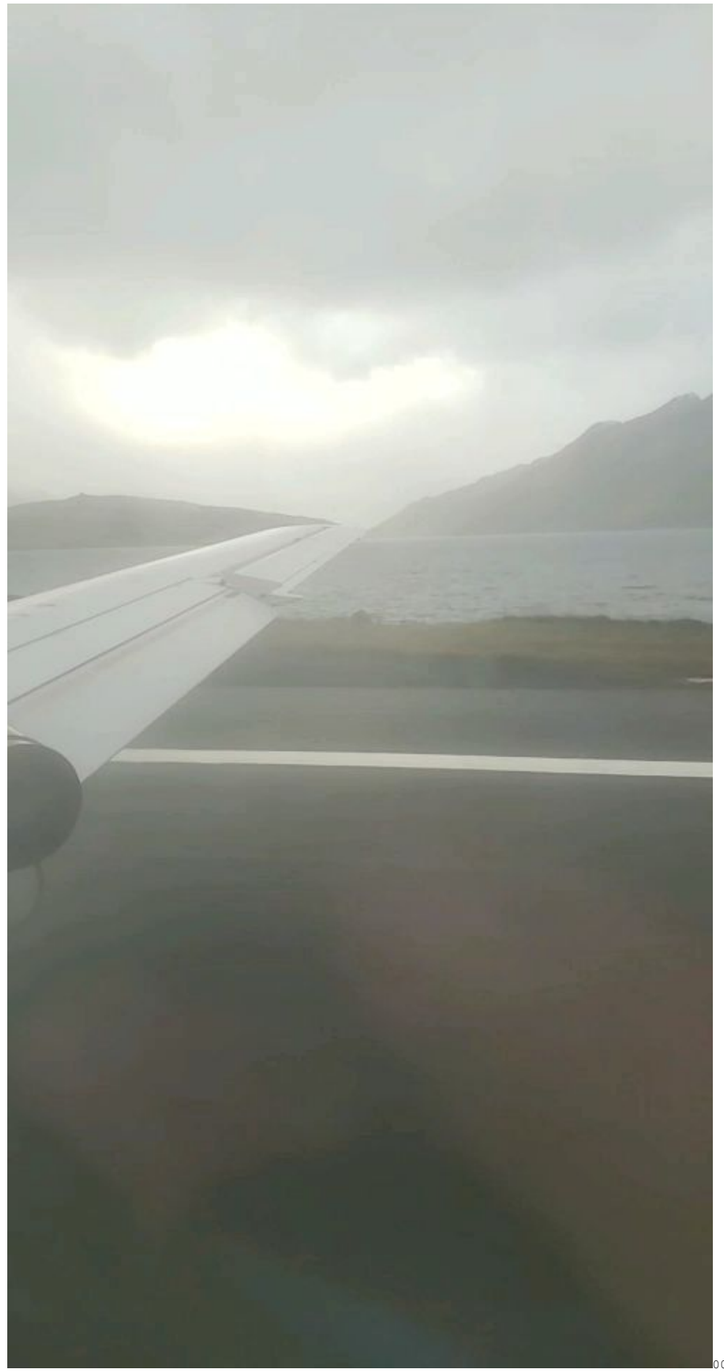
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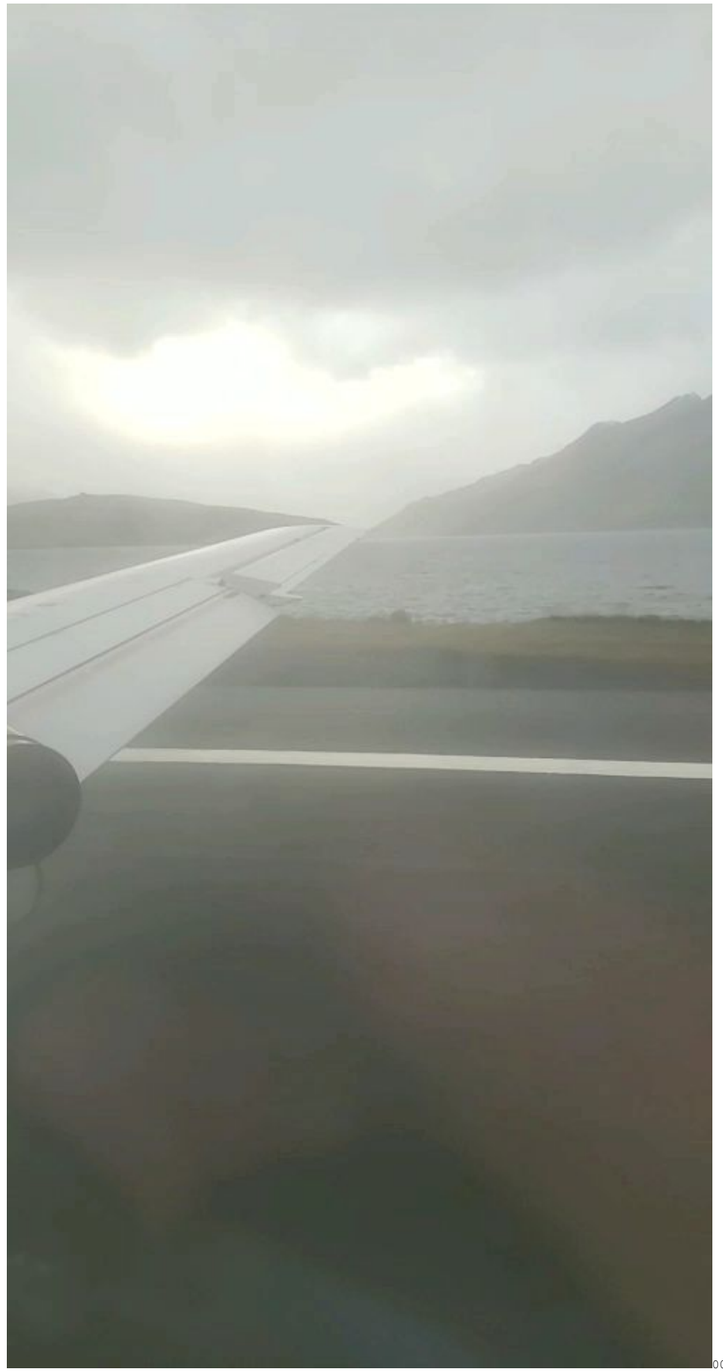

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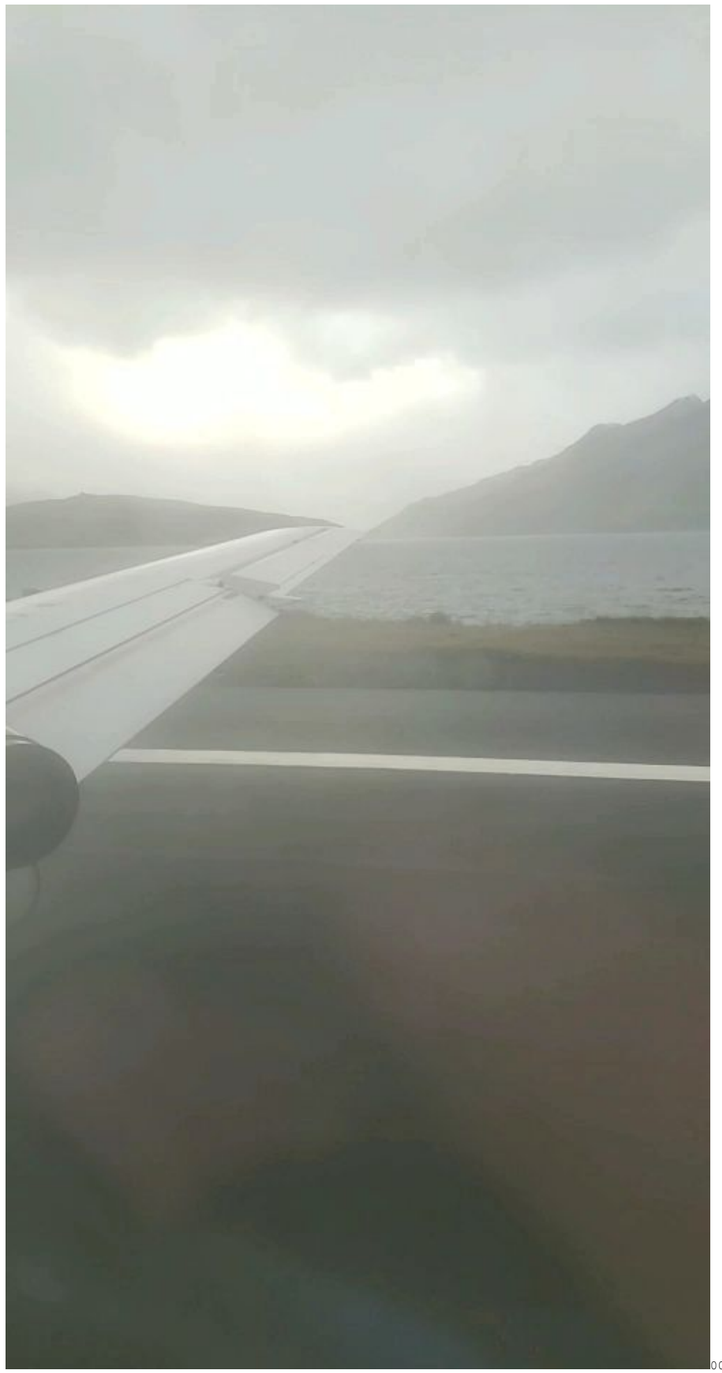

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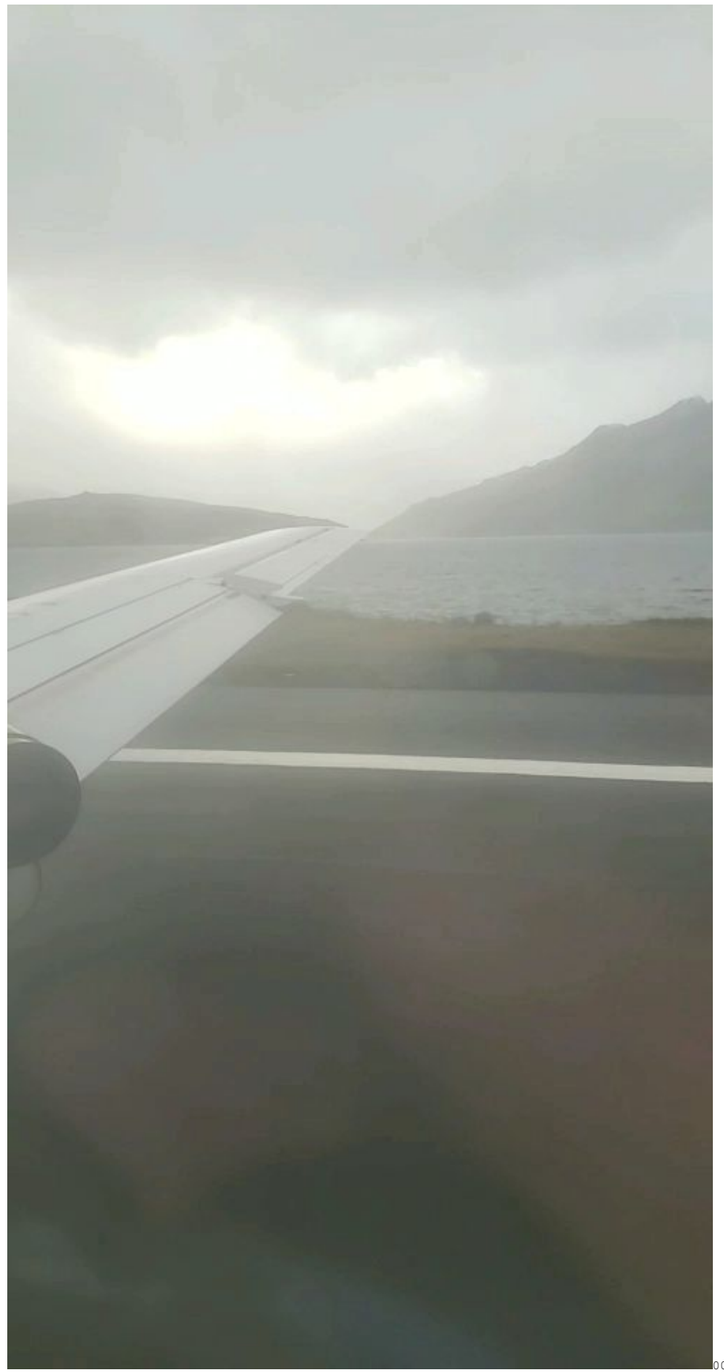

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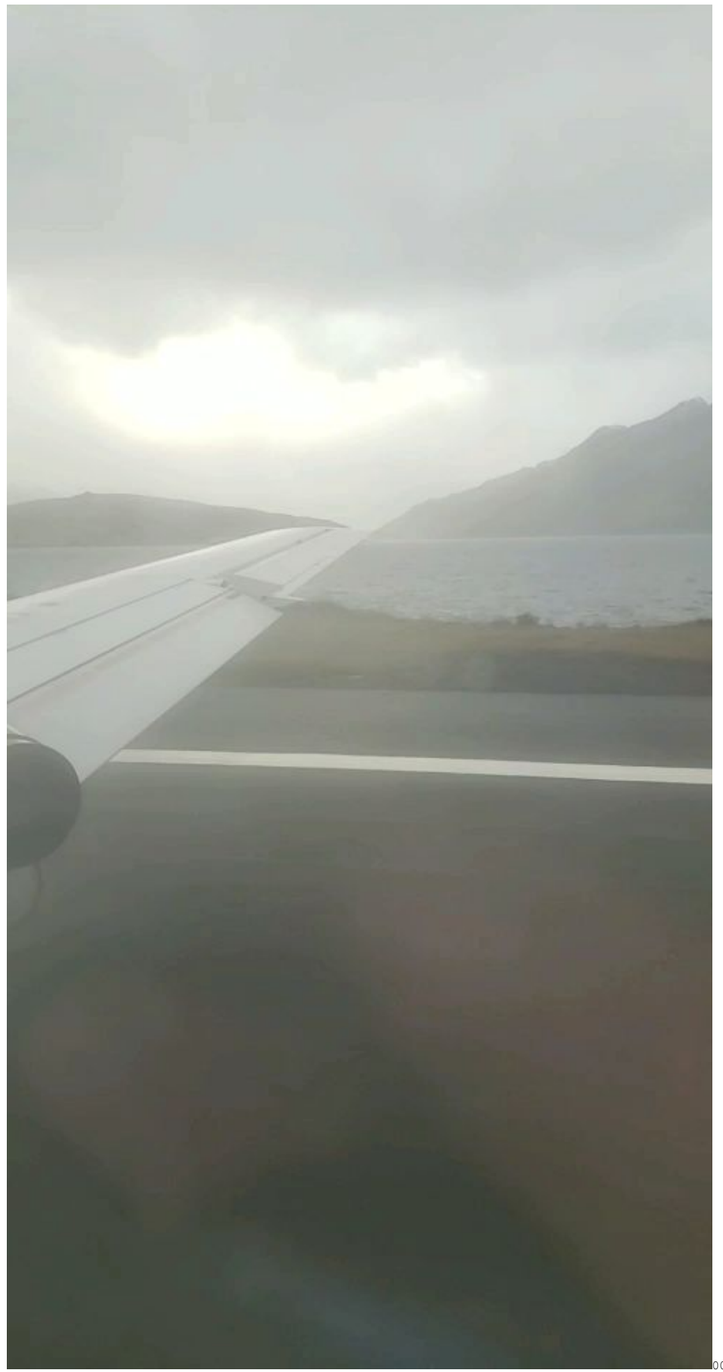

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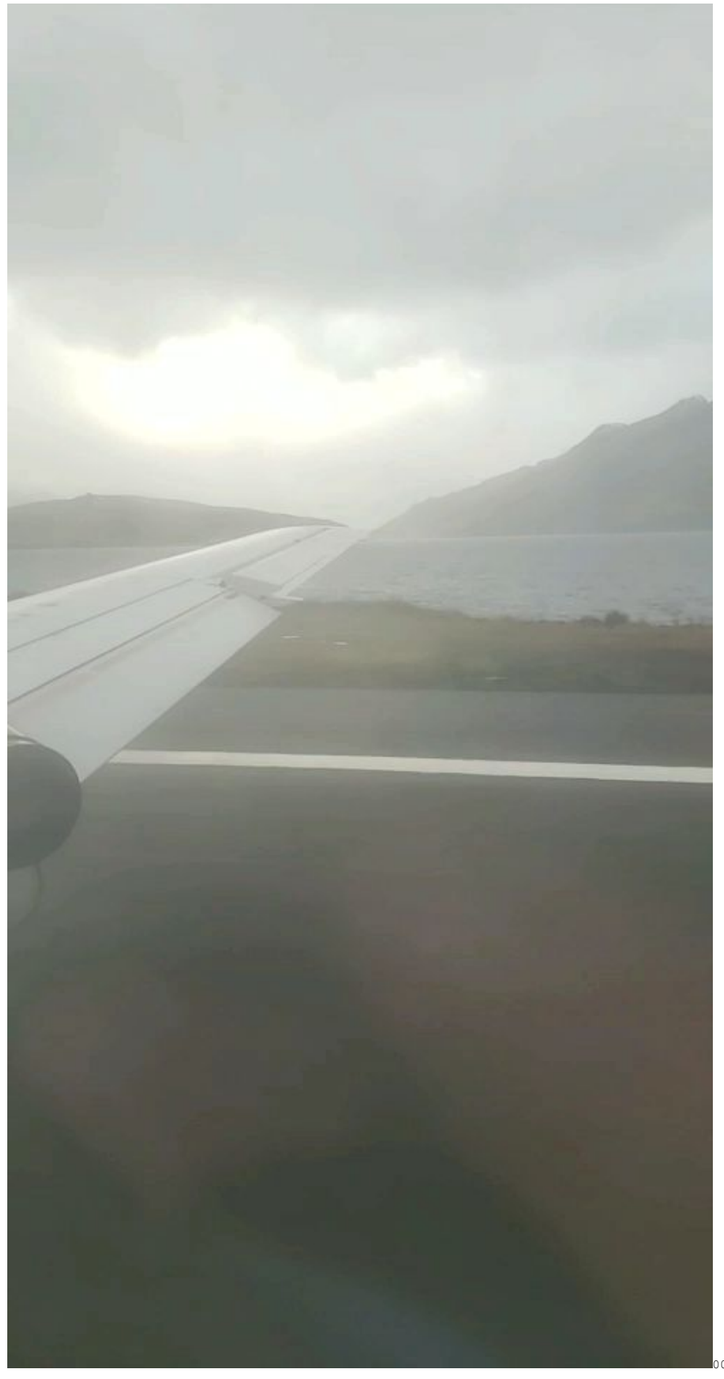

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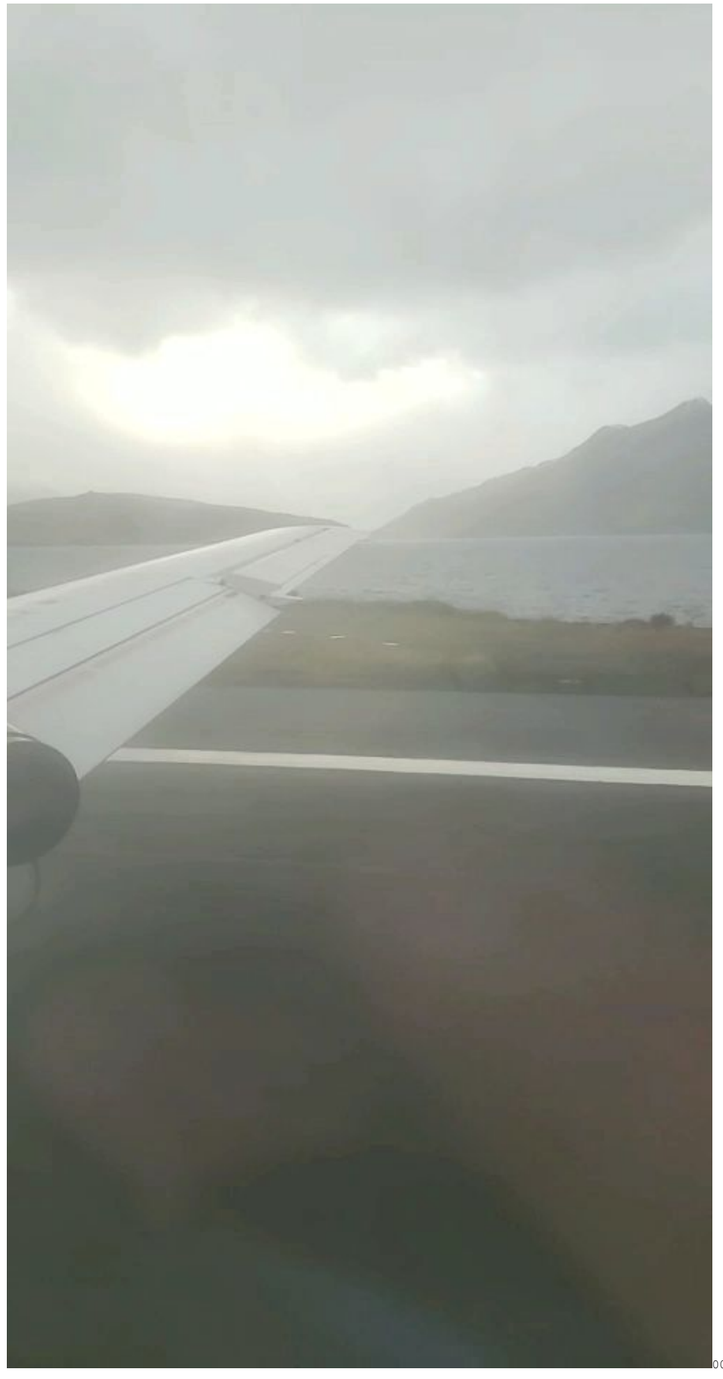

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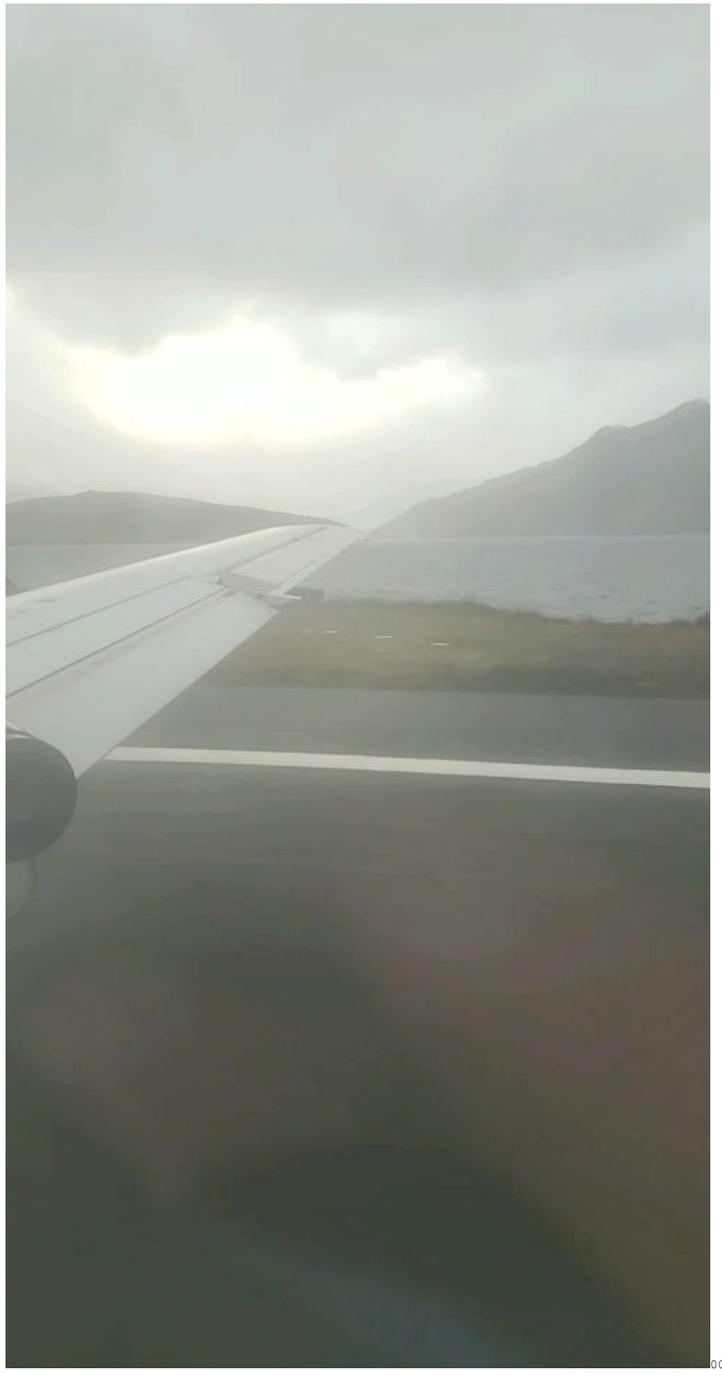

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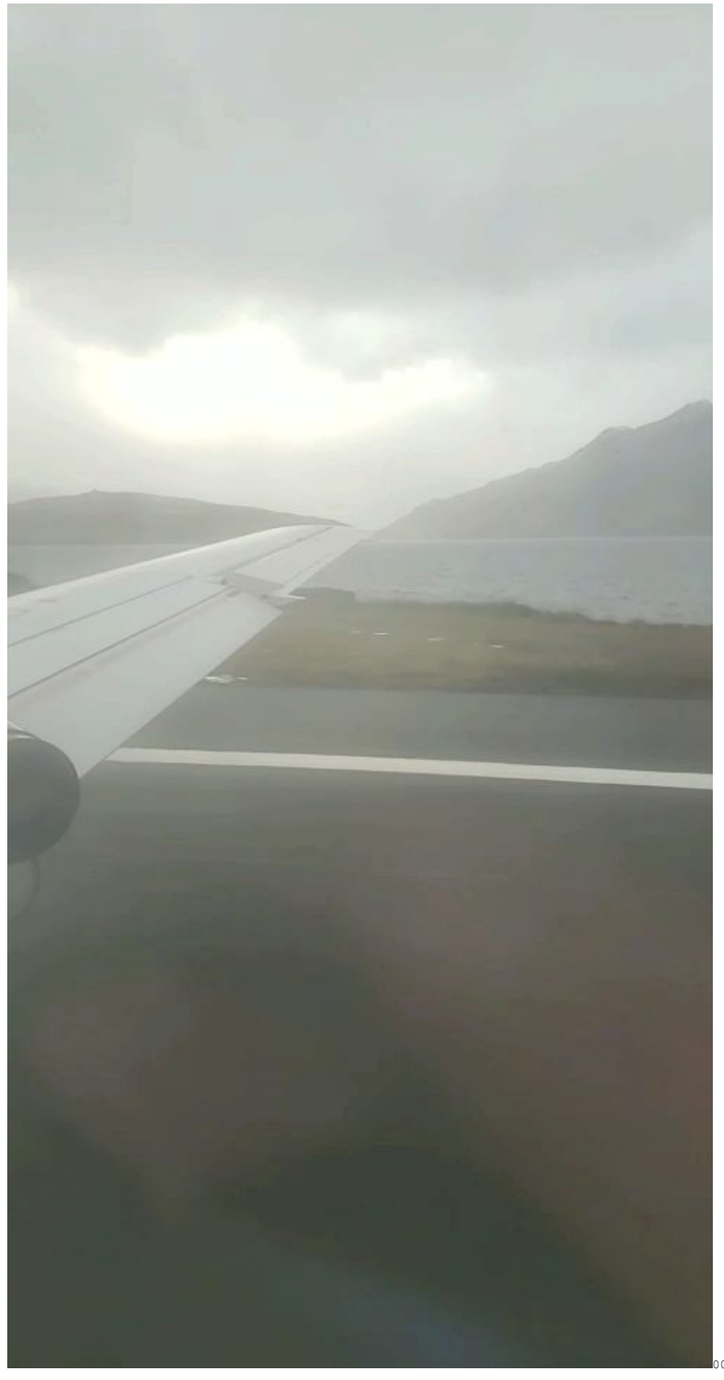

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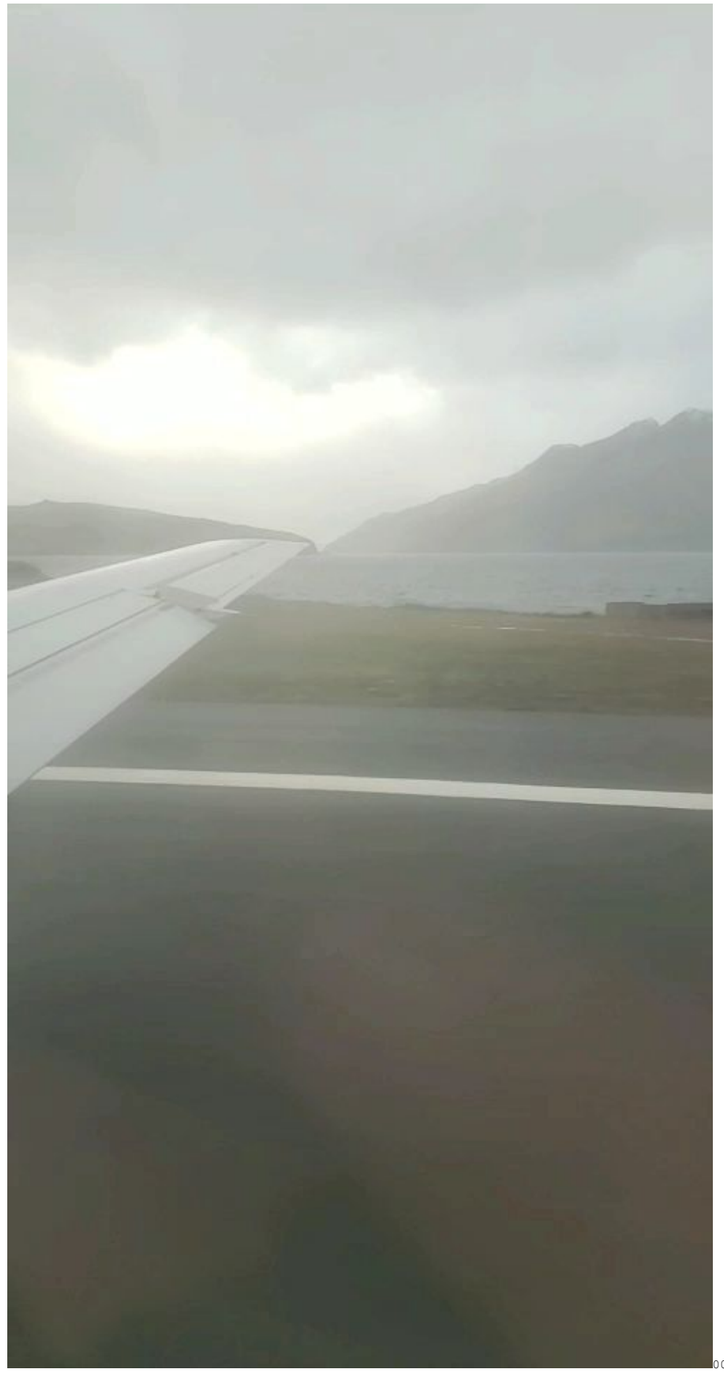

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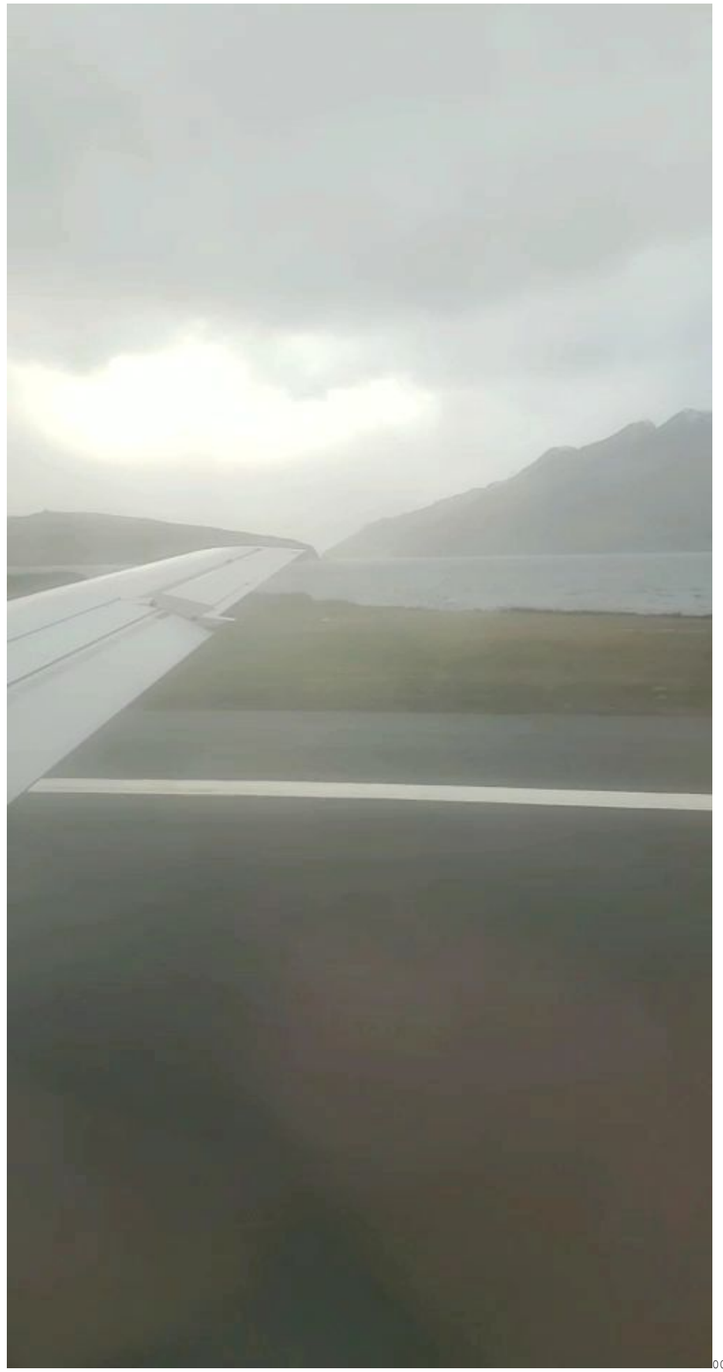

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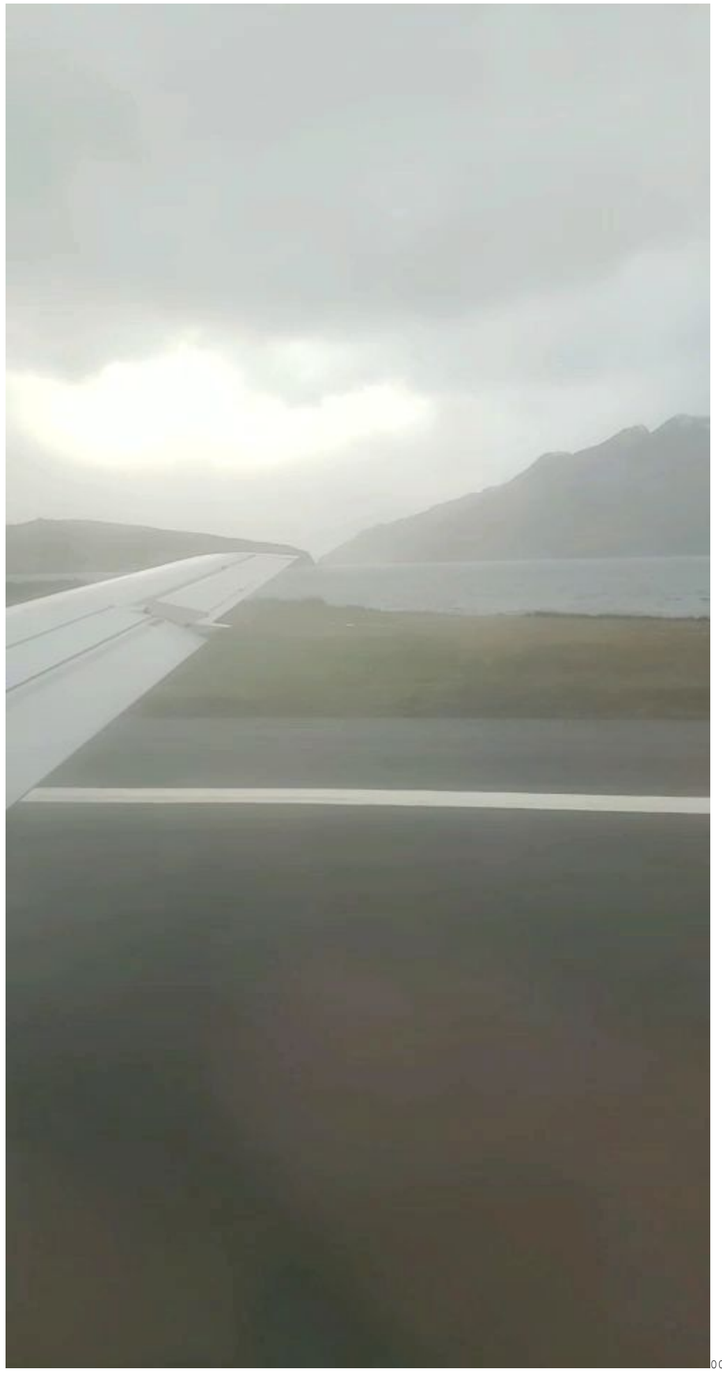

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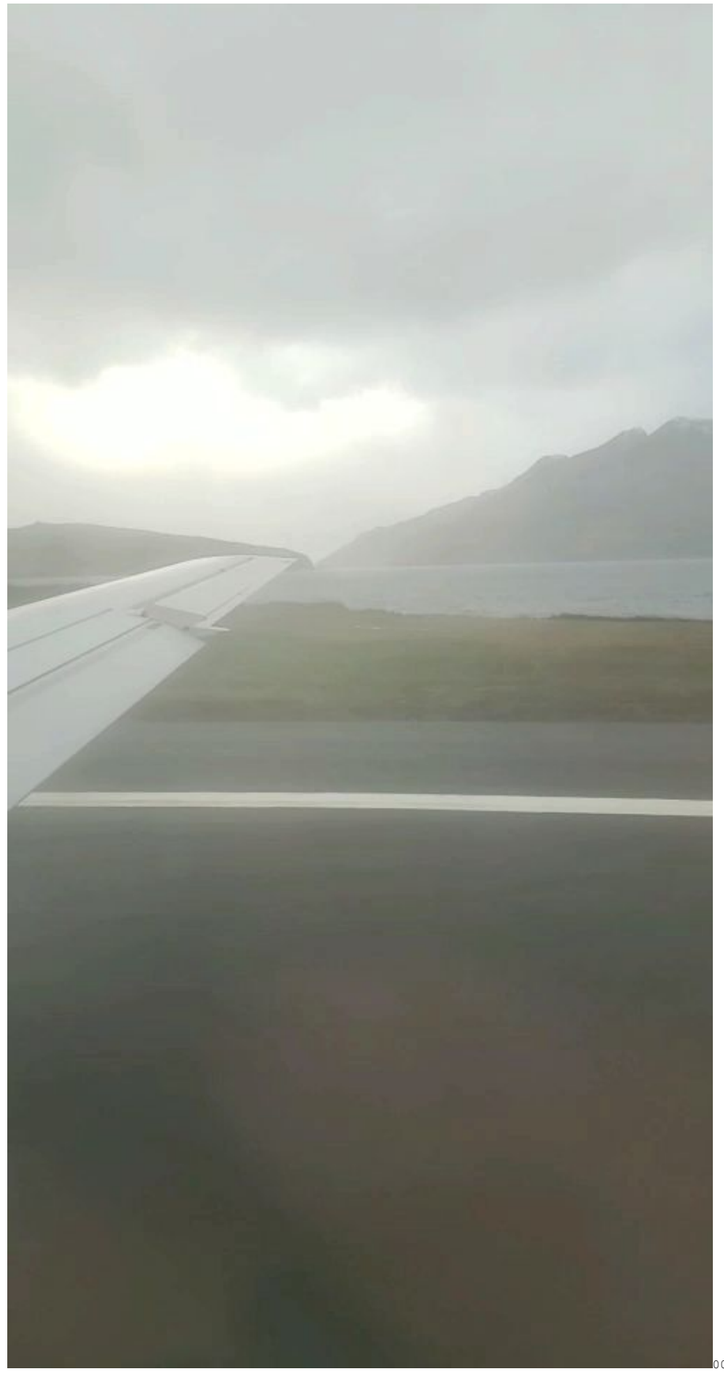

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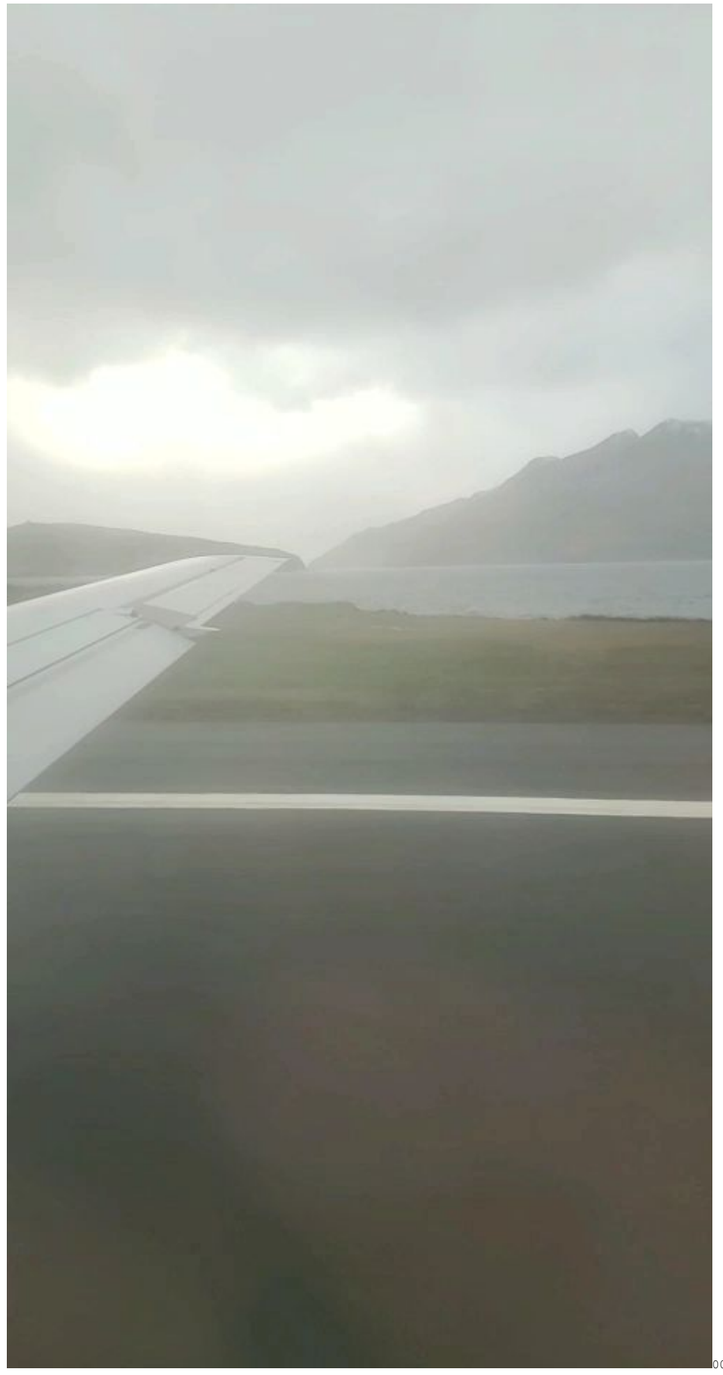

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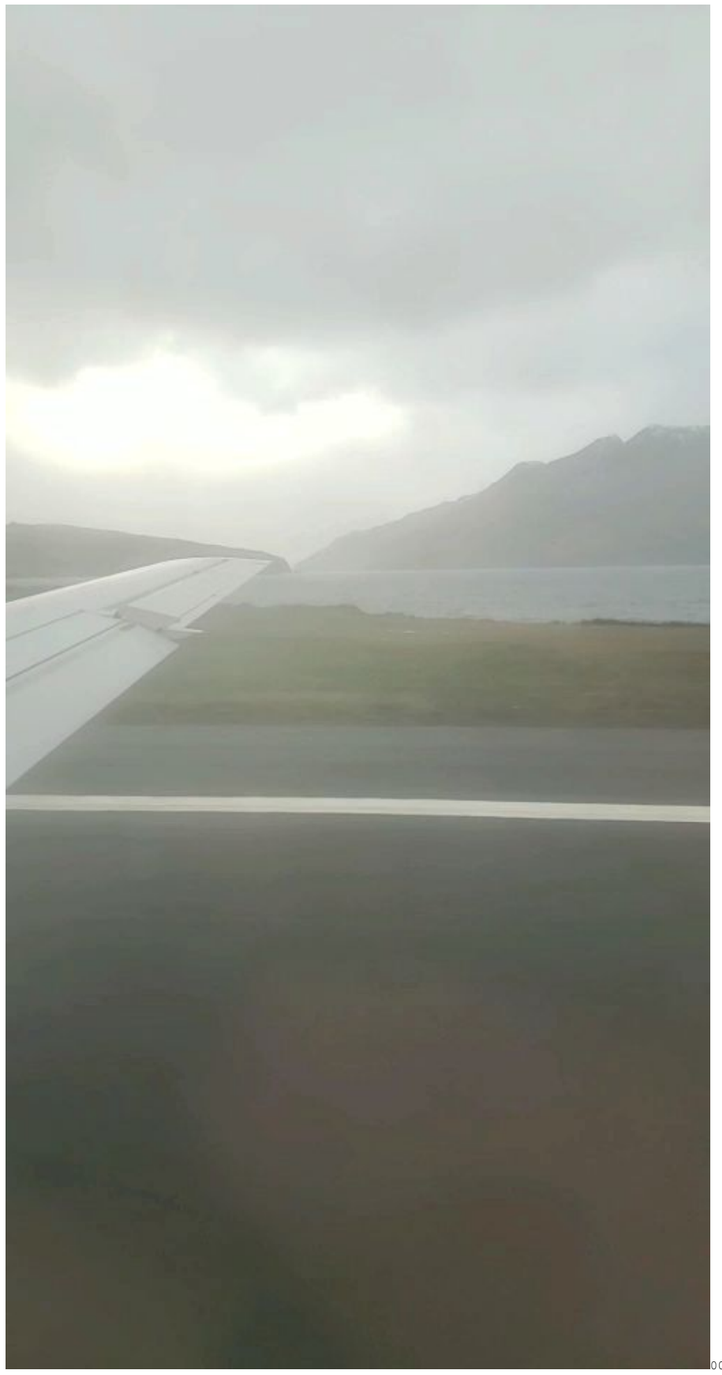

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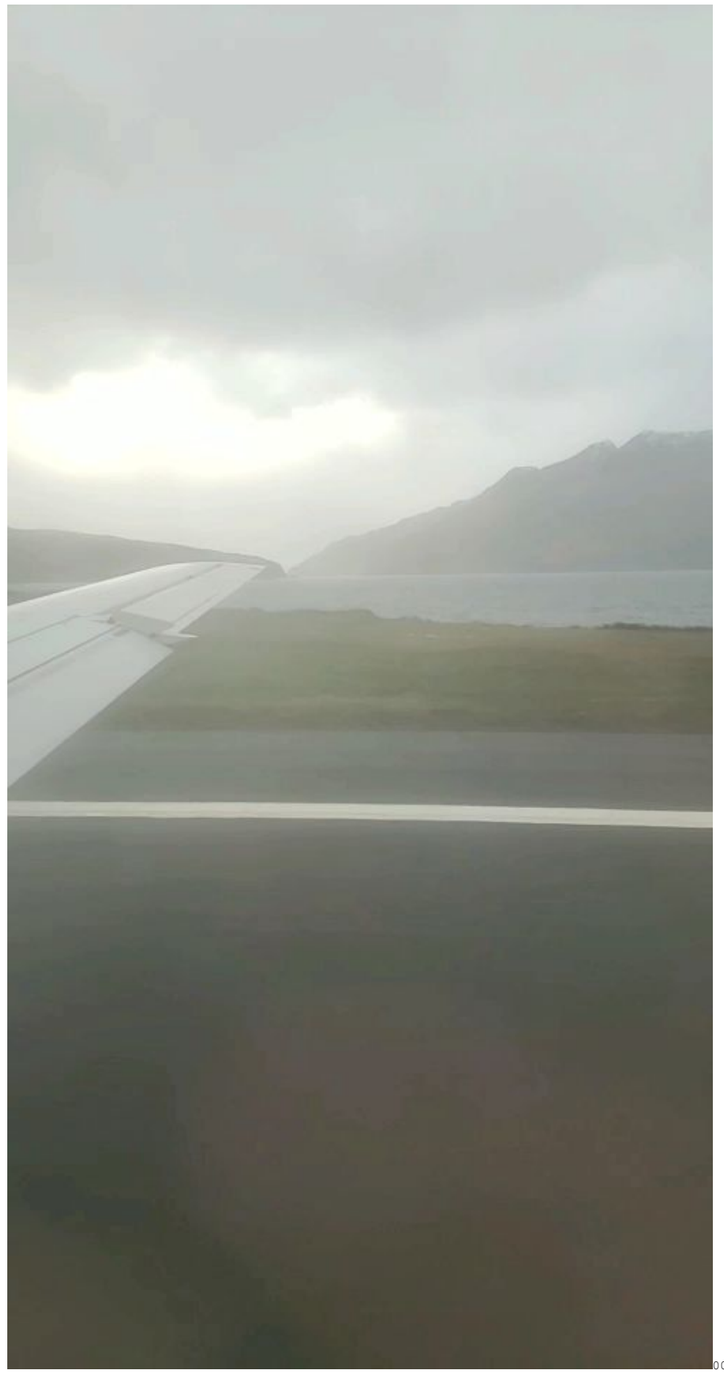

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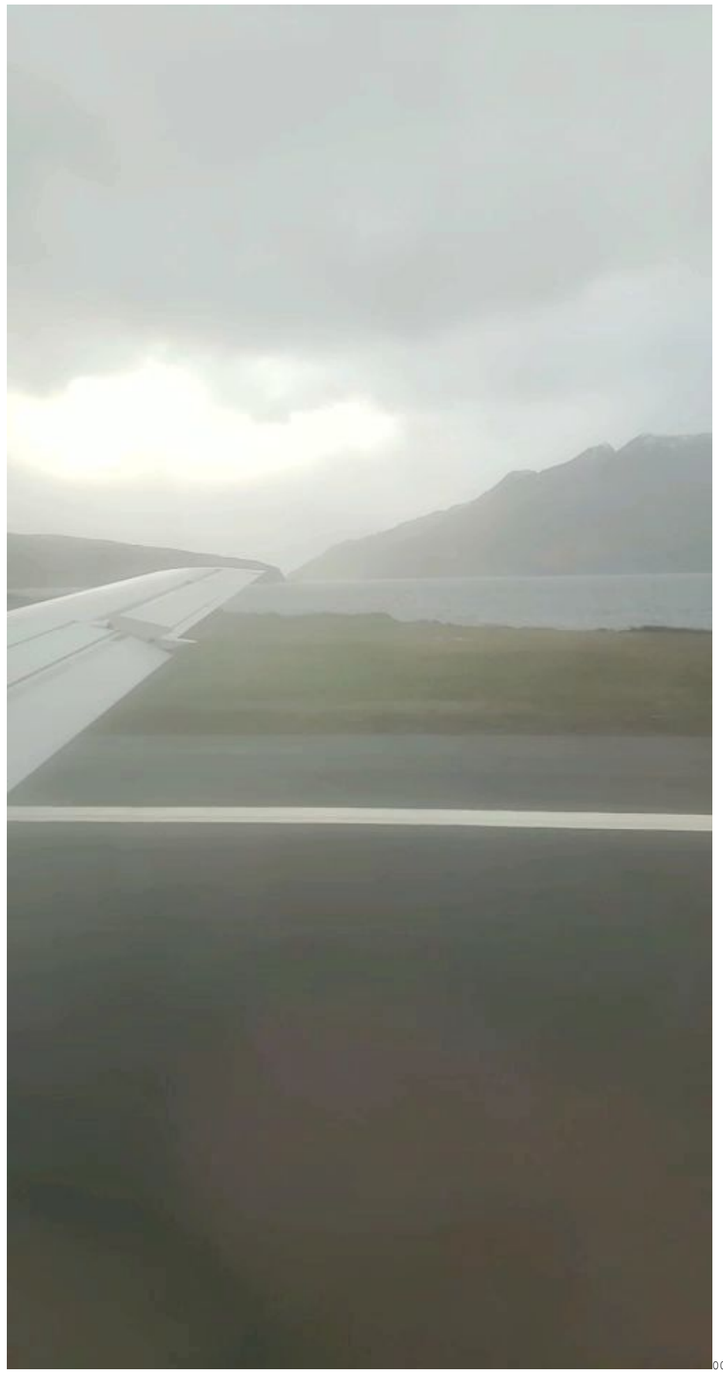

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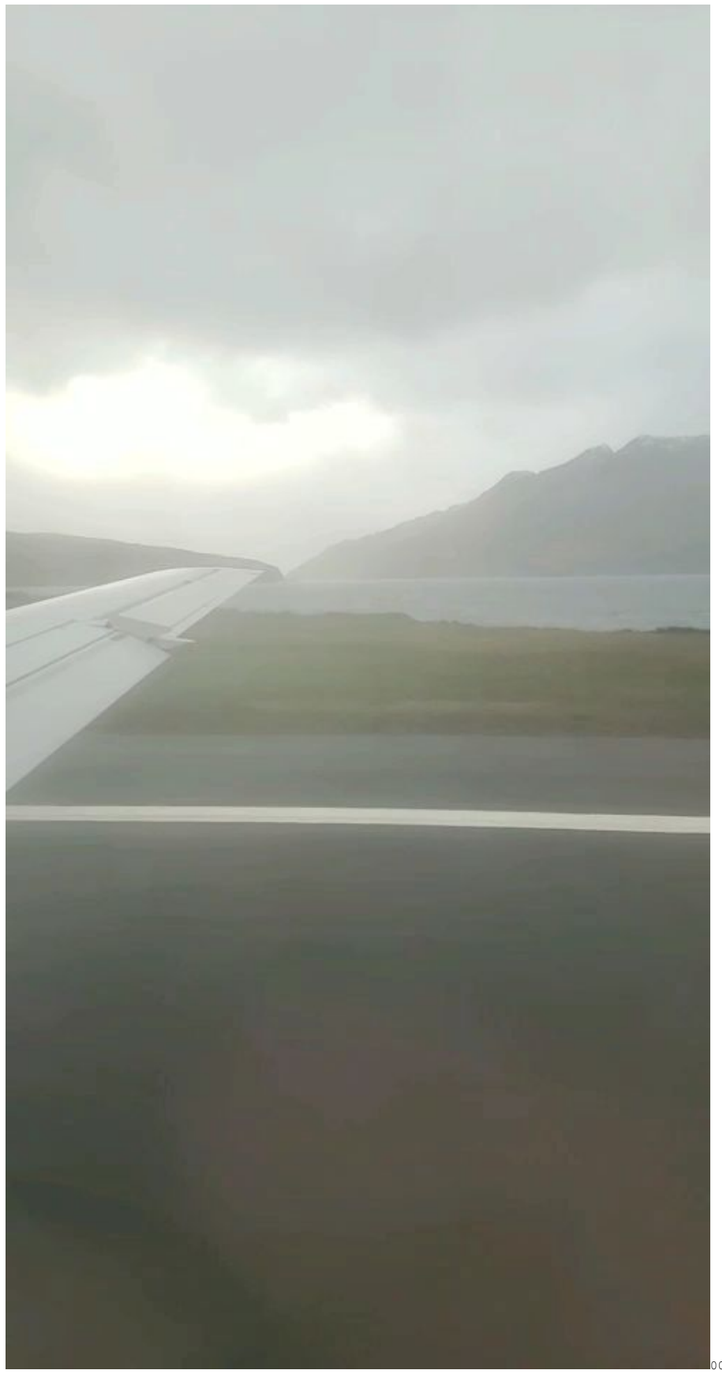

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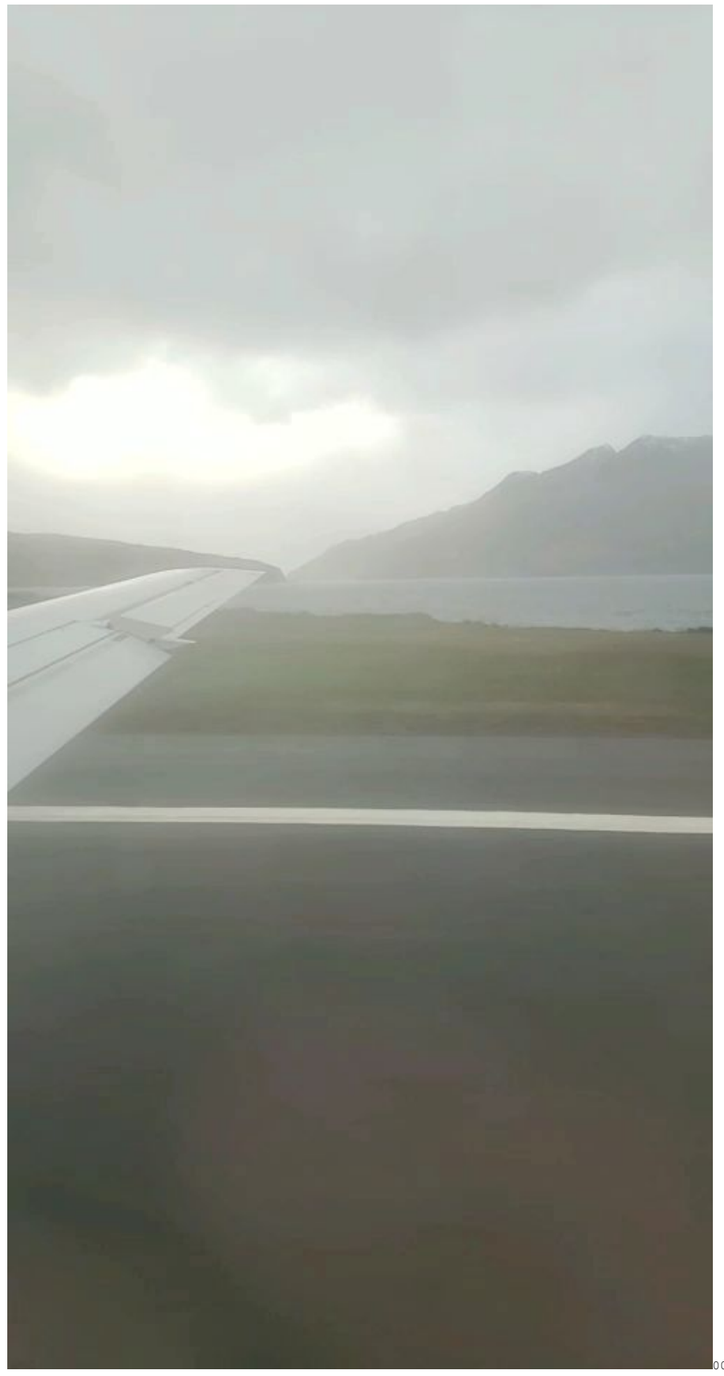

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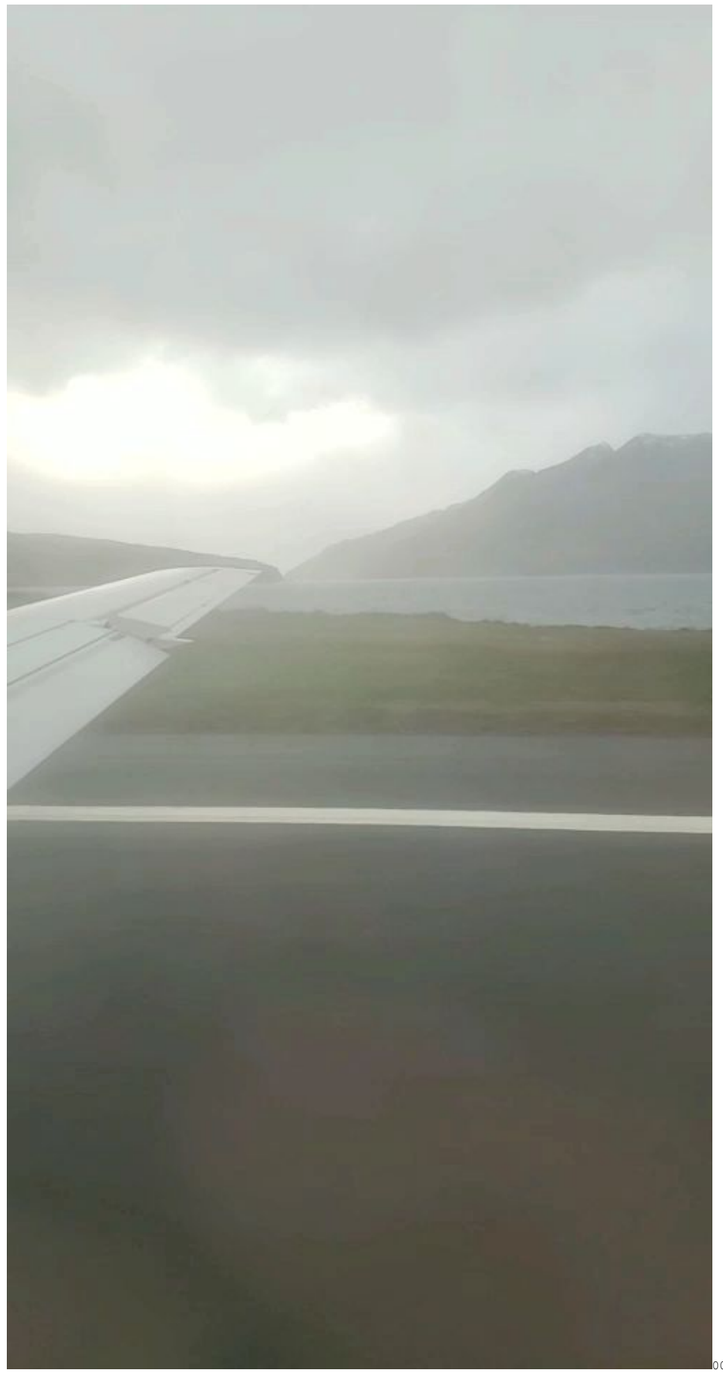

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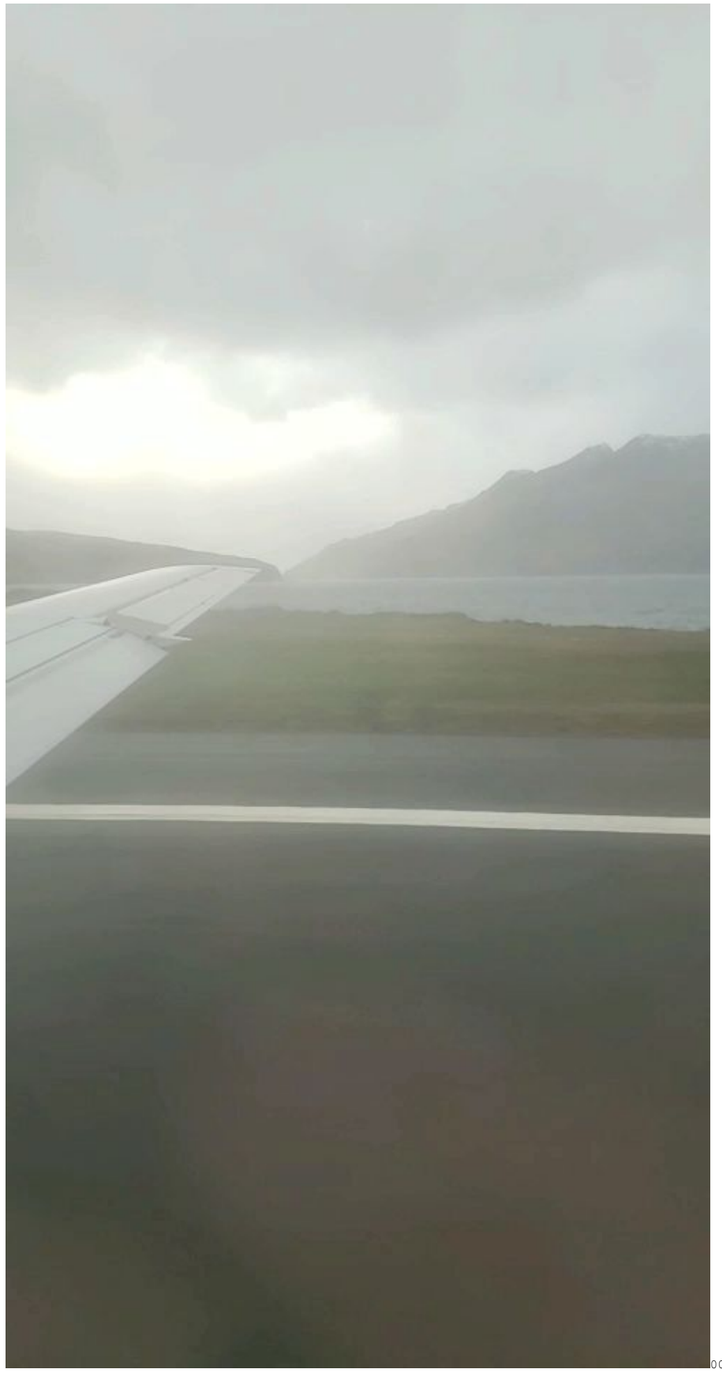

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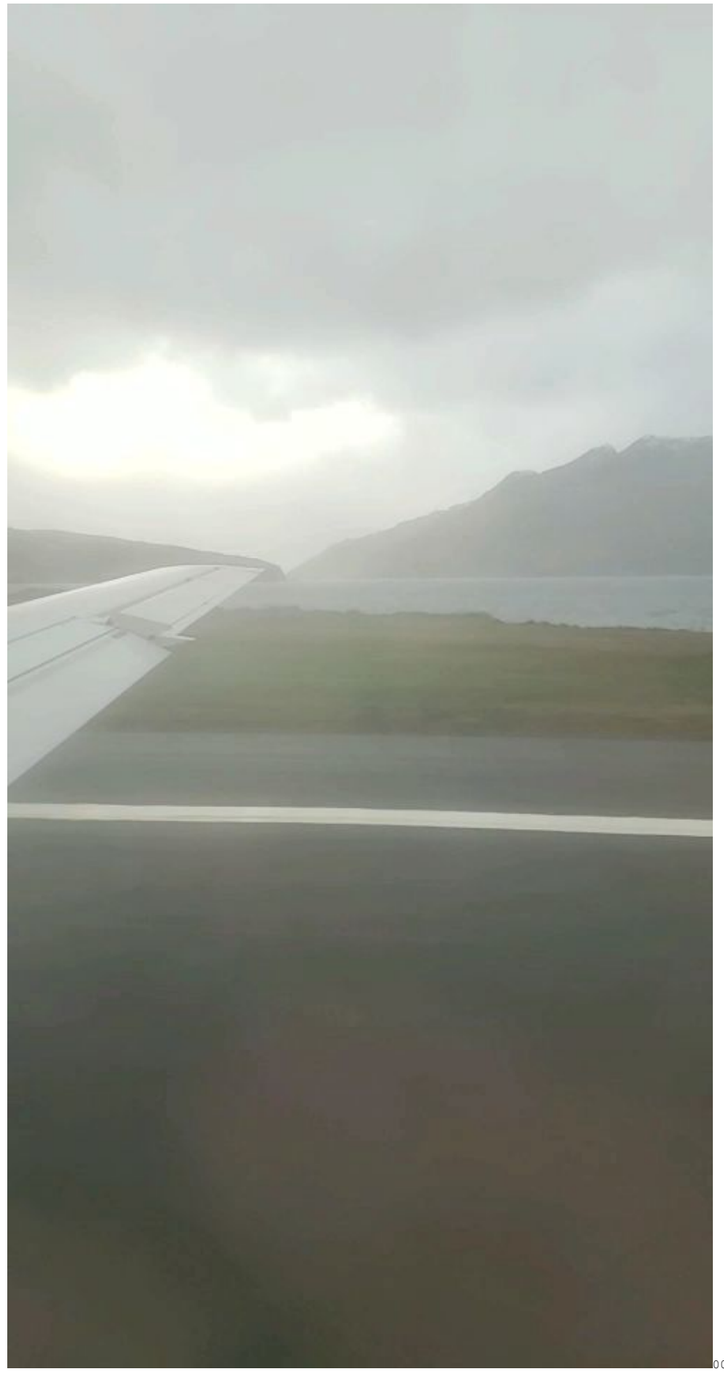

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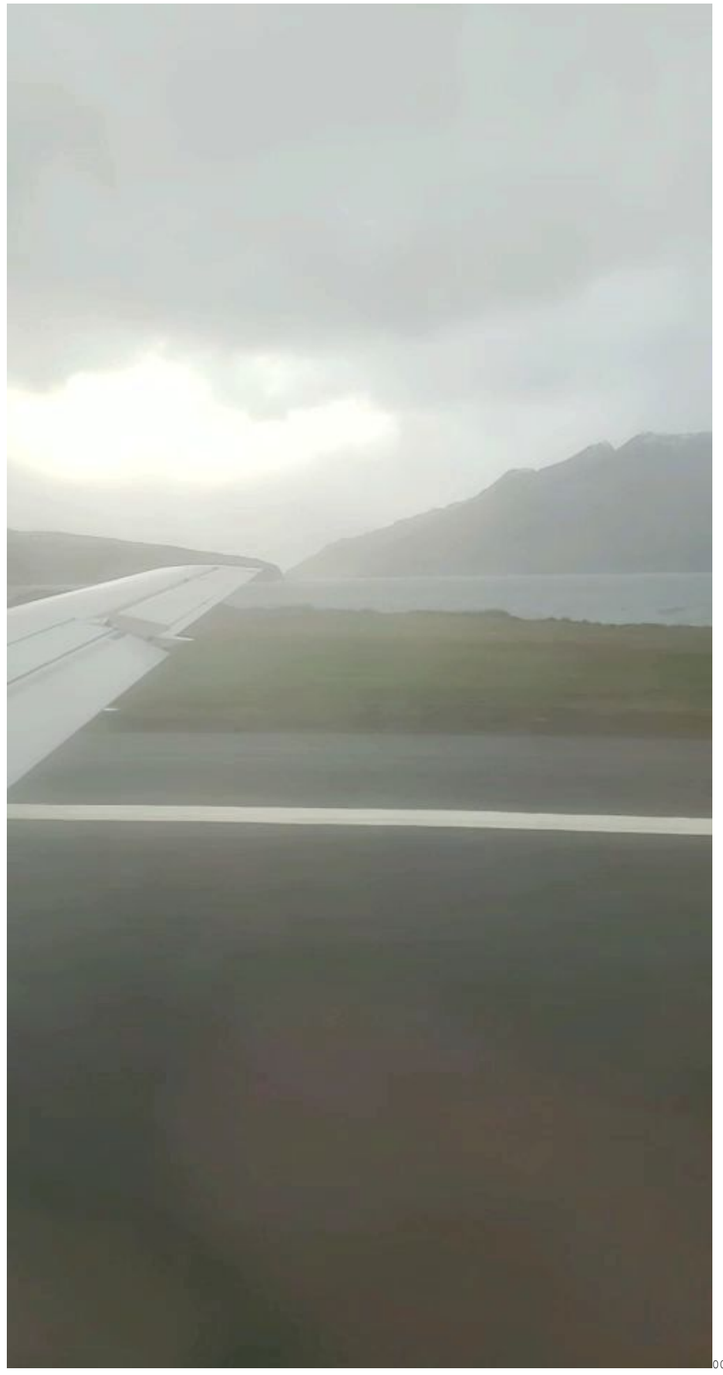

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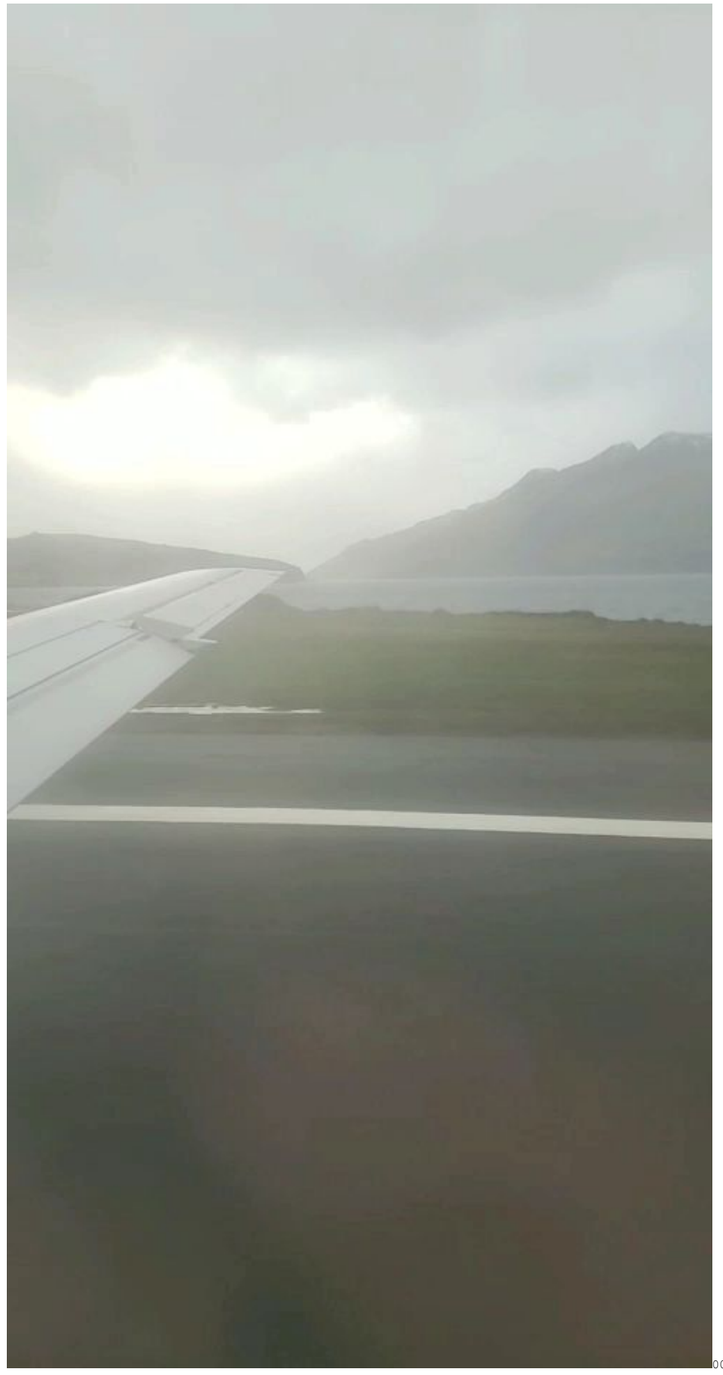

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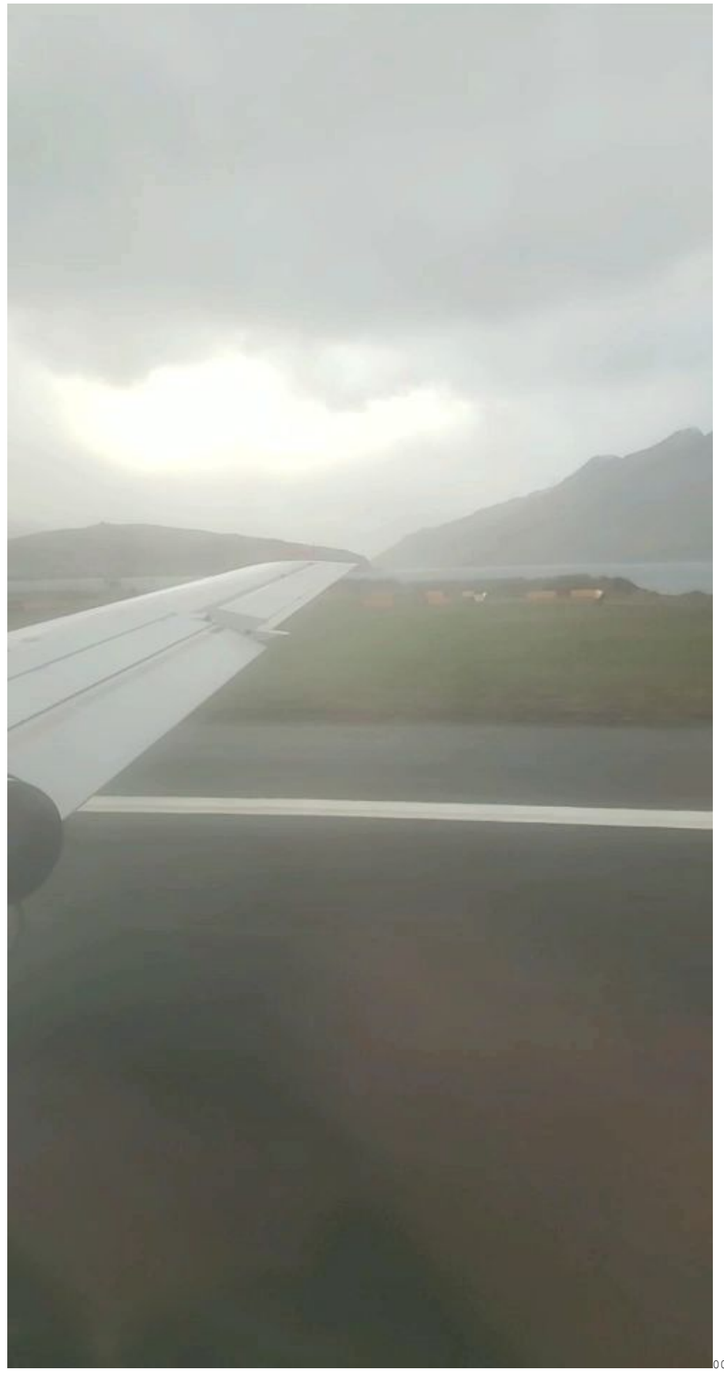
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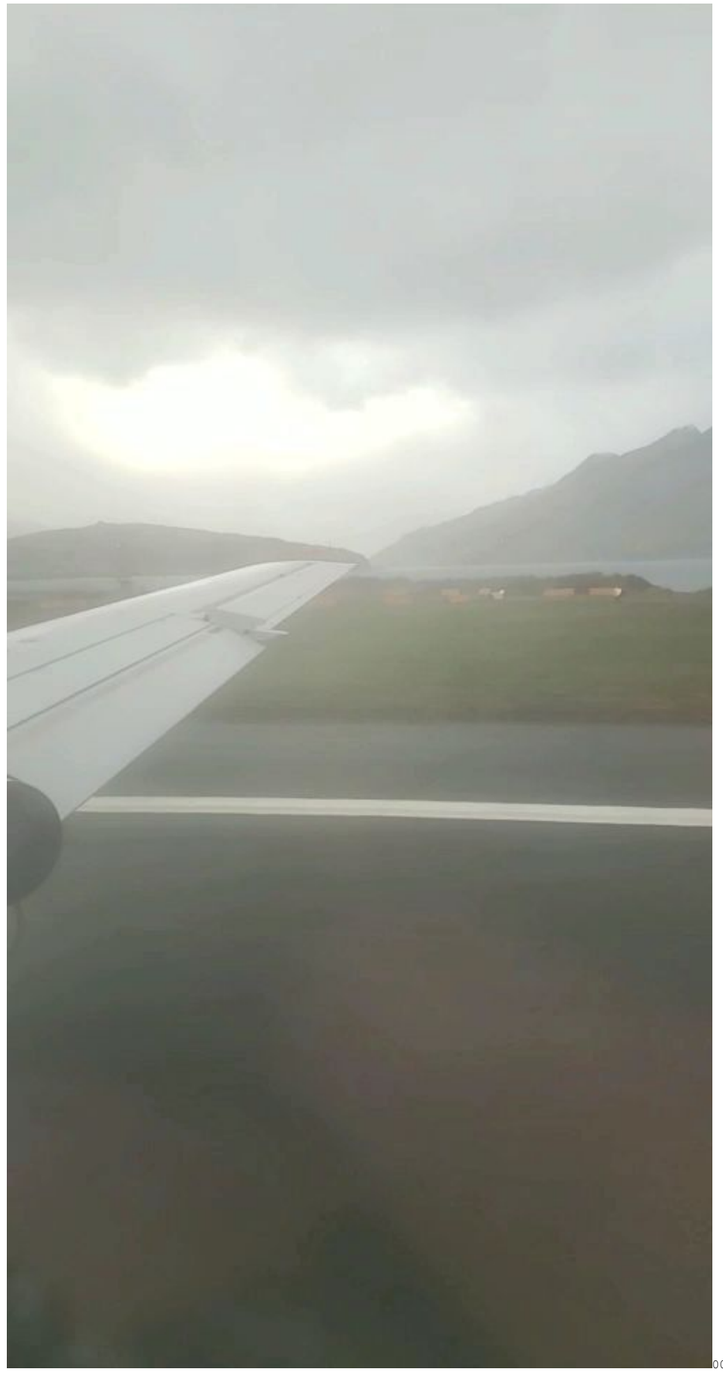

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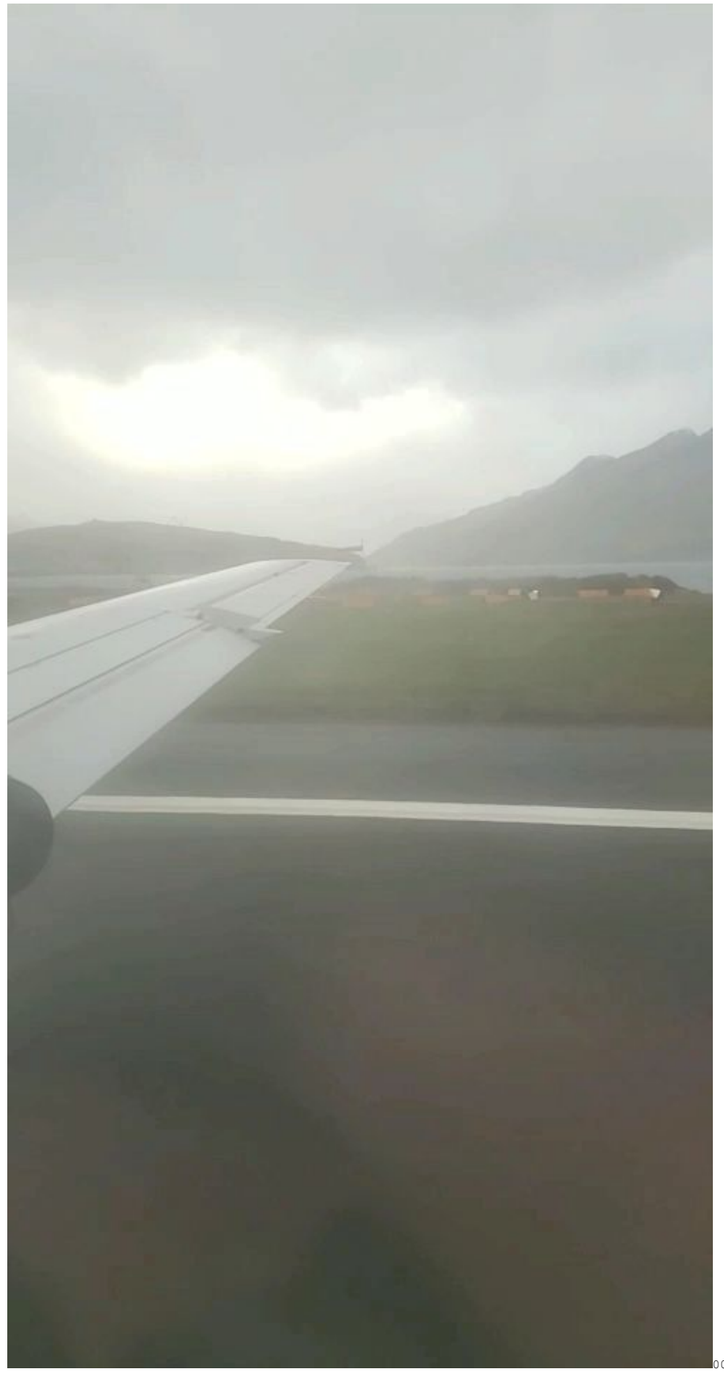

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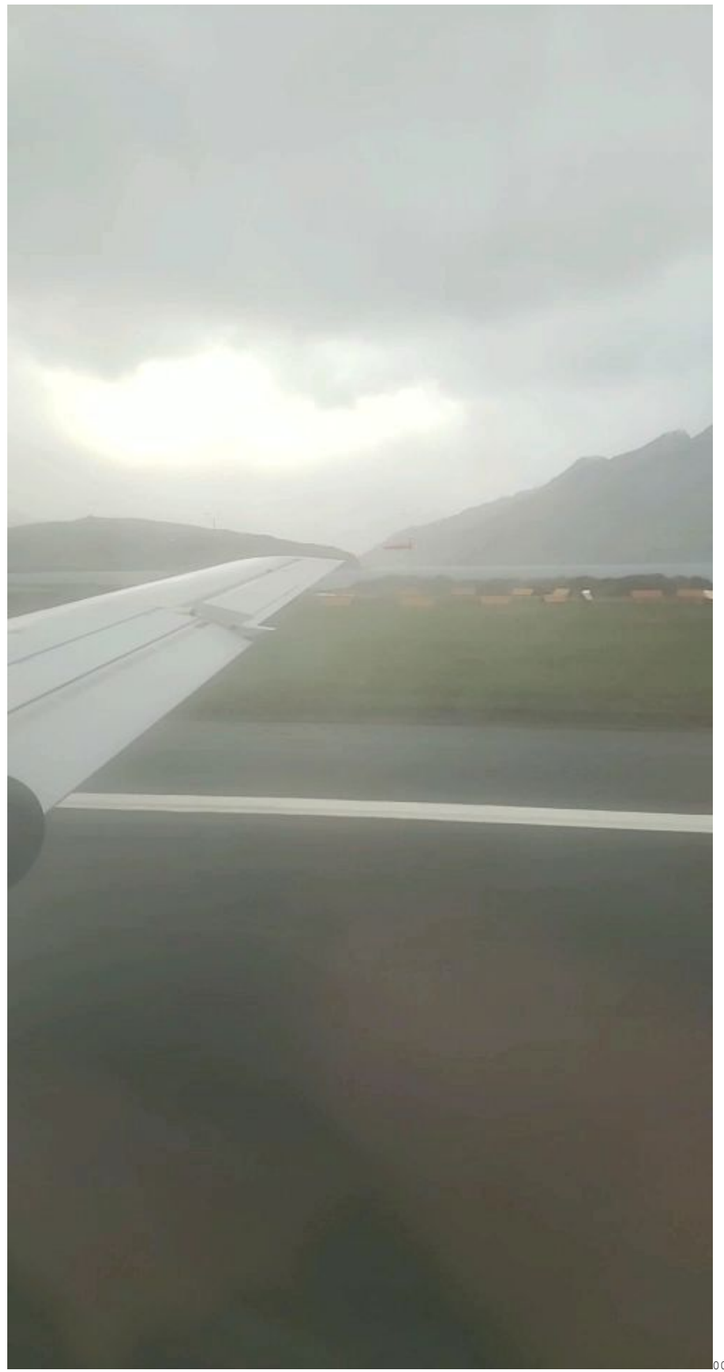

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Attachment 8

Runway witness mark and debris evidence

Runway Witness Mark and Debris Evidence



Figure A: View from runway 13 touchdown zone looking toward runway departure end with annotation denoting long dark witness mark associated with the left main gear (LMG) outboard tire.



Figure B: View toward runway 13 touchdown zone with annotation denoting end of long dark witness mark associated with the LMG outboard tire.

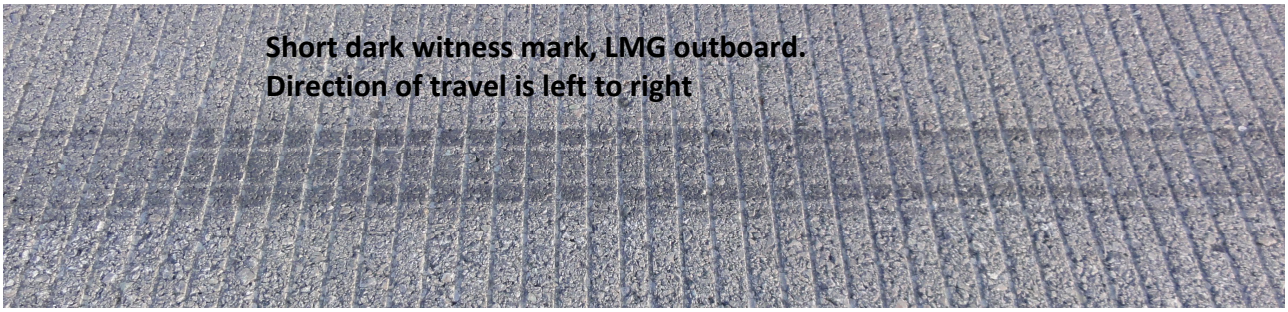


Figure C: View of short dark witness mark associated with the LMG outboard tire.



Figure D: Runway 13-31 pavement macrotexture and groove spacing. Scale shows inches and centimeters.



Figure E: View 1 toward runway 13 departure end with annotation denoting the long dark witness mark associated with the LMG outboard tire.



Figure F: View 2 toward runway 13 departure end with annotation denoting the long dark witness mark associated with the LMG outboard tire.

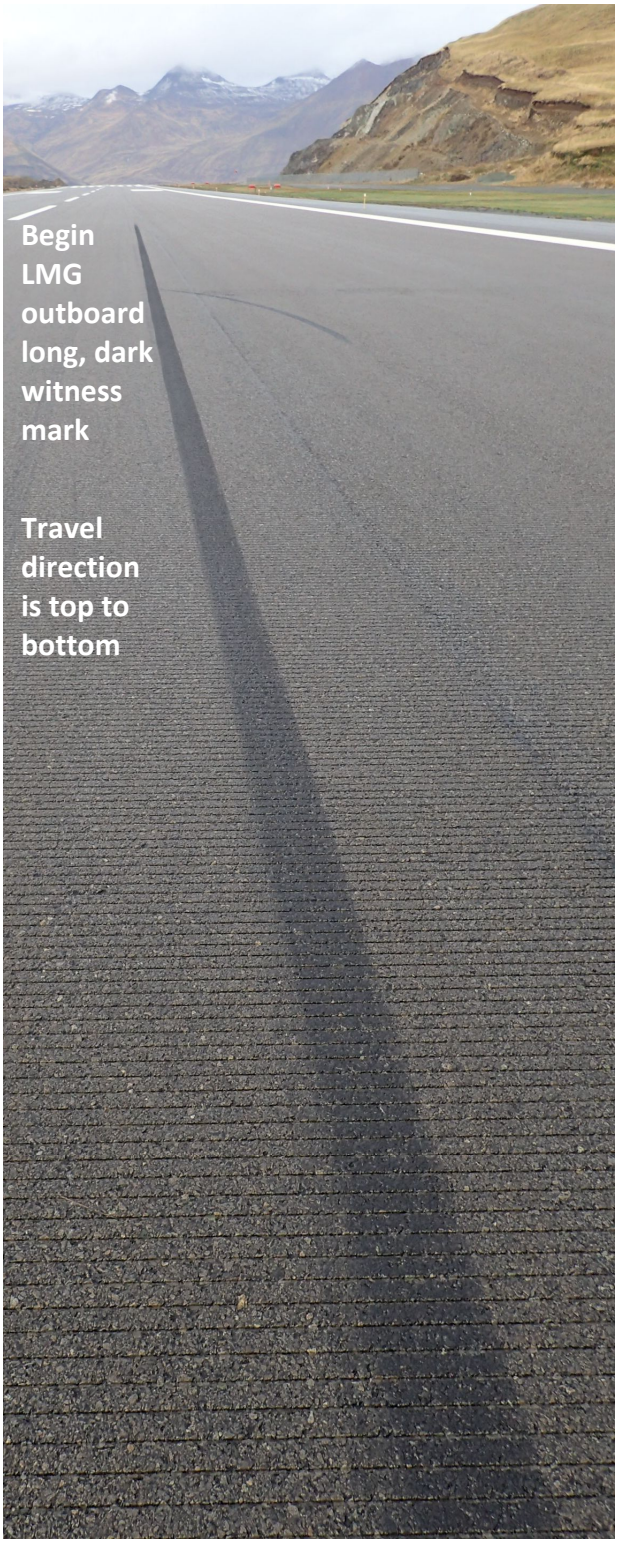


Figure G: View toward runway 13 approach end with annotation denoting the long dark witness mark associated with the LMG outboard tire.

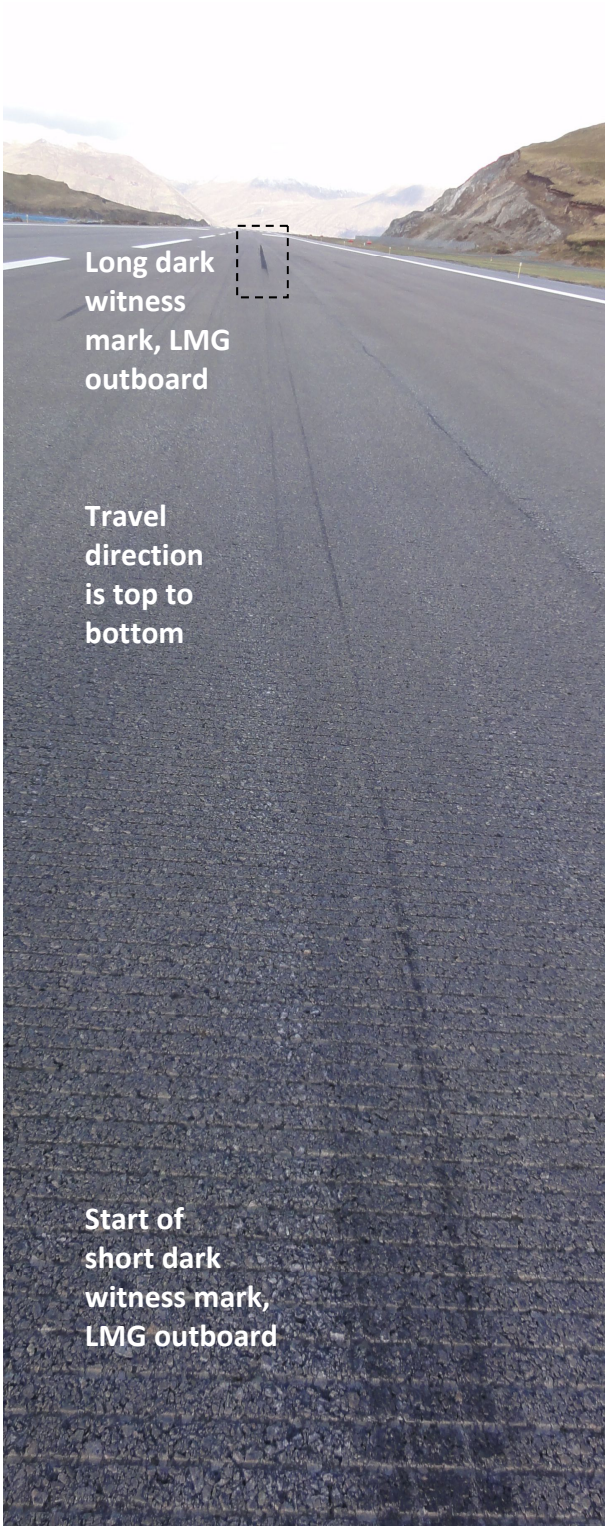


Figure H: View toward runway 13 approach end with annotations denoting the long and short dark witness marks associated with LMG outboard tire.



Figure I: View of long dark witness mark associated with the left main gear (LMG) outboard tire, looking toward runway 13 departure end.



Figure J: Two pieces of debris photographed on runway by Alaska DOT (see lower, center foreground). Background shows airport windsock (left), access road (center) and Unalaska Bay (right). Access road entrance is about 2,300 feet from the runway 13 threshold. Airplane travel direction was right to left.



Figure K: A piece of debris located left of the runway 13 centerline, near the end of the long, dark witness mark associated with the LMG outboard tire. Photographed by NTSB Alaska Regional Investigator.



Figure L: View from departure end of runway 13 (looking toward the approach end of runway 13) with annotations denoting witness marks from the left main gear (LMG) and right main gear (RMG) tires.



Figure M: View from departure end of runway 13 (looking toward the approach end of runway 13) with annotations denoting witness marks from the left main gear (LMG) and right main gear (RMG) tires.



Figure N: View from the departure end of runway 13 looking toward witness marks associated with the right main gear (RMG) inboard and outboard tires as they departed the improved surface.



Figure O: View from departure end of runway 13 looking toward witness marks associated with the left main gear (LMG) inboard and outboard tires as they departed the improved surface.



Figure P: View from departure end of runway 13 looking toward witness marks associated with the left main gear (LMG), nose gear (NG), and right main gear (RMG) as they departed the improved surface.

Runway 13 Witness Mark Evidence (based on GPS survey, photographs, and measurements)
The initial dark witness mark associated with the LMG outboard tire was about 165 feet long, about 5 inches wide, began about 1,835 feet downrange of the runway 13 displaced threshold, and was offset about 15 feet left of centerline (began about 16.5 feet left of centerline and gradually tapered to the right to end about 15 feet left of centerline).

Of the six 3- to 5-inch narrow rubber strips found on runway 13, one was located on October 18th about 15 feet beyond and about 15 feet outboard of the end of the initial dark witness mark. A second rubber strip was recovered in the same area on October 19th, close to the end of and outboard of the initial dark witness mark. A third rubber strip was recovered on the same day, left of the runway 13 centerline and well beyond the end of the initial dark witness mark (specific lateral and longitudinal position not documented). The two rubber strips in Figure J were recovered during a vehicle-based runway visual survey that occurred between the accident landing and NTSB investigative team arrival (during a period when aircraft were limited to emergency or investigative support operations only). The final rubber strip position was not documented.

The LMG outboard tire left a witness mark in the runway safety area/blast pad/perimeter fence approach areas. Runway 13 has a 300-foot, paved, declared distance runway safety area (RSA) available for aircraft rollout. The "blast pad" is the 140-foot length of chevroned pavement that follows the RSA.

When the flight crew steered N686PA right of centerline at the departure end of runway 13 (to avoid the harbor), each of the four (4) main landing gear tires left dark witness marks on the RSA and blast pad pavement until the pavement ended. The witness mark evidence transitioned at the pavement/grass boundary to four (4) prominent wheel ruts through the grass toward the airport perimeter fence.

Attachment 9

Preliminary Flight Data Recorder (FDR) plots

PenAir Saab 2000 Landing Overrun, N686PA, UnAlaska, Alaska, October 17, 2019

AltitudePress, 1 Hz — AltitudeRadio, 1 Hz — AFCSAltitudeSel, 1/4 Hz

AirspeedInd, 1 Hz — GroundSpd, 1 Hz

APEngaged, 0,1, 1 Hz — APDiscWarn, 0,1, 1 Hz

AccelLong, 4 Hz

Eng1PLA, 1 Hz — Eng2PLA, 1 Hz

Eng1Torque, 1 Hz — Eng2Torque, 1 Hz

GearHdlUp, 0,1, 1 Hz — GearHdlDn, 0,1, 1 Hz

GearUpLockN, 0,1, 1 Hz — GearUpLockL, 0,1, 1 Hz — GearUpLockR, 0,1, 1 Hz

GearDnLockN, 0,1, 1 Hz — GearDnLockL, 0,1, 1 Hz — GearDnLockR, 0,1, 1 Hz

GearWOW, 0,1, 1 Hz

Eng1PropBladeAngle, 1 Hz — Eng2PropBladeAngle, 1 Hz

AccelVert, 8 Hz

Pitch, 4 Hz

CtrlColPosL, 1 Hz — CtrlColPosR, 1 Hz

ElevatorL, 1 Hz — ElevatorR, 1 Hz

Roll, 2 Hz

CtrlWhlPosL, 1 Hz — CtrlWhlPosR, 1 Hz

AileronL, 2 Hz — AileronR, 2 Hz

AccelLat, 4 Hz

Heading, 1 Hz — HeadingSel, 1/4 Hz

Rudder, 2 Hz — RudderPedPos, 2 Hz

FlapL, 1/2 Hz — FlapR, 1/2 Hz

156150 156200 156250 156300 156350 156400 156450 156500 156550 156600 156650 156700 156750 156800 156850 156900 156950 157000

TIME, SECONDS

NATIONAL TRANSPORTATION SAFETY BOARD

PenAir Saab 2000 Landing Overrun, N686PA, UnAlaska, Alaska, October 17, 2019

NATIONAL TRANSPORTATION SAFETY BOARD

AltitudePress, 1 Hz; AltitudeRadio, 1 Hz; AFCSAltitudeSel, 1/4 Hz

AirspeedInd, 1 Hz; GroundSpd, 1 Hz

APEngaged, 0,1, 1 Hz; APDiscWarn, 0,1, 1 Hz

AccelLong, 4 Hz

Eng1PLA, 1 Hz; Eng2PLA, 1 Hz

Eng1Torque, 1 Hz; Eng2Torque, 1 Hz

GearHdlUp, 0,1, 1 Hz; GearHdlDn, 0,1, 1 Hz

GearUpLockN, 0,1, 1 Hz; GearUpLockL, 0,1, 1 Hz; GearUpLockR, 0,1, 1 Hz

GearDnLockN, 0,1, 1 Hz; GearDnLockL, 0,1, 1 Hz; GearDnLockR, 0,1, 1 Hz

GearWOW, 0,1, 1 Hz

Eng1PropBladeAngle, 1 Hz; Eng2PropBladeAngle, 1 Hz

AccelVert, 8 Hz

Pitch, 4 Hz

CtrlColPosL, 1 Hz; CtrlColPosR, 1 Hz

ElevatorL, 1 Hz; ElevatorR, 1 Hz

Roll, 2 Hz

CtrlWhlPosL, 1 Hz; CtrlWhlPosR, 1 Hz

AileronL, 2 Hz; AileronR, 2 Hz

AccelLat, 4 Hz

Heading, 1 Hz; HeadingSel, 1/4 Hz

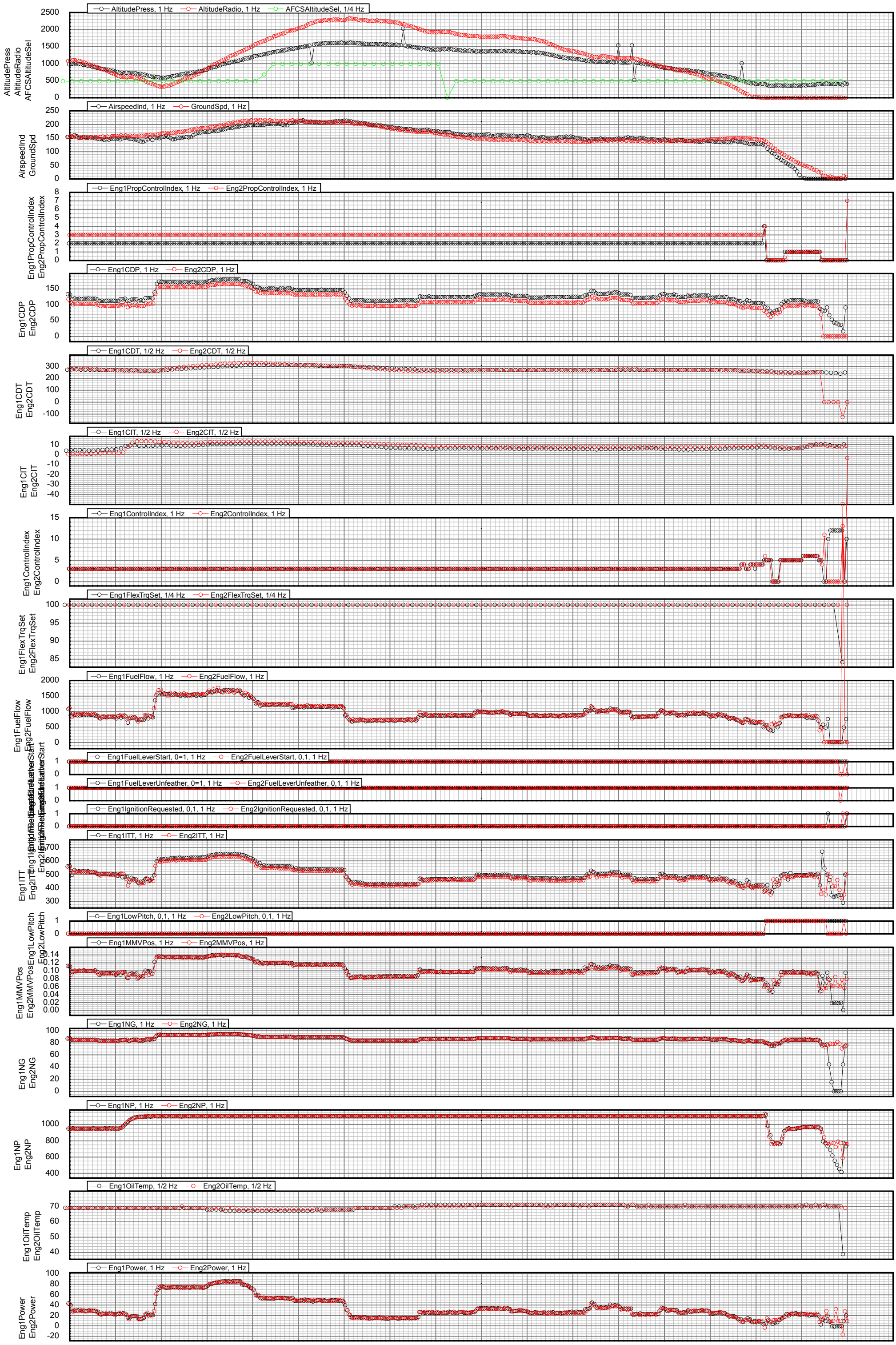
Rudder, 2 Hz; RudderPedPos, 2 Hz

FlapL, 1/2 Hz; FlapR, 1/2 Hz

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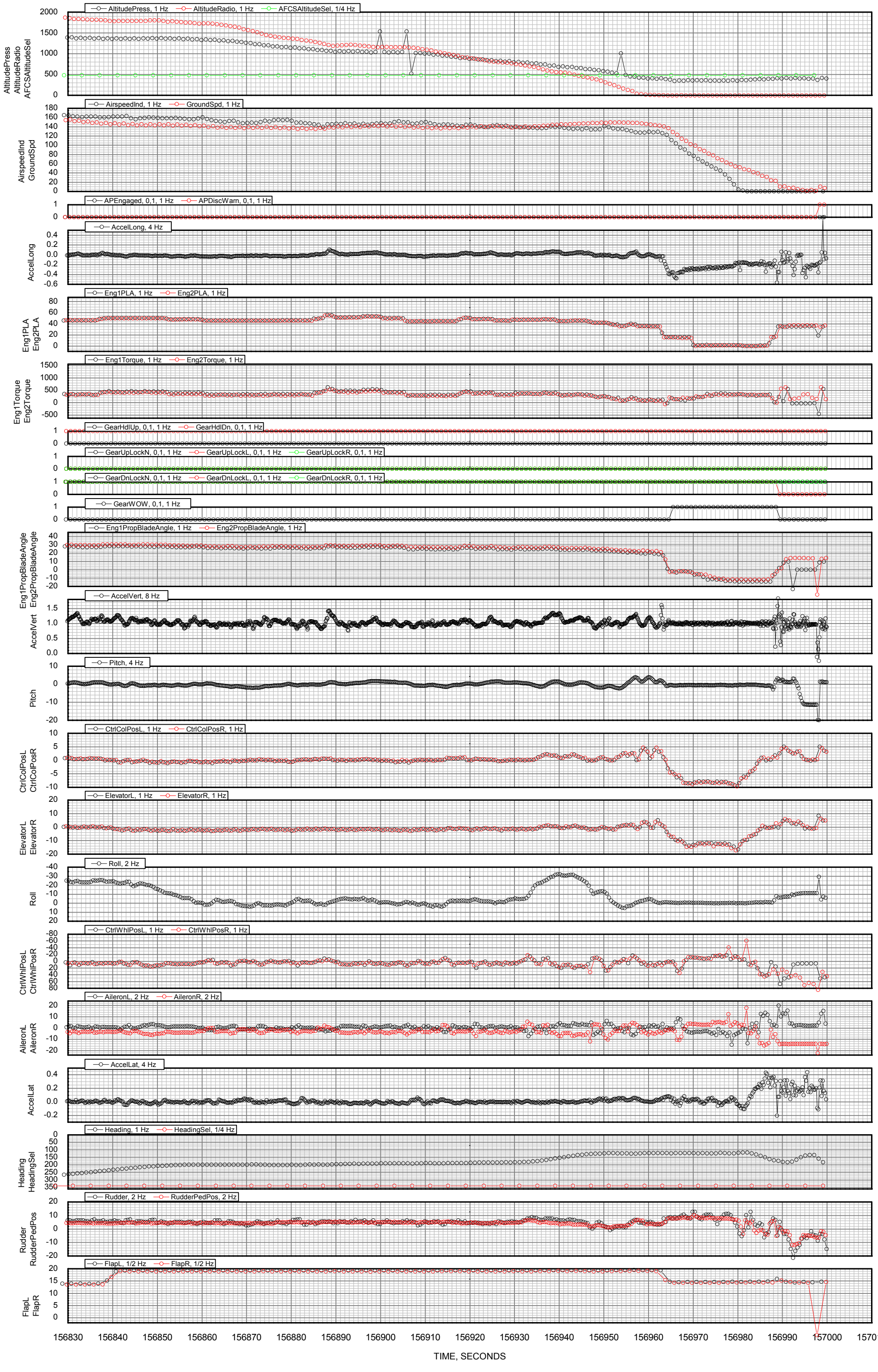
TIME, SECONDS

PenAir Saab 2000 Landing Overrun, N686PA, UnAlaska, Alaska, October 17, 2019



NATIONAL TRANSPORTATION SAFETY BOARD

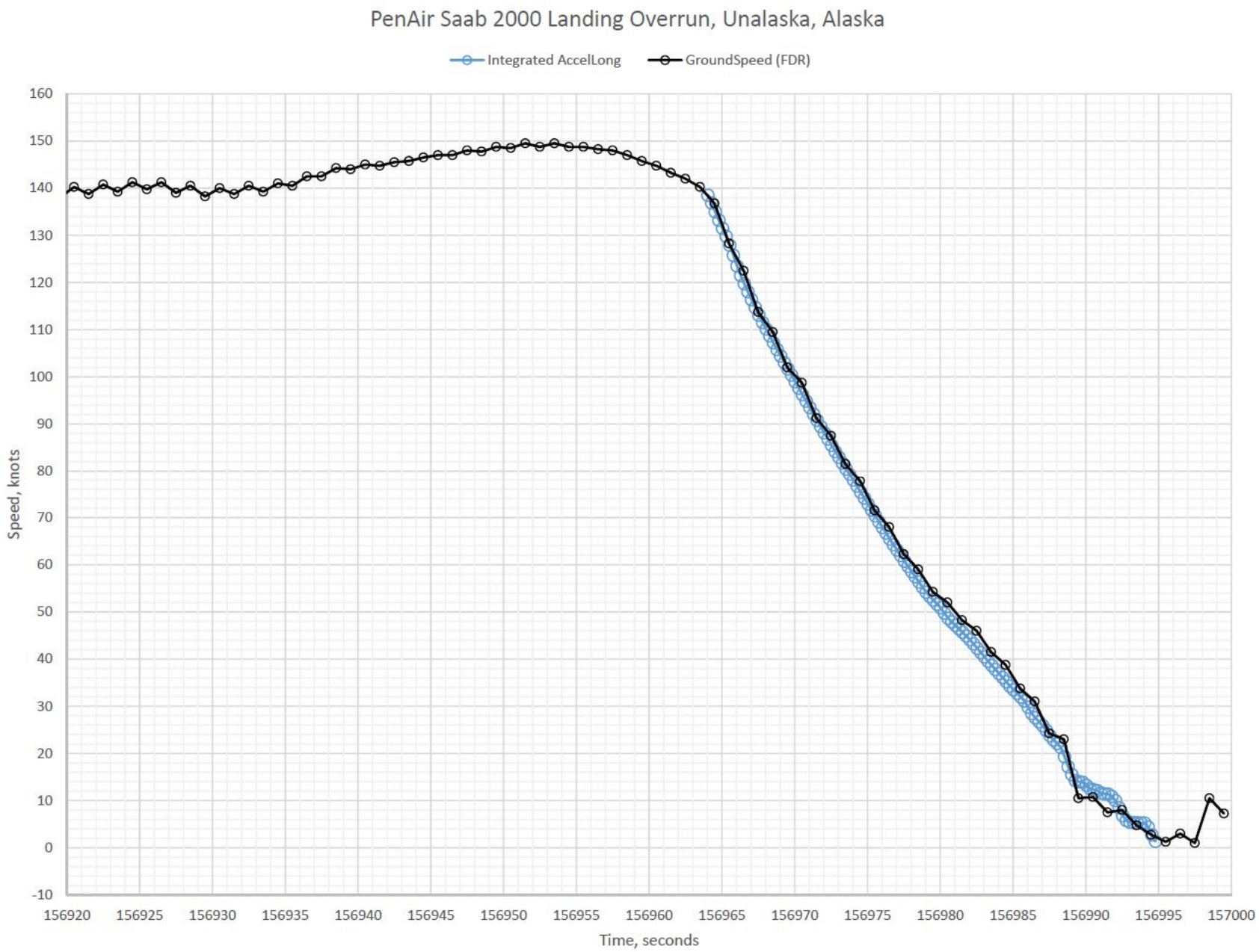
PenAir Saab 2000 Landing Overrun, N686PA, UnAlaska, Alaska, October 17, 2019



NATIONAL TRANSPORTATION SAFETY BOARD

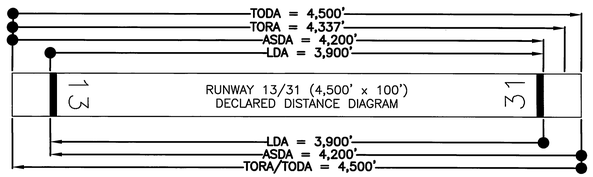
Attachment 10

Calculated N686PA groundspeed (from integration of FDR longitudinal acceleration data)


PenAir Saab 2000 Landing Overrun, Unalaska, Alaska
Integrated AccelLong
GroundSpeed (FDR)
Speed, knots
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
156920
156925
156930
156935
156940
156945
156950
156955
156960
156965
156970
156975
156980
156985
156990
156995
157000
Time, seconds

Attachment 11

DUT Airport Layout Plan (ALP)



DUTCH HARBOR

AMAKNAK ISLAND

MT. BALLYHOO

UNALASKA BAY

SHORELINE

APRON 285' x 310'

ROAD WARNING GATE

SEAPLANE GATE

SEAPLANE RAMP

SATELLITE DISH

BALLYHOO ROAD

LUNDRA DR

STA 96+99.48
R/W 31 END
ELEV:14.1'
TDZE:18.9'

RELOCATED BALLYHOO ROAD & PERIMETER FENCE

WINDCONE

BLAST PAD

RECLAIMED LAND

ROAD WARNING GATE

EAST POINT RD

DEPARTURE RPZ (500' x 1,000' x 700') MINIMUMS > THAN 1 MILE LARGE A&B CATEGORY AIRCRAFT

APPROACH RPZ (500' x 1,000' x 700') MINIMUMS > THAN 1 MILE LARGE A&B CATEGORY AIRCRAFT

AIRCRAFT PARKING APRON 115' TOFA 75' RSA

TW B WIDTH: 200'x92'

REILS(E)

300' RSA & OFA

279'

214'

VASI-4

BRL 3

BRL 2

BRL 1

HOLD LINE

TW A WIDTH: 220'x44'

250'

750'

GATE

STA 104+69.43
T/W A CENTERLINE
ELEV:15.29'

STA 100+00.00
R/W 31
DISPLACED THRESHOLD
ELEV:14.1'

STA 101+29.03
T/W B CENTERLINE
ELEV:14.51'

DUT A (SACS)
STA 99+93.81
147.85'

ROAD WARNING GATE

BIORKA DR

AIRPORT BEACH ROAD

SHORELINE

AMOS

WINDCONE AND SEGMENTED CIRCLE

APRON 408' x 400' x 602'

ROTATING BEACON

L SNOW GAGE

FAA NON DIRECTIONAL BEACON AND DME

RUNWAY ACCESS TO LEASE AREAS

N44°29'14.78"W (TRUE BEARING)

4,500' x 100' RUNWAY

ARP

400' OFZ

250' RSA

150' RSA

PAVEMENT EDGE

DUT C (SACS)
STA 125+68.76
165.21'L

DUT D (SACS)
STA 118+03.32
265.28'R

REILS(R)

300' RSA & OFA

STA 139+00.12
R/W 13
DISPLACED THRESHOLD
ELEV:21.7'

STA 142+00.15
R/W 13 END
ELEV:23.5'
TDZE:21.7'

BRL
OFA
OFZ
RSA

NON–STANDARD CONDITIONS

DESIGN STANDARD NAME	FAA STANDARDS	DISPOSITION
RUNWAY OFA (LxW)	300' x 500'	OBJECTS ALLOWED PER MASTER PLAN. TO CLEAR IN FUTURE. SEE EXISTING FACILITIES TABLE.

OFZ PENETRATIONS

FENCE	SOUTHWEST OF RW 31 THRESHOLD
ROAD	SOUTHWEST OF RW 31 THRESHOLD

NOTE: BUILDING RESTRICTION LINE HEIGHT ABOVE PRIMARY SURFACE BRL 1 = 7.1', BRL 2 = 71.4', BRL 3 = 7.1'

EXISTING FACILITIES

ID	DESCRIPTION	TOP EL. (Ft.)
1	REVETMENT HANGAR (TBR–ULTIMATE)	61.7
2	MISC. STRUCTURES (REVETMENTS) (TBR–ULTIMATE)	39.9
3	ADOT&PF AUXILIARY BUILDING (TBR)	28.5
4	WWII STRUCTURES	43.7
5a	AIRPORT ADMIN BUILDING (TBR–ULTIMATE)	38.7
5b	ARFF (TBR–ULTIMATE)	52.6
6a	RAMP B HANGAR (TBR–ULTIMATE)	44.5
6b	SREB & CHEMICAL STORAGE	69.9
7	PASSENGER TERMINAL BUILDING (TBR)	41.6
8	TORPEDO BUILDING (TBR)	53.8
9a	CARGO BUILDING (TBR)	41.6
9b	CARGO BUILDING (TBR)	27.7
10	AEROLOGY BUILDING (TBR–ULTIMATE)	37.6
11	SECURITY FENCE	–
12	FIREHOUSE	41.5
13	MISCELLANEOUS BUILDING 1	63.5
14	HOUSING UNITS (TBR–ULTIMATE)	89.7
15	POWER PLANT (UNDER EXPANSION)	110.1
16	FUEL DOCK AND SHIPPING LANE	12.4/212

2015 MAG DEC. 21.1°E

SCALE IN FEET
0 100 200 400

BY	DATE	REVISION

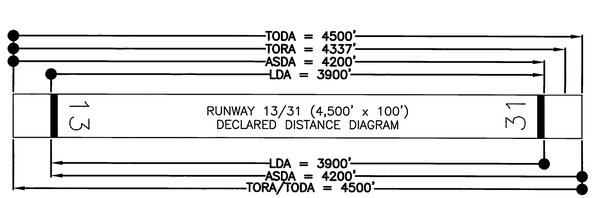
STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
CENTRAL REGION

UNALASKA AIRPORT
UNALASKA, ALASKA
AIRPORT LAYOUT PLANS

EXISTING LAYOUT PLAN

DATE: FEBRUARY 2016
SHEET: 2 OF 8

Designed By: MM
Drawn By: MM/SA
Checked By: EJG
Date Plotted: 2/23/2016, 11:23 AM
Layout Name: EXISTING LP
File Name: 2222.01-EXISTING LAYOUT PLAN.DWG



DUTCH HARBOR

AMAKNAK ISLAND

MT. BALLYHOO

UNALASKA BAY

ROAD WARNING GATE

SEAPLANE GATE

SHORELINE

STA 100+00.00 ULTIMATE R/W 31 DISPLACED THRESHOLD ELEV:14.1'

STA 96+99.48 ULTIMATE R/W 31 END ELEV:14.1' TDZE:18.9'

SEAPLANE RAMP

RECLAIMED LAND

WINDCONE

RELOCATED BALLYHOO ROAD & PERIMETER FENCE

DEPARTURE RPZ (500' x 1,000' x 1,700') MINIMUMS > THAN 1 MILE LARGE A&B CATEGORY AIRCRAFT

APPROACH RPZ (500' x 1,000' x 1,700') MINIMUMS > THAN 1 MILE LARGE A&B CATEGORY AIRCRAFT

TOE OF FILL

BLAST PAD

EAST POINT RD

BIORKA DR

AIRPORT BEACH ROAD

APRON 285' x 310'

SATELLITE DISH

BALLYHOO RD

AURORA DR

AIRCRAFT PARKING APRON

TW "B" WIDTH: 200'x92'

300' DISP. THOLD.

300' PAVED RSA

600' PAVED RSA

(ULTIMATE)

OUT A (SACS) STA 99+93.8 147.85' L

OUT B (PACS) STA 118+03.32 265.28' R

OUT C (PACS) STA 118+03.32 265.28' R

RUNWAY ACCESS TO LEASE AREAS

N44°25'14.78"W (TRUE BEARING)

ULTIMATE 4,500' x 100' RUNWAY

ARP

PAPI

PAVEMENT EDGE

OUT D (SACS) STA 125+68.76 165.21' L

STA 139+00.12 ULTIMATE R/W 13 DISPLACED THRESHOLD ELEV:21.7

STA 142+00.15 R/W 13 END TDZE:21.7 ELEV:23.5

FENCE (ULTIMATE)

WINDCONE

FAA NON DIRECTIONAL BEACON AND DME

AWOS

STA 104+69.43 T/W A CENTERLINE ELEV:15.29'

B-III TAXILANE 1067'

HOLD LINE

TW "A" WIDTH: 75' 220'x454'

STA 101+29.03 T/W B CENTERLINE ELEV:14.51'

PARKING

SHORELINE

LEASE LOT

PASSENGER TERMINAL

CARGO BLDG. & A/C RAMP

ROTATING BEACON

WINDCONE AND SEGMENTED CIRCLE TO BE RELOCATED

ULTIMATE-ARFF WATER RESCUE ACCESS

APRON 1,066' x 265'

RSA

OFZ

OFA

BRL

VASI-4

PAPI

F3 F5 F6 F7 F9 F10

1 2 3 4 5a 5b 6a 6b 7 8 9a 9b 10 11 12 13 14 15 16

Designed By:	MIM
Drawn By:	MIM/SA
Checked By:	EJG

Date Plotted:	2/23/2016, 11:23 AM
Layout Name:	Ultimate Layout Plan
File Name:	2222101-ULTIMATE LAYOUT PLANLDWG

EXISTING FACILITIES

ID	DESCRIPTION	TOP EL. (Ft.)
1	REVETMENT HANGAR (TBR-ULTIMATE)	61.7
2	MISC. STRUCTURES (REVETMENTS) (TBR-ULTIMATE)	39.9
3	ADOT&PF AUXILIARY BUILDING (TBR)	28.5
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11	SECURITY FENCE	–
12	FIREHOUSE	41.5
13	MISCELLANEOUS BUILDING 1	63.5
14	HOUSING UNITS (TBR-ULTIMATE)	89.7
15	POWER PLANT (UNDER EXPANSION)	110.1
16	FUEL DOCK AND SHIPPING LANE	12.4/212

ULTIMATE FACILITIES

ID	DESCRIPTION	TOP EL. (Ft.) Est.
F3	AIRPORT STAFF HOUSING	32
F5	AIRPORT ADMIN BUILDING/ARFF	55
F6	HANGAR	69
F7	PASSENGER TERMINAL BUILDING	42
F9	CARGO FACILITY	42
F10	AEROLOGY BUILDING	110

NOTE:
1. BUILDING RESTRICTION LINE HEIGHT ABOVE PRIMARY SURFACE BRL 1 = 21.4', BRL 2 = 59.3', BRL 3 = 27.2'
2. THERE ARE NO OFZ OBJECT PENETRATIONS.

2015 MAG VAR 14.7° E

SCALE IN FEET
0 100 200 400

BY	DATE	REVISION

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
CENTRAL REGION

UNALASKA AIRPORT
UNALASKA, ALASKA
AIRPORT LAYOUT PLANS

ULTIMATE LAYOUT PLAN

DATE: FEBRUARY 2016

SHEET: 3 OF 8